NORTH DAKOTA UNIVERSITY SYSTEM
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State Capitol – 600 E Boulevard Ave – Dept. 215
Bismarck ND 58505-0230
Phone: 701.328.2960 Fax: 701.328.2961
E-mail: ndus.inquiry@ndus.edu Web: ndus.edu

North Dakota State Board of Higher Education
June 21, 2023, Academic and Student Affairs Committee Meeting

The State Board of Higher Education Academic and Student Affairs Committee met on June 21st at 9:30 a.m. CT.

Committee Chair Warford called the meeting to order at 9:30.

SBHE Committee on Academic and Student Affairs members present:
Dr. John Warford
Mr. Kevin Black
Ms. Sadie Hanson
Dr. Lisa Montplaisir, Faculty Advisor

DCB – Carmen Simone, **DSU** –John Miller, Melissa Wells, **LRSC** – President Darling, **MaSU** – Brian Huschle, **MiSU** – Laura Geller, **NDSU** –David Bertolini, **UND** – Karyn Plumm, **VCSU** –Larry Brooks, **WSC** – Wanda Meyer.

Others present: **NDUS** –Lisa Johnson, Claire Gunwall, Katie Fitzsimmons, Chris Pieske, Terry Meyer, **AG Counsel** – Meredith Larson.

1. **Agenda**
   Hanson moved, Black seconded, to approve the agenda, as presented.

   Hanson, Black, and Hacker voted yes. The motion passed.

2. **Meeting Minutes**
   Hanson moved, Black seconded, to approve the May 17, 2023, meeting minutes, as presented.

   Hanson, Black, and Warford voted yes. The motion passed.

3. New Academic Program Request (final approval at SBHE ASAC)
   a. Minot State University
      i. A.A.S. in Accounting

   Black moved, Hanson seconded, to approve MISU's new program request, item 3a.

   Hanson, Black, and Warford voted yes. The motion passed.

   b. North Dakota State University
      i. Minor in Artificial Intelligence
      ii. UG Certificate in Computer Science Foundations
      iii. UG Certificate in Computing Systems
      iv. UG Certificate in Core Computer Science Competencies
      v. UG Certificate in Data Science
      vi. UG Certificate in Fundamentals of Computing and Security

vii. UG Certificate in Software Development
viii. UG Certificate and B.S. in Cybersecurity

Black moved, Hanson seconded, to approve NDSU's New program requests, items 3b (i – viii), as presented.

Hanson, Black, and Warford voted yes. The motion passed.

4. Academic Program Termination (final approval at SBHE ASAC)
    c. North Dakota State University
        i. M.S. and Ph.D. in Food Safety

Black moved, Hanson seconded, to approve NDSU's program termination request, item 4c, as presented.

Black, Hanson, and Warford voted yes. The motion passed.

    d. University of North Dakota
        i. B.S. in Industrial Technology
        ii. M.S. in Technology

Black moved, Hanson seconded, to approve UND's program termination request, item 4d, as presented.

Black, Hanson, and Warford voted yes. The motion passed.

Vice Chancellor Johnson offered a brief summary of several year-end highlights that are pertinent to the ASAC:

- Coordinated review and approval of over 40 new program requests within the last year.
- Processed over 200+ program changes to include new program exploration, prefix changes, Changes. in delivery method, program/plan modifications, program title/CIP changes, and program inactivation/terminations and department, school, college name changes.
- Approved over 275 stackable credentials within the last three years.
- Distributed $111,500 in 2023-2024 to adopt or edit 60+ expanded Open Educational Resources—textbook costs saving for students.

Johnson noted that through restructuring of the approval process, more than 200 changes previously mentioned were processed at levels (AAC or Cabinet) prior to that of the ASAC committee. She thanked the campuses for their cooperation and feedback in creating greater efficiencies and documentation related to these processes.

Committee Chair Warford adjourned the meeting at 9:50 a.m. CT.

Approved September 20, 2023.

New Academic Program Request

Institution:

Minot State University

Program Name:

Accounting

Degree Types:

Associate in Applied Science

What day did AAC review the Academic Program Exploration Notice for this New Academic Program?

2023-01-03

CIP Code:

52.0302

Academic Program Code:

UGACCT

Academic Department/Division/College:

Department of Accounting & Finance/College of Business

Semester of Program:

Fall

Year of Program:

2024

Other Participating Institutions:

Not Applicable

Delivery Method:

On Campus

Describe the delivery methods and location(s) to which the program will be delivered:

Face-to-face, on-campus delivery at Minot State University

Funding Source:

Tuition Revenue

Describe the funding source:

The courses for this program already exist. Thus, there is very little, if any additional cost to create the program.

Is the program eligible for Financial Aid?

Yes

Degree Types eligible for Financial Aid:

Associate in Applied Science

Does the program require a criminal background check described in NDUS Procedure 511?

No

Describe a brief description of the program:

The Associate of Applied Science (AAS) in Accounting would prepare students for entry-level positions in the accounting field that do not require four year degrees (e.g., accounting clerks, bookkeepers). The AAS Accounting degree would provide knowledge of accounting principles and accounting functions to be used in the application of accounting skills and procedures.

Address student demand and employment availability for students completing the program:

This degree would qualify graduates for a "financial clerk" position. There are an average of 124 financial clerk positions open in the State of ND, according to insights.nd.gov. This program would also allow students to easily transition into a Bachelor's degree program. In addition to the 124 financial clerk positions open, there are also an average of 154 financial specialist positions open each month in the State of ND.

Describe how this need was assessed and indicate sources for data used and indicated ancipated enrollment rates for the first five years:

The North Dakota University System's Strategic Plan, Goal 6 Workforce, lists the Top 10 North Dakota High Priority Occupations. #9 on this list is Bookkeeping, Accounting and Auditing Clerks. #6 is Accountants and Auditors. This degree supports workforce needs in these top priority occupations. During the first year, we hope to have 4 students enrolled in the program during year 1. During years 2, 3, 4, and 5, we expect to have 4, 6, 8, and 10 students, respectively, starting the program each year.

Describe how the program addresses the institutional strategic plan:

The AAS Accounting degree will build enrollment (Goal 1) without increasing costs. This degree is a pathway for individuals interested in becoming accounting clerks and bookkeepers, in which a 4-year degree is not required. The program is designed so that students can easily transfer to a bachelor's degree upon completion of the AAS program.

Describe how the program addresses the NDUS stategic plan:

The North Dakota University System's Strategic Plan, Goal 6 Workforce, lists the Top 10 North Dakota High Priority Occupations. #9 on this list is Bookkeeping, Accounting and Auditing Clerks. #6 is Accountants and Auditors. This degree supports workforce needs in these top priority occupations.

Are there similar programs that exist within NDUS or state?

Yes

Identify similar programs that exist within NDUS or state:

Williston State College offers an AAS Accounting degree that includes 5 accounting courses (15 credits). Dakota College at Bottineau offers an AS in Liberal Arts with an Accounting subplan that includes 4 accounting courses (11 credits). No students were enrolled in that subplan as of summer 2022.

Briefly discuss if and how the program duplicated similar NDUS programs:

MiSU's program is designed to feed into a 4-year accounting program if a student so chooses. It also includes 6 accounting courses (18 credits), which is more than the other institutions offer.

Briefly justify the duplication of existing program(s) in NDUS or state:

The high workforce demand for bookkeeping, accounting and auditing clerks suggests there is opportunity to offer this program, especially since there is very little, if any cost associated with adding this degree program. For students who want to continue on to earn a bachelor's degree in accounting can do that at MiSU.

Discuss whether the potential students will be drawn from the same population as those in existing program in NDUS or state:

Williston State College draws students within its county due to its full scholarship for all residents. We believe this will draw a new market of students in our community who are not interested in a

4-year degree.

Discuss whether a collaborative program has been considered with an institution where the program exists:

Since this program will have very little, if any added cost, collaboration is not a necessity. We'd be open to working with other 2-year programs to transition their graduates into our 4-year degree program. We are willing to have DCB at MiSU students who are part of their AS in Liberal Arts with an Accounting subplan enroll in the MiSU accounting courses to reduce duplication of instruction. Online synchronous (or web-based) sections could be embedded in face-to-face courses to allow students at other campuses to enroll, also reducing duplication of courses.

How will tuition be charged:

Base rate

Is this the same tuition model method as the existing NDUS program:

Yes

What is the length of the program?

2 years

Identify the proposed program-level accreditation organization, if applicable:

IACBE or International Accreditation Council for Business Education

ASSOCIATE OF APPLIED SCIENCE IN ACCOUNTING

YEAR 1 FALL		YEAR 1 SPRING	
Course	**Credits**	**Course**	**Credits**
-ENGL 110 College Composition I	3	-ENGL 120 College Composition II	3
-MATH 210 Elementary Statistics	4	-ECON 201 or ECON 202 MICRO or MACRO	3
-UNIV 110 First Year Seminar	2-3	-BOTE 247 Spreadsheet Applications	3
-COMM 110 Fundamentals of Public Speaking	3	-ACCT 201 Elements of Accounting II	3
-ACCT 200 Elements of Accounting I	3	-BADM 269 Professional Ethics	3
Total	15-16	Total	15
YEAR 2 FALL		**YEAR 2 SPRING**	
Course	**Credits**	**Course**	**Credits**
-BIT 302 Business Communications	3	-ACCT 360 Accounting Information Systems	3
-ACCT 411 Taxation of Individuals	3	-Payroll Course	3
-BIT 347 Data Analytics	3	-Elective	3
-ACCT 321 Managerial Accounting	3	-Elective	3
- FIN 353 Principles of Financial Management	3	-ACCT 315 Legal Environment of Business	3
Total	15	Total	15

GENERAL EDUCATION COURSES (18 cr.)	
-ENGL 110 (3 cr.)	
-ENGL 120 (3 cr.)	
-MATH 104 (4 cr.)	
-ECON 201 OR ECON 202 (3 cr.)	
-COMM 110 (3 cr.)	
-UNIV 110 (2 cr.)	
REQUIRED BUSINESS CORE COURSES (12 cr.)	
BADM 269 (3 cr.)	
BOTE 247 (3 cr.)	
BIT 302 (3 cr.)	
FIN 353 (3 cr.)	
REQUIRED ACCOUNTING TRACK COURSES (24 cr.)	
ACCT 200 (3 cr.)	ACCT 411 (3 cr.)
ACCT 201 (3 cr.)	NEW PAYROLL CLASS (3 cr.)
ACCT 315 (3 cr.)	BIT 347 (3 cr.)
ACCT 321 (3 cr.)	
ACCT 360 (3 cr.)	
SELECT 5-6 CREDITS TO COMPLETE ACCOUNTING TRACK	
ACCT 351 (3 cr.)	
ACCT 412 (3 cr.)	
BUS 497 (1-12 CREDITS)	

TO COMPLETE BACHELOR OF SCIENCE DEGREE

YEAR 3 FALL		YEAR 3 SPRING	
Course	**Credits**	**Course**	**Credits**
-HIST 105/106/IP1 Gen Ed	3	-Science Gen Ed	4
-Science Gen Ed	4	-BADM 301 Fundamentals of Management	3
-ECON 201 or 202 (COB core)	3	-BADM 321 Marketing	3
-ACCT 301 Intermediate Accounting	3	-ACCT 302 Intermediate Accounting I	3
-ACCT 331 Business Law I	3	-BIT 220 Management Information Systems	3
Total	16	Total	16
YEAR 4 FALL		**YEAR 4 SPRING**	
Course	**Credits**	**Course**	**Credits**
-ACCT Elective	3	- ACCT Elective	3
-ACCT 303 Intermediate Acct III	3	-ACCT 401 Advanced Accounting	3
-ACCT 430 Auditing/ Assurance Concepts	3	-ACCT 412 Taxation of Business *	3
-Humanities Gen Ed	3	-Humanities Gen Ed	3
-ACCT 480 Controllership	3	- ACCT Elective	3
Total	15	Total	15
*May have been taken as part of associate degree			
**makes sure it meets developmental GE			

Accounting (52.0301)

Contents

About Lightcast

Lightcast is a labor market analytics firm that is passionate about providing meaningful data for colleges and their students.

Our data is trusted by a breadth of users including researchers at colleges and universities, economic development organizations, and Fortune 500 companies.

Lightcast data offers a three-pronged approach to labor market information:

1. Our traditional LMI combines dozens of government sources from agencies like the Bureau of Economic Analysis, U.S. Census Bureau, and Bureau of Labor Statistics into one dataset that details industries, occupations, demographics, academic programs, and more.

2. Lightcast's job posting analytics give a real-time look into the needs of employers in today's labor market. Each month, millions of postings are scraped from employer sites and job boards, de-duplicated, and compiled into an actionable dataset.

3. Lightcast also leverages workforce profiles—an innovative database of more than 100 million resumés and professional profiles that are aggregated from the open web. These profiles unify information for workers—such as education, employment history, skills, and more—to reveal robust detail on what is happening in today's workforce.

Together, these data related to labor market demand, relevant skills, and the competitive landscape help colleges and universities make informed decisions about their program offerings.

Program Definition

Institution:

Code	Description
200253	Minot State University

Program in Question:

Code	Description
52.0301	Accounting

Competitive Landscape

Institution Sectors:

Description	Description
Administrative Unit Only	Private not-for-profit, 2-year
Public, 4-year or above	Private for-profit, 2-year
Private not-for-profit, 4-year or above	Public, less-than-2-year
Private for-profit, 4-year or above	Private not-for-profit, less-than-2-year
Public, 2-year	Private for-profit, less-than-2-year

Education Levels:

Description
Associate's Degree

Program Type:

Description	Description
Distance Offered (Includes Hybrid & Mixed Modality Programs)	Non-Distance Offered Programs

Region:

Code	Description
0	United States

Additional Competing Programs:

Code	Description
52.0304	Accounting and Finance

Student Charges Type: Tuition & Fees

Student Charges Grad Status: Undergraduate

Student Charges Residency: In-State

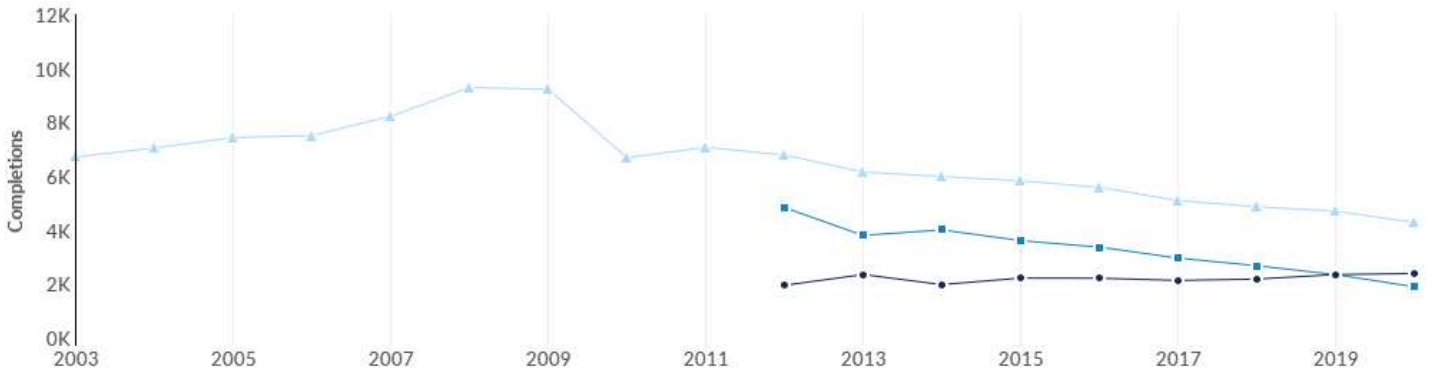
Program Overview

	Completions (2020)	% Completions	Institutions (2020)	% Institutions
All Programs	4,288	100%	310	100%
Distance Offered Programs	2,390	56%	138	45%
Non-Distance Offered Programs	1,898	44%	182	59%

Completions by Institution

Institution	Associate's Degree Completions (2020)	Growth % YOY (2020)	Market Share (2020)	IPEDS Tuition & Fees (2020)	Completions Trend (2016-2020)
Southern New Hampshire University	261	18.1%	6.1%	$9,650	
Colorado Technical University-Colorado Springs	196	23.3%	4.6%	$12,573	
Eastern Gateway Community College	122	320.7%	2.8%	$4,026	
Paris Junior College	59	15.7%	1.4%	$3,960	
Cuyahoga Community College District	54	-6.9%	1.3%	$4,322	
Madison Area Technical College	54	0.0%	1.3%	$4,530	
Dallas College	54	1,250.0%	1.3%	$4,050	
Houston Community College	54	5.9%	1.3%	$4,344	
Long Island Business Institute	54	-27.0%	1.3%	$10,416	
Delaware Technical Community College-Terry	52	-14.8%	1.2%	$4,945	

Regional Trends



	2012 Completions	2020 Completions	% Change
Distance Offered Programs	1,952	2,390	+22.4%
Non-Distance Offered Programs	4,837	1,898	-60.8%
All Programs	6,789	4,288	-36.8%

Labor Market Demand

Labor Market Area Selection:

Code	Description
0	United States

Target Occupations:
12 items selected. See Appendix A for details.

Degree Levels:

Description
Associate's degree

Completions Year (default): 2020

Jobs Year (default): 2021

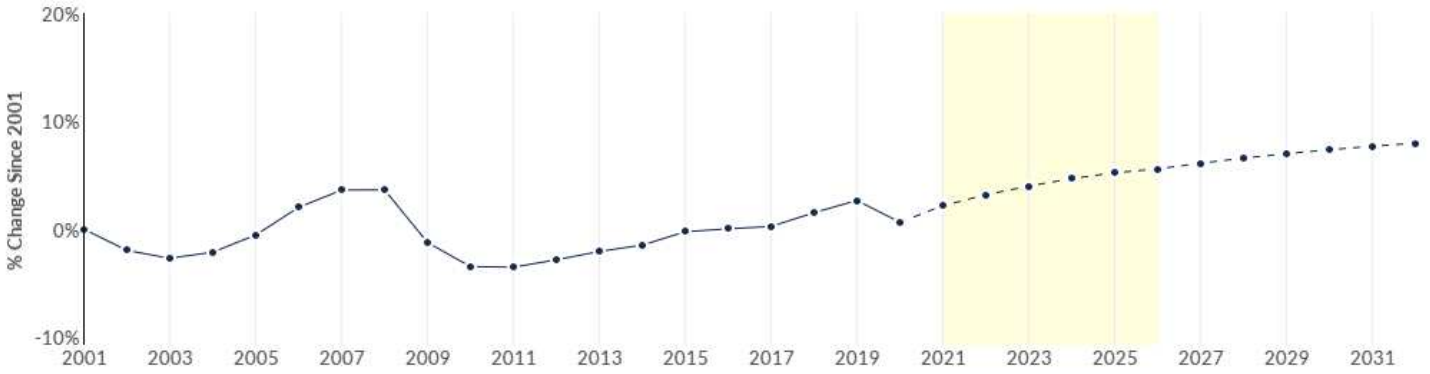
Target Occupations

*Filtered by the proportion of the national workforce in these occupations with an Associate's degree

446,803	+2.4%	$30.30/hr $63.0K/yr	47,146
*Jobs (2021)**	*% Change (2021-2026)**	Median Earnings	*Annual Openings**

Occupation	*2021 Jobs**	*Annual Openings**	Median Earnings	*Growth (2021 - 2026)**
Bookkeeping, Accounting, and Auditing Clerks	*201,140*	*23,084*	$20.38/hr	*+0.02%*
Accountants and Auditors	*117,604*	*11,666*	$35.38/hr	*+4.63%*
Financial Managers	*52,343*	*4,779*	$64.00/hr	*+8.65%*
Payroll and Timekeeping Clerks	*20,343*	*2,075*	$22.59/hr	*-5.11%*
Financial and Investment Analysts, Financial Risk Specialists, and Financial Specialists, All Other	*17,725*	*1,563*	$40.18/hr	*+5.13%*
Tax Preparers	*10,887*	*1,399*	$22.00/hr	*+6.05%*
Brokerage Clerks	*6,491*	*724*	$26.57/hr	*-2.25%*
Credit Analysts	*6,004*	*537*	$36.05/hr	*-1.32%*
Tax Examiners and Collectors, and Revenue Agents	*5,692*	*495*	$26.75/hr	*-0.86%*
Financial Examiners	*4,393*	*425*	$39.15/hr	*+9.86%*
Budget Analysts	*3,214*	*274*	$37.97/hr	*+3.05%*
Statistical Assistants	*965*	*125*	$24.21/hr	*+4.46%*

Regional Trends



	Region	2021 Jobs	2026 Jobs	Change	% Change
●	Region	4,874,861	5,037,333	162,472	3.3%

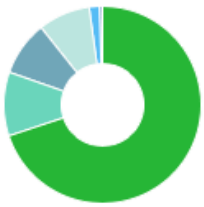
Occupation Gender Breakdown

	Gender	2021 Jobs	2021 Percent
●	Males	1,590,361	32.6%
●	Females	3,284,500	67.4%

Occupation Age Breakdown

Age	2021 Jobs	2021 Percent
14-18	6,002	0.1%
19-24	205,973	4.2%
25-34	970,411	19.9%
35-44	1,096,933	22.5%
45-54	1,112,971	22.8%
55-64	1,015,405	20.8%
65+	467,166	9.6%

Occupation Race/Ethnicity Breakdown



Race/Ethnicity	2021 Jobs	2021 Percent
White	3,407,080	69.9%
Hispanic or Latino	509,783	10.5%
Asian	436,605	9.0%
Black or African American	415,322	8.5%
Two or More Races	80,879	1.7%
American Indian or Alaska Native	18,428	0.4%
Native Hawaiian or Other Pacific Islander	6,764	0.1%

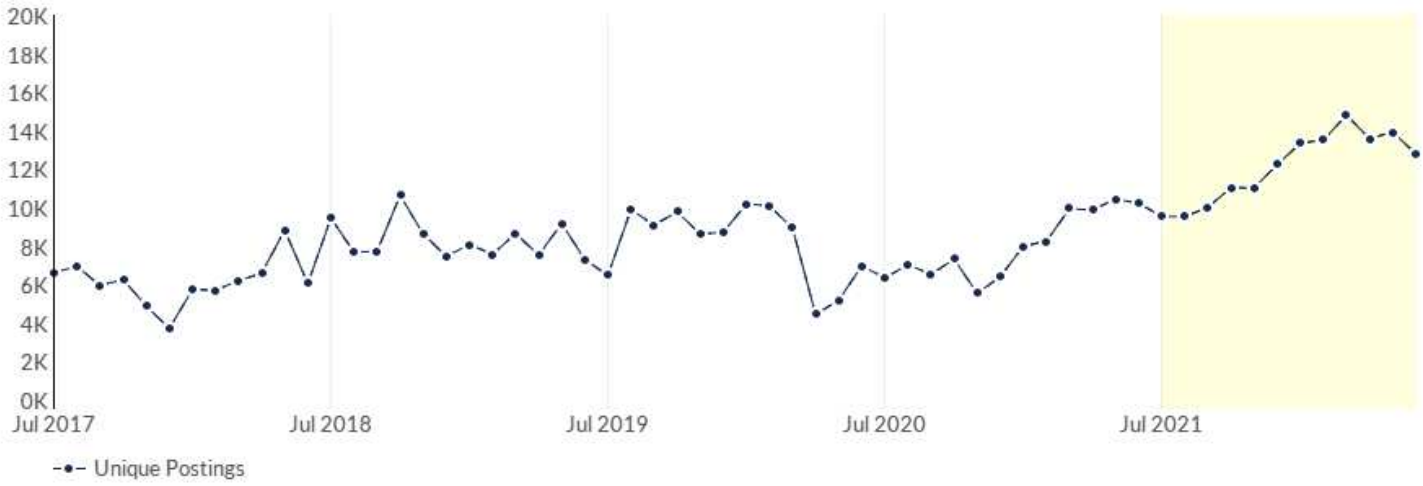
Job Postings Summary

145,510	3 : 1
Unique Postings (Jul 2021 - Jun 2022)	**Posting Intensity (Jul 2021 - Jun 2022)**
453,853 Total Postings	Regional Average: 3 : 1

There were **453,853** total job postings for your selection from July 2021 to June 2022, of which **145,510** were unique. These numbers give us a Posting Intensity of **3-to-1**, meaning that for every 3 postings there is 1 unique job posting.

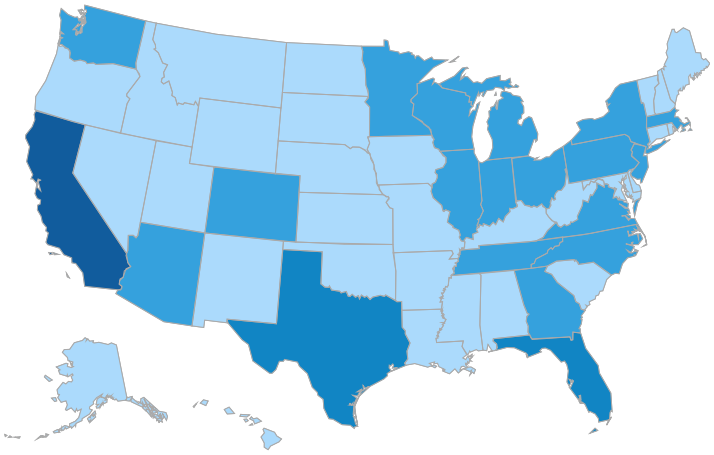
This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

Unique Postings Trend



Month	Unique Postings	Posting Intensity
Jun 2022	12,816	2 : 1
May 2022	13,938	2 : 1
Apr 2022	13,601	3 : 1
Mar 2022	14,815	2 : 1
Feb 2022	13,529	2 : 1
Jan 2022	13,356	3 : 1
Dec 2021	12,255	3 : 1
Nov 2021	11,034	4 : 1
Oct 2021	11,049	5 : 1
Sep 2021	10,029	5 : 1
Aug 2021	9,542	3 : 1
Jul 2021	9,546	3 : 1

Job Postings Regional Breakdown



State	Unique Postings (Jul 2021 - Jun 2022)
California	17,502
Texas	12,113
Florida	10,458
New York	7,407
Ohio	5,517

Top Companies Posting

Company	Total/Unique (Jul 2021 - Jun 2022)	Posting Intensity	Unique Postings Trend (Jul 2021 - Jun 2022)
Robert Half	11,138 / 6,301	2 : 1	
Randstad	5,056 / 3,484	1 : 1	
Bank of America	7,790 / 2,094	4 : 1	
Creative Financial Staffing	4,261 / 1,492	3 : 1	
Aston Carter	1,850 / 1,016	2 : 1	
PNC	4,991 / 823	6 : 1	
Zurich Insurance	859 / 547	2 : 1	
Travelers	634 / 546	1 : 1	
Humana	1,203 / 468	3 : 1	
Kforce	865 / 467	2 : 1	

Top Cities Posting

City	Total/Unique (Jul 2021 - Jun 2022)	Posting Intensity	Unique Postings Trend (Jul 2021 - Jun 2022)
New York, NY	6,467 / 2,601	2 : 1	
Houston, TX	5,333 / 2,185	2 : 1	
Los Angeles, CA	7,191 / 1,921	4 : 1	
Atlanta, GA	3,397 / 1,888	2 : 1	
Dallas, TX	6,482 / 1,819	4 : 1	
Chicago, IL	3,731 / 1,534	2 : 1	
Phoenix, AZ	6,432 / 1,505	4 : 1	
Minneapolis, MN	3,463 / 1,375	3 : 1	
Miami, FL	4,474 / 1,341	3 : 1	
San Diego, CA	4,865 / 1,259	4 : 1	

Top Posted Occupations

Occupation (SOC)	Total/Unique (Jul 2021 - Jun 2022)	Posting Intensity	Unique Postings Trend (Jul 2021 - Jun 2022)
Bookkeeping, Accounting, and Auditing Clerks	264,418 / 80,290	3 : 1	
Accountants and Auditors	62,099 / 22,452	3 : 1	
Financial Managers	44,688 / 15,571	3 : 1	
Payroll and Timekeeping Clerks	43,934 / 12,287	4 : 1	
Financial and Investment Analysts, Financial Risk Specialists, and Financial Specialists, All Other	25,436 / 9,823	3 : 1	
Tax Examiners and Collectors, and Revenue Agents	4,625 / 1,814	3 : 1	
Credit Analysts	3,814 / 1,296	3 : 1	
Tax Preparers	1,822 / 824	2 : 1	
Budget Analysts	1,769 / 654	3 : 1	
Financial Examiners	687 / 262	3 : 1	

Top Posted Job Titles

Job Title	Total/Unique (Jul 2021 - Jun 2022)	Posting Intensity	Unique Postings Trend (Jul 2021 - Jun 2022)
Accounts Payable Specialists	27,371 / 8,893	3 : 1	
Bookkeepers	31,031 / 6,091	5 : 1	
Accounting Clerks	18,761 / 6,089	3 : 1	
Accountants	13,729 / 5,675	2 : 1	
Accounts Payable Clerks	17,316 / 5,651	3 : 1	
Payroll Specialists	17,285 / 4,599	4 : 1	
Accounts Receivable Specialists	14,470 / 4,482	3 : 1	
Accounting Assistants	13,249 / 4,172	3 : 1	
Accounting Specialists	9,235 / 3,728	2 : 1	
Full Charge Bookkeepers	11,363 / 3,374	3 : 1	

Rank as a Talent Provider

Lightcast's workforce profile data shows Minot State University has 569 alumni working regionally in the 12 occupations selected. These 569 alumni represent 0.01% of regional profiles working in these occupations, which ranks your institution >1,000 among regional talent providers.

569	0.01%	>1,000
Your Alumni in Region Working in Target Occupations	**Percent of Regional Profiles** Working in Target Occupations	**Your Rank as a** Regional Talent Provider

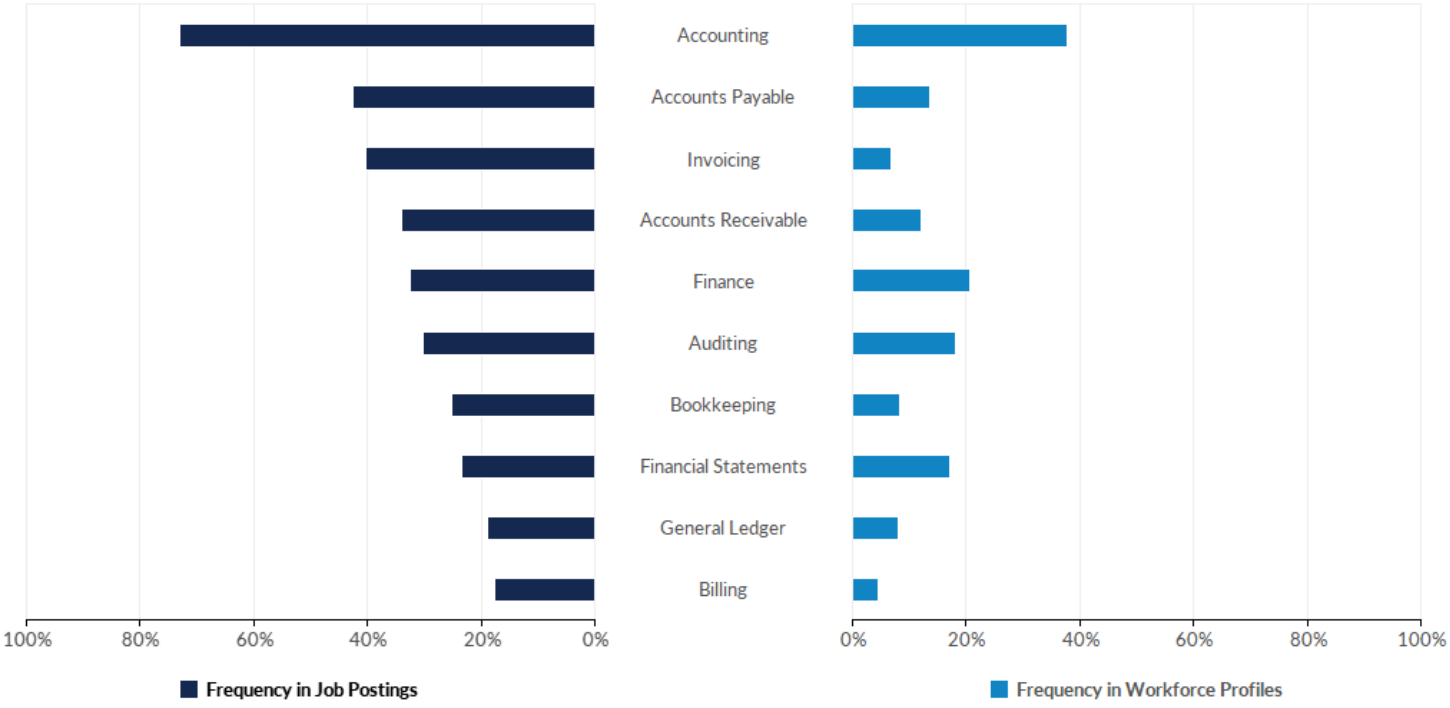
Top Talent Providers

The top regional institutions supplying the labor market with workers employed in the target occupations listed above, based on Lightcast's workforce profile data.

School	Profiles	Percent
University of Phoenix-Arizona	48,327	1.05%
University of Maryland-College Park	22,727	0.49%
New York University	22,568	0.49%
University of California-Los Angeles	22,131	0.48%
Pennsylvania State University-Main Campus	22,114	0.48%
The University of Texas at Austin	21,223	0.46%
University of Illinois Urbana-Champaign	18,620	0.40%
Indiana University-Bloomington	18,613	0.40%
Arizona State University Campus Immersion	18,257	0.40%
CUNY Bernard M Baruch College	18,090	0.39%

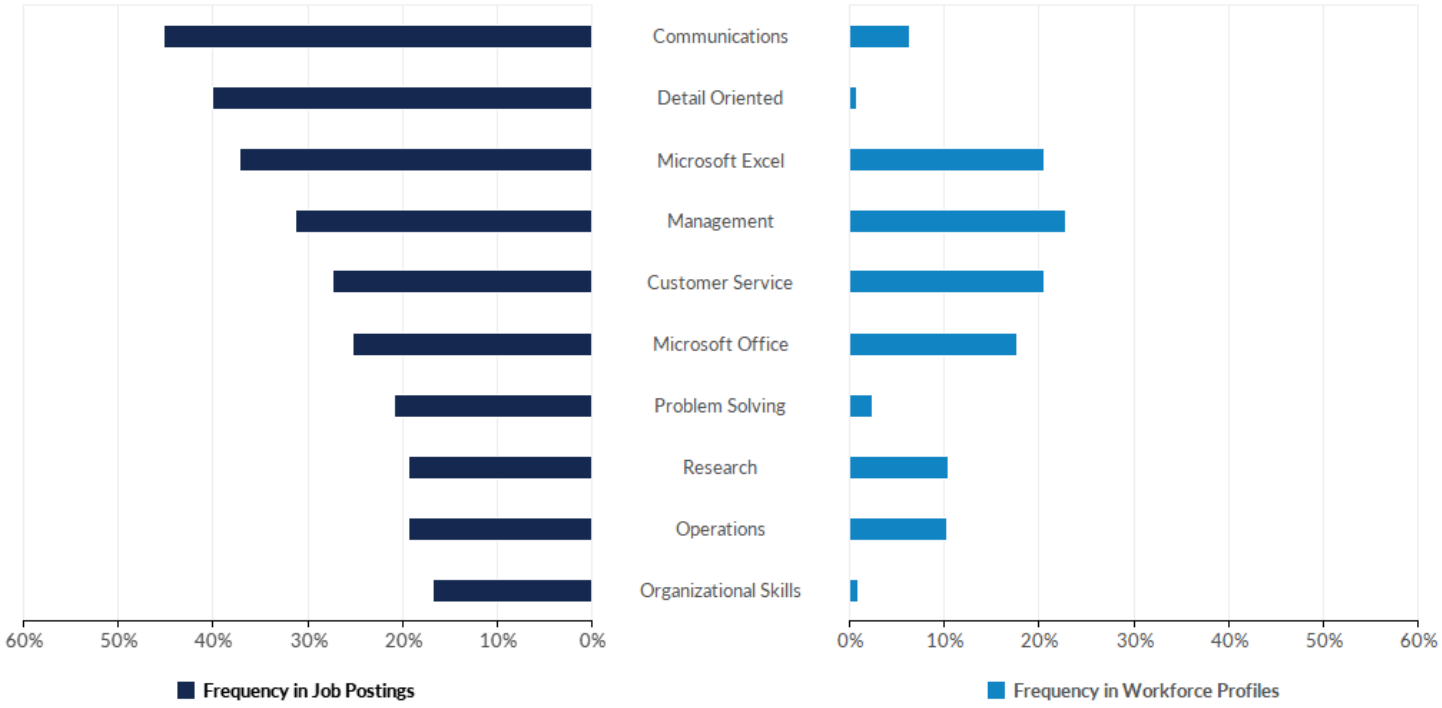
Relevant Skills

Top Specialized Skills



Skill	Frequency in Postings	Postings with Skill / Total Postings (Jul 2021 - Jun 2022)	Frequency in Profiles	Profiles with Skill / Total Profiles (2020 - 2022)
Accounting	73%	106,466 / 145,510	38%	1,650,884 / 4,366,868
Accounts Payable	42%	61,818 / 145,510	14%	593,080 / 4,366,868
Invoicing	40%	58,768 / 145,510	7%	291,682 / 4,366,868
Accounts Receivable	34%	49,429 / 145,510	12%	527,542 / 4,366,868
Finance	32%	47,101 / 145,510	21%	905,542 / 4,366,868
Auditing	30%	43,976 / 145,510	18%	796,999 / 4,366,868
Bookkeeping	25%	36,688 / 145,510	8%	366,089 / 4,366,868
Financial Statements	23%	33,971 / 145,510	17%	751,049 / 4,366,868
General Ledger	19%	27,646 / 145,510	8%	351,461 / 4,366,868
Billing	18%	25,498 / 145,510	5%	196,796 / 4,366,868

Top Common Skills



Skill	Frequency in Postings	Postings with Skill / Total Postings (Jul 2021 - Jun 2022)	Frequency in Profiles	Profiles with Skill / Total Profiles (2020 - 2022)
Communications	45%	65,648 / 145,510	6%	277,855 / 4,366,868
Detail Oriented	40%	58,296 / 145,510	1%	34,740 / 4,366,868
Microsoft Excel	37%	54,082 / 145,510	21%	895,538 / 4,366,868
Management	31%	45,568 / 145,510	23%	995,474 / 4,366,868
Customer Service	27%	39,857 / 145,510	21%	895,638 / 4,366,868
Microsoft Office	25%	36,711 / 145,510	18%	771,701 / 4,366,868
Problem Solving	21%	30,400 / 145,510	2%	102,805 / 4,366,868
Research	19%	28,166 / 145,510	10%	454,748 / 4,366,868
Operations	19%	28,044 / 145,510	10%	447,553 / 4,366,868
Organizational Skills	17%	24,443 / 145,510	1%	37,058 / 4,366,868

Top Qualifications

Qualification	Postings with Qualification
Bachelor Of Science in Business	3,675
Certified Accounting Technician	1,942
Certified Public Accountant	1,806
Certified Payroll Professional	900
Master Of Business Administration (MBA)	827
Certified Coding Specialist	826
Licensed Practical Nurse	787
Bachelor Of Science in Business Administration	721
Security Clearance	515
Registered Health Information Technician	505

Appendix A (Occupations)

Code	Description
13-2011	Accountants and Auditors
13-2098	Financial and Investment Analysts, Financial Risk Specialists, and Financial Specialists, All Other
13-2061	Financial Examiners
11-3031	Financial Managers
13-2031	Budget Analysts
13-2041	Credit Analysts

Code	Description
13-2081	Tax Examiners and Collectors, and Revenue Agents
13-2082	Tax Preparers
43-3031	Bookkeeping, Accounting, and Auditing Clerks
43-3051	Payroll and Timekeeping Clerks
43-4011	Brokerage Clerks
43-9111	Statistical Assistants

New Academic Program Request

Institution:

North Dakota State University

Program Name:

Artificial Intelligence

Degree Types:

Minor Program

What day did AAC review the Academic Program Exploration Notice for this New Academic Program?

2023-03-09

CIP Code:

11.0102

Academic Program Code:

Will be determined by Registration & Records in consultation with Core Technology Services upon approval.

Academic Department/Division/College:

Department of Computer Science/College of Engineering

Semester of Program:

Fall

Year of Program:

2023

Other Participating Institutions:

Not Applicable

Delivery Method:

On Campus
Hybrid (on campus & distance)
Hybrid (Distance Education Only)
Online Only

Describe the delivery methods and location(s) to which the program will be delivered:

Traditional face-to-face classroom setting on NDSU campus; online synchronously and asynchronously; hybrid options

Funding Source:

Instructional Re-allocation

Describe the funding source:

The program relies on existing courses. Any additional expenses due to growing class sizes are expected to be compensated by revenue in the same way as is the case for increasing student numbers in existing programs.

Is the program eligible for Financial Aid?

Yes

Degree Types eligible for Financial Aid:

Minor Program

Does the program require a criminal background check described in NDUS Procedure 511?

No

Describe a brief description of the program:

The program will allow students from multiple departments in the NDSU College of Engineering (e.g., Computer Science, Electrical and Computer Engineering, Industrial and Manufacturing Engineering) to deepen their understanding of Artificial Intelligence. It is laid out to include a concise coverage of mathematical and computational foundations, a specific course on artificial intelligence, and an elective that can be drawn from courses offered in the Computer Science Department or any of the other departments that have broadened their machine learning and artificial intelligence offerings in recent years.

Address student demand and employment availability for students completing the program:

This Minor program addresses a different subset of skills than our Computer Science Minor, making it more approachable for other Majors in the NDSU College of Engineering who have strongly requested that we add an AI Minor. The need for AI-related skills is apparent from the attached Lightcast report. It shows that for the Python programming language, which is often used in Artificial Intelligence, frequency in job postings outnumbers frequency in profiles by an even greater fraction than for the Java programming language that is characteristic of our Computer Science Minor.

Describe how this need was assessed and indicate sources for data used and indicated ancipated enrollment rates for the first five years:

Several faculty members in other departments in the NDSU College of Engineering, in particular the Departments of Electrical and Computer Engineering and Industrial and Manufacturing Engineering urgently need their students to have the skills in this minor. They were prepared to create their own program, which would have resulted in excessive duplication of courses. We already have all needed courses available in our department. We designed the program such that it would not require new courses. Regardless of enrollment in the years of the program, we would offer a sufficient set of courses for this program. This is because we were able to construct a highly flexible core from existing courses that serve purposes in our major (CSCI 160, CSCI 222, CSCI 372, and CSCI 426) and the Management Information Systems major (CSCI 227, CSCI 228, and CSCI 312) through minimal adjustments of content and expectations. This was possible thanks to the extraordinary flexibility of the respective instructors. The electives were drawn from our department as well as ECE and IME. We also removed prerequisites to one core course (CSCI 426) and one elective (CSC 428) last year to open important courses to non-majors, and put us into a position where we can combine those courses into more comprehensive offerings for students from other departments.

Describe how the program addresses the institutional strategic plan:

Artificial intelligence has been at the center of many, if not most, of the transformative innovations of the past few years. Faculty in several NDSU departments depend on machine learning and, more generally, artificial intelligence, in their research. Agricultural and other types of engineering in the State of North Dakota depend on artificial intelligence for moving beyond the status quo. Growing and broadening the workforce educated in the foundations and applications of artificial intelligence is a central need for North Dakota and the world.

Describe how the program addresses the NDUS stategic plan:

The proposal is responsive to demands that have been brought to us by multiple other departments, which themselves respond to student and research demand. Given the importance of artificial intelligence, it prepares students for success. While UND offers a graduate certificate in Artificial Intelligence and Machine learning, we are requesting an undergraduate minor. The competencies will prepare students to contribute to research across the College of

Engineering and develop an artificial-intelligence-conscious workforce after graduation.

Are there similar programs that exist within NDUS or state?

No

What is the length of the program?

16 or 18 credits depending on track

Identify the proposed program-level accreditation organization, if applicable:

ABET accredits computer science and software engineering programs but does not specifically address artificial intelligence programs.

NDSU Artificial Intelligence Minor Curriculum

A Minor in Artificial Intelligence (AI) requires at least 19 semester hours of core AI and related courses. A minimum of eight credits must be earned in residence at NDSU. Students must declare their minor(s), online through the Major / Minor form found in the forms section, on the Registration and Records website. A grade of C or better is required in all courses applied toward the AI Minor.

Total number of credits: 19-21

Choose either of the following (4-6 credits):

- CSCI 160 Computer Science I (4 credits)

Or the sequence

- CSCI 227 Computing Fundamentals I (3 credits)
- CSCI 228 Computing Fundamentals II (3 credits)

Also required (9 credits):

- CSCI 222 Discrete Mathematics (3 credits)
  or Math 270 Introduction to Abstract Mathematics (3 credits)
- CSCI 372 Comparative Programming Languages (3 credits)
  or CSCI 312 Survey of Programming Languages (3 credits)
- CSCI 426 Introduction to Artificial Intelligence (3 credits)

Additional Electives (choose 6 credits):

- CSCI 420 Introduction to Data Science in Python (3 credits)
- CSCI 422 Introduction to Data Engineering (3 credits)
- CSCI 425 Machine Learning (3 credits)
- CSCI 428 Artificial Intelligence, Ethics, and the Environment (3 credits)
- CSCI 485 Autonomous Command and Artificial Intelligence for Robots and Other Cyber-Physical Systems (3 credits)
- ECE 477 Hardware Design for Machine Learning (3 credits)
- IME 465 Introduction to Machine Learning (3 credits)

Minor Requirements and Notes:
A minimum of 8 credits must be taken at NDSU.
Cannot be combined with the Data Science or Standard Tracks of the B.S. in Computer Science.
A grade of 'C' or better is required in all courses applied to the AI minor.

Program Overview

Artificial Intelligence

Lightcast Q3 2022 Data Set

September 2022

1340 Administration Avenue
Fargo, North Dakota 58102
701-231-8011

Parameters

Completions Year: 2020

Jobs Timeframe: 2022 - 2032

Job Postings Timeframe: Sep 2021 - Aug 2022

Programs:

Code	Description
11.0102	Artificial Intelligence

Regions:

Code	Description
27	Minnesota
30	Montana

Code	Description
38	North Dakota
46	South Dakota

Education Level: Any

Tuition Type: Tuition & Fees

Graduate Status: Undergraduate

Residency: In-State

There are no regional training providers for your selection.

Program Overview

0
Completions

	Completions (2020)	% Completions	Institutions (2020)	% Institutions
All Programs	0	0%	0	0%
Distance Offered Programs	0	0%	0	0%
Non-Distance Offered Programs	0	0%	0	0%

Market Share by Institution Type

There are no regional Completions for your selection.

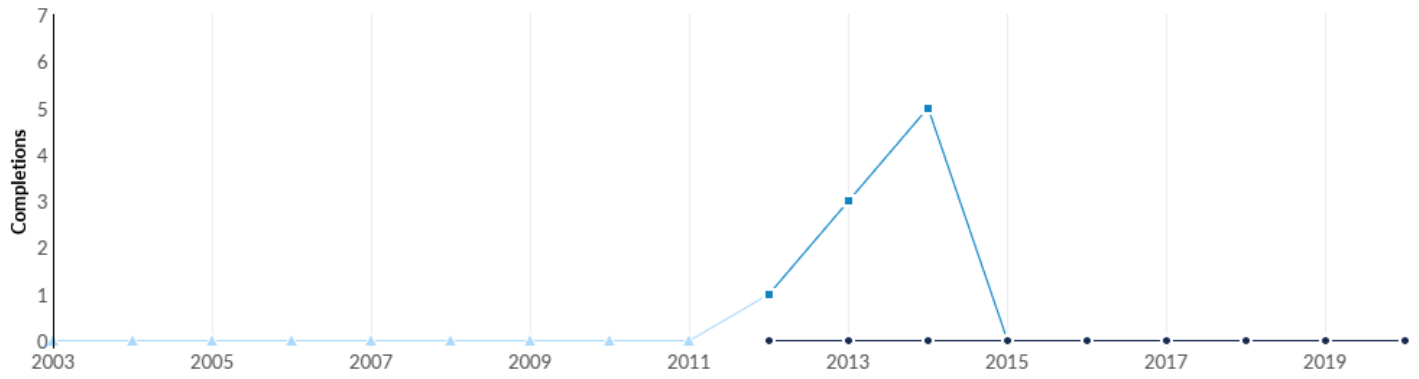
Market Share by Program

There are no regional Completions for your selection.

Completions by Institution

No institutions with completions found in this region.

Regional Trends



	2012 Completions	2020 Completions	% Change
Distance Offered Programs	0	0	0.0%
Non-Distance Offered Programs	1	0	-100.0%
All Programs	1	0	-100.0%

Regional Completions by Award Level

Not enough data for this chart.

Similar Programs

76	19,541
Programs (2020)	Completions (2020)

CIP Code	Program	Completions (2020)
52.0201	Business Administration and Management, General	7,468
11.0701	Computer Science	1,533
14.1901	Mechanical Engineering	1,337
40.0501	Chemistry, General	703
11.1003	Computer and Information Systems Security/Auditing/Information Assurance	649
14.1001	Electrical and Electronics Engineering	621
11.0101	Computer and Information Sciences, General	591
14.0801	Civil Engineering, General	532
11.0103	Information Technology	481
14.0701	Chemical Engineering	415

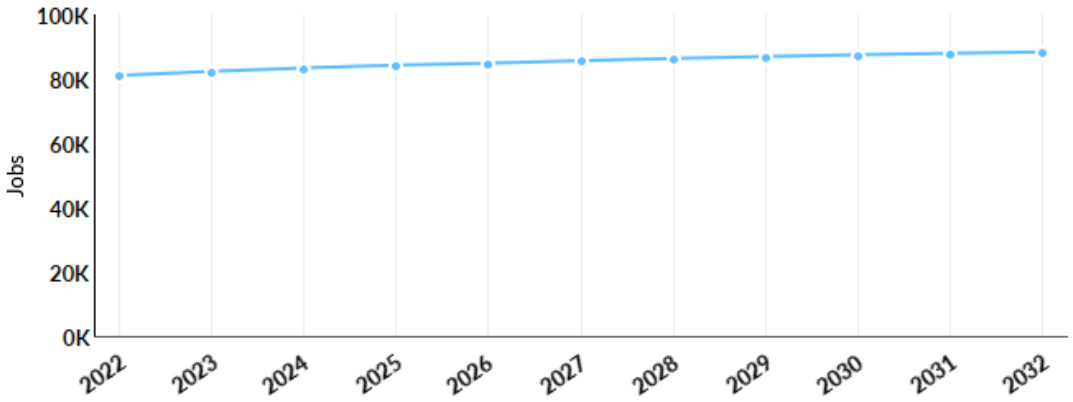
Target Occupations

81,003	+9.0%	$49.32/hr $102.6K/yr	6,867
Jobs (2022)	% Change (2022-2032)	Median Earnings	Annual Openings
5% below National average	Nation: +14.5%	Nation: $56.81/hr; $118.2K/yr	

Occupation	2022 Jobs	Annual Openings	Median Earnings	Growth (2022 - 2032)	Location Quotient (2022)
Software Developers	44,829	4,143	$47.91/hr	+14.76%	1.04
Computer Systems Analysts	17,396	1,265	$46.80/hr	+0.75%	1.11
Computer and Information Systems Managers	11,639	956	$71.01/hr	+5.64%	0.78
Computer Programmers	3,567	229	$38.13/hr	-10.85%	0.72
Engineers, All Other	2,994	215	$45.83/hr	+6.45%	0.58
Electro-Mechanical and Mechatronics Technologists and Technicians	322	31	$29.35/hr	-1.55%	0.94
Computer and Information Research Scientists	257	27	$62.78/hr	+25.68%	0.25

Growth

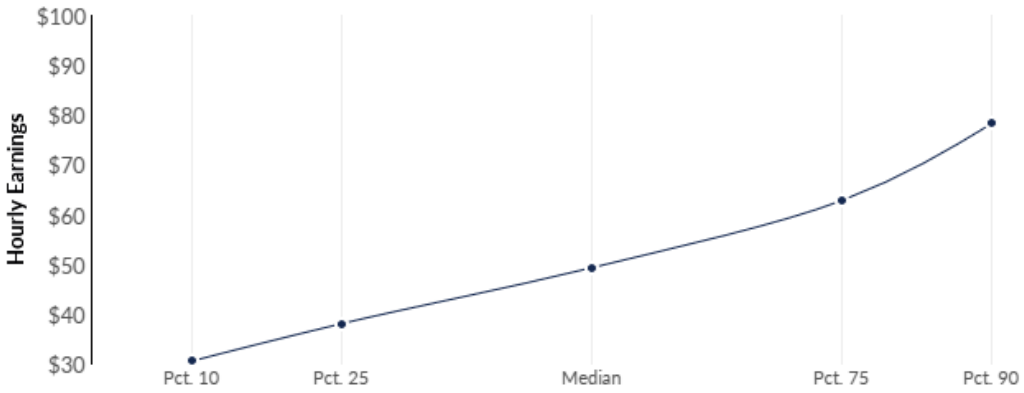
81,003	88,272	7,269	9.0%
2022 Jobs	2032 Jobs	Change (2022-2032)	% Change (2022-2032)



Occupation	2022 Jobs	2032 Jobs	Change	% Change
Computer and Information Systems Managers (11-3021)	11,639	12,296	657	6%
Computer Systems Analysts (15-1211)	17,396	17,526	130	1%
Computer and Information Research Scientists (15-1221)	257	323	66	26%
Computer Programmers (15-1251)	3,567	3,180	-387	-11%
Software Developers (15-1252)	44,829	51,444	6,615	15%
Engineers, All Other (17-2199)	2,994	3,187	193	6%
Electro-Mechanical and Mechatronics Technologists and Technicians (17-3024)	322	317	-5	-2%

Percentile Earnings

$38.08/hr	$49.32/hr	$62.84/hr
25th Percentile Earnings	Median Earnings	75th Percentile Earnings



Occupation	25th Percentile Earnings	Median Earnings	75th Percentile Earnings
Computer and Information Systems Managers (11-3021)	$55.07	$71.01	$79.84
Computer Systems Analysts (15-1211)	$36.53	$46.80	$56.91
Computer and Information Research Scientists (15-1221)	$57.95	$62.78	$63.36
Computer Programmers (15-1251)	$30.20	$38.13	$46.79
Software Developers (15-1252)	$37.47	$47.91	$61.13
Engineers, All Other (17-2199)	$36.42	$45.83	$59.85
Electro-Mechanical and Mechatronics Technologists and Technicians (17-3024)	$23.25	$29.35	$36.57

Job Postings Summary

42,458	2 : 1	29 days
Unique Postings	**Posting Intensity**	**Median Posting Duration**
95,496 Total Postings		Regional Average: 34 days
	Regional Average: 3 : 1	

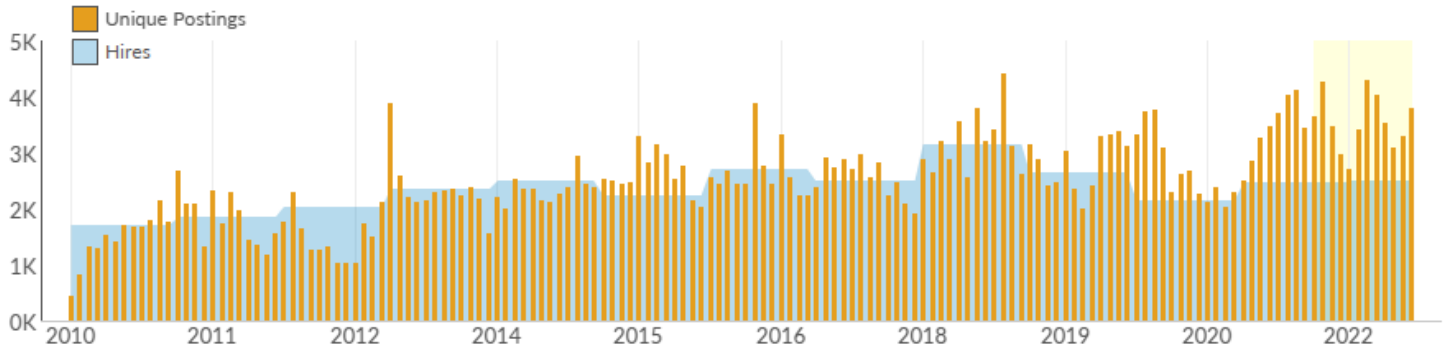
There were **95,496** total job postings for your selection from September 2021 to August 2022, of which **42,458** were unique. These numbers give us a Posting Intensity of **2-to-1**, meaning that for every 2 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

Job Postings vs. Hires

3,538	2,491
Avg. Monthly Postings (Sep 2021 - Aug 2022)	Avg. Monthly Hires (Sep 2021 - Aug 2022)

In an average month, there were **3,538** newly posted job postings for *7 Occupations*, and **2,491** actually hired. This means there was approximately 1 hire for every 1 unique job posting for *7 Occupations*.



Occupation	Avg Monthly Postings (Sep 2021 - Aug 2022)	Avg Monthly Hires (Sep 2021 - Aug 2022)
Software Developers	2,398	1,487
Computer Systems Analysts	624	484
Engineers, All Other	168	75
Computer Programmers	151	91
Computer and Information Systems Managers	91	332
Electro-Mechanical and Mechatronics Technologists and Technicians	64	11
Computer and Information Research Scientists	41	11

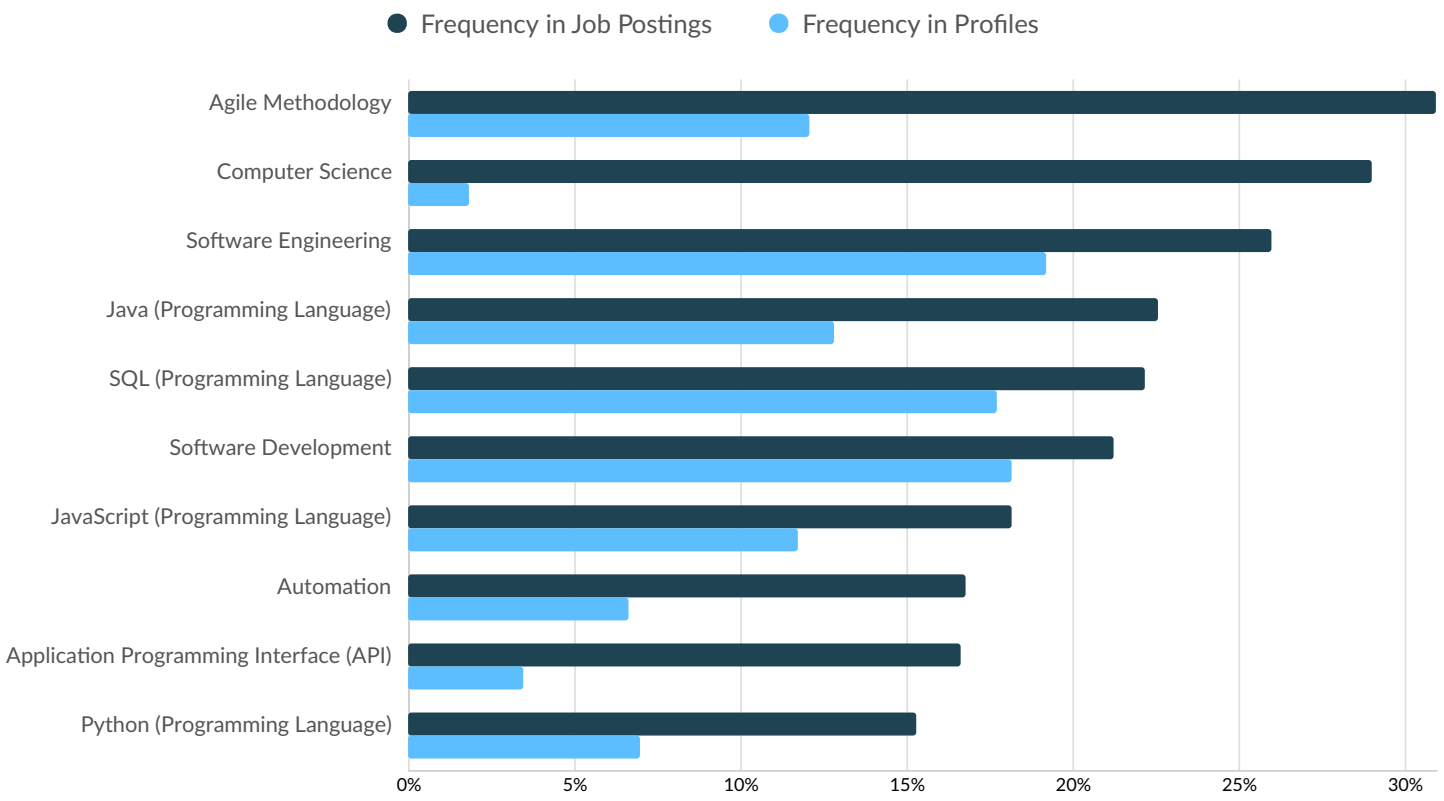
Top Companies Posting

Company	Total/Unique (Sep 2021 - Aug 2022)	Posting Intensity	Median Posting Duration
Randstad	4,465 / 2,014	2 : 1	21 days
UnitedHealth Group	5,354 / 1,777	3 : 1	30 days
Humana	2,602 / 1,088	2 : 1	36 days
Wells Fargo	4,036 / 842	5 : 1	34 days
US Bank	1,138 / 651	2 : 1	34 days
Target	3,982 / 627	6 : 1	18 days
Revature	2,415 / 516	5 : 1	21 days
General Dynamics	704 / 485	1 : 1	37 days
CTG	531 / 429	1 : 1	37 days
ASGN	857 / 426	2 : 1	19 days

Top Posted Job Titles

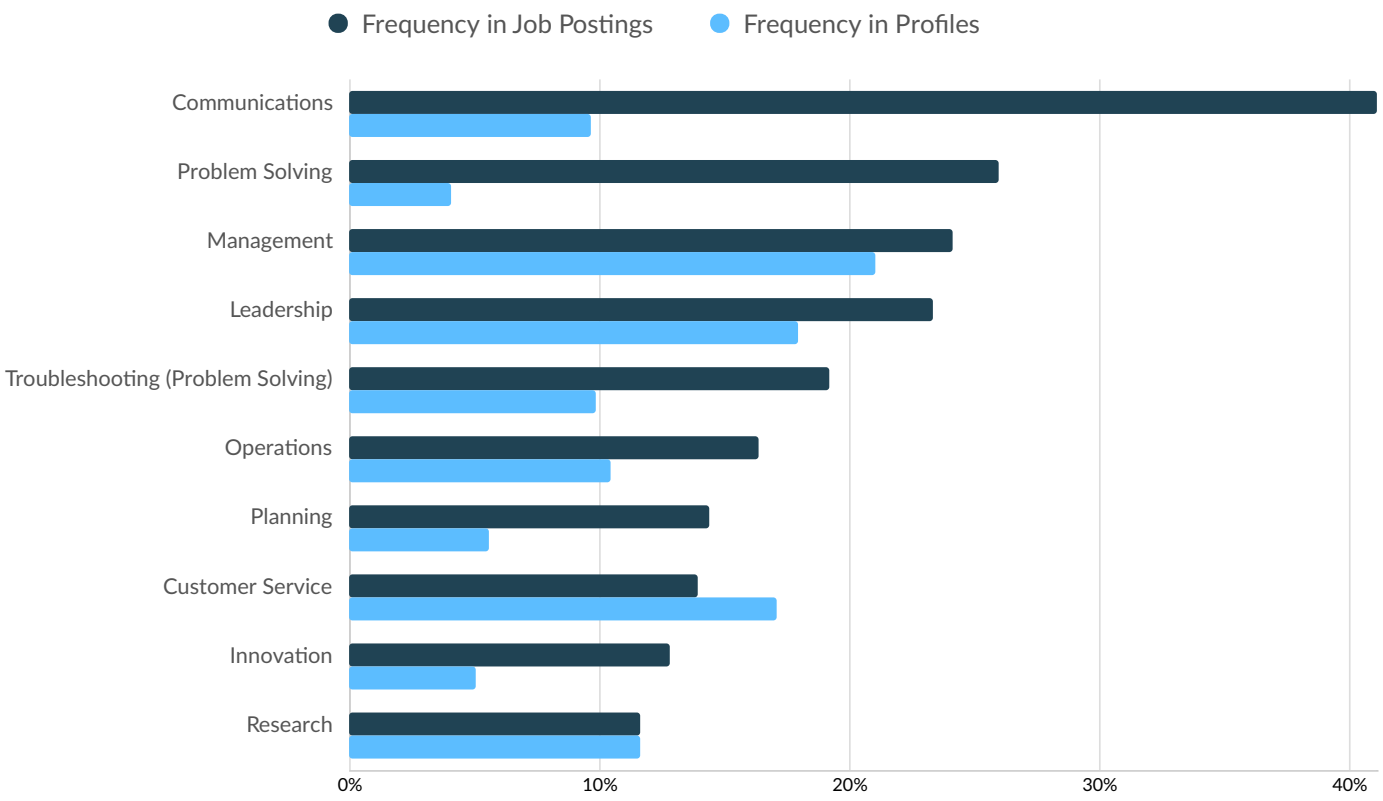
Job Title	Total/Unique (Sep 2021 - Aug 2022)	Posting Intensity	Median Posting Duration
Software Engineers	7,709 / 2,909	3 : 1	30 days
Software Developers	2,027 / 961	2 : 1	31 days
Business Systems Analysts	2,160 / 896	2 : 1	27 days
Java Developers	1,479 / 726	2 : 1	21 days
Full Stack Developers	1,457 / 594	2 : 1	30 days
DevOps Engineers	1,014 / 547	2 : 1	24 days
Principal Software Engineers	970 / 450	2 : 1	24 days
Lead Software Engineers	1,484 / 418	4 : 1	25 days
Java Engineers	943 / 413	2 : 1	29 days
.NET Developers	747 / 407	2 : 1	25 days

Top Specialized Skills



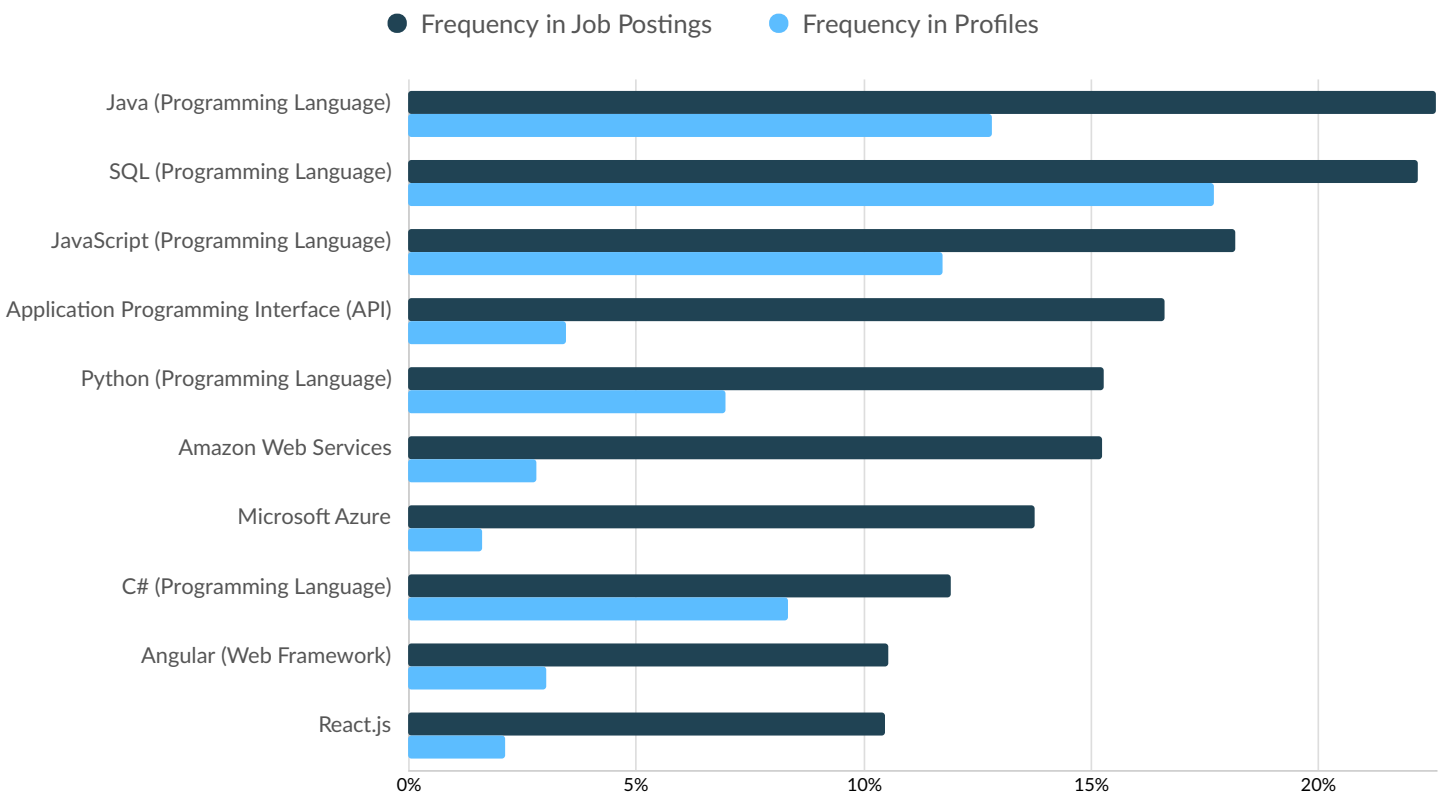
Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Agile Methodology	13,146	31%	12,111	12%
Computer Science	12,326	29%	1,855	2%
Software Engineering	11,038	26%	19,302	19%
Java (Programming Language)	9,592	23%	12,887	13%
SQL (Programming Language)	9,420	22%	17,767	18%
Software Development	9,023	21%	18,258	18%
JavaScript (Programming Language)	7,724	18%	11,787	12%
Automation	7,128	17%	6,663	7%
Application Programming Interface (API)	7,057	17%	3,485	3%
Python (Programming Language)	6,499	15%	7,001	7%

Top Common Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Communications	17,471	41%	9,735	10%
Problem Solving	11,033	26%	4,075	4%
Management	10,249	24%	21,128	21%
Leadership	9,934	23%	18,025	18%
Troubleshooting (Problem Solving)	8,161	19%	9,924	10%
Operations	6,969	16%	10,490	10%
Planning	6,121	14%	5,588	6%
Customer Service	5,923	14%	17,168	17%
Innovation	5,437	13%	5,115	5%
Research	4,952	12%	11,674	12%

Top Software Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
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SQL (Programming Language)	9,420	22%	17,767	18%
JavaScript (Programming Language)	7,724	18%	11,787	12%
Application Programming Interface (API)	7,057	17%	3,485	3%
Python (Programming Language)	6,499	15%	7,001	7%
Amazon Web Services	6,482	15%	2,811	3%
Microsoft Azure	5,853	14%	1,642	2%
C# (Programming Language)	5,058	12%	8,380	8%
Angular (Web Framework)	4,474	11%	3,037	3%
React.js	4,450	10%	2,142	2%

Top Qualifications

Qualification	Postings with Qualification
Bachelor Of Science in Business	461
Master Of Business Administration (MBA)	457
Security Clearance	371
Project Management Professional Certification	258
Secret Clearance	245
Certified Information Systems Security Professional	224
ITIL Certifications	212
Microsoft Certified Professional	206
Salesforce Certification	195
Software Development Engineer in Test	165

Appendix A - Data Sources and Calculations

Institution Data

The institution data in this report is taken directly from the national IPEDS database published by the U.S. Department of Education's National Center for Education Statistics.

Location Quotient

Location quotient (LQ) is a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. It can reveal what makes a particular region unique in comparison to the national average.

Occupation Data

Emsi occupation employment data are based on final Emsi industry data and final Emsi staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Emsi earnings by industry.

Lightcast Job Postings

Job postings are collected from various sources and processed/enriched to provide information such as standardized company name, occupation, skills, and geography.

State Data Sources

This report uses state data from the following agencies: Minnesota Department of Employment and Economic Development; Montana Department of Labor and Industry; North Dakota Job Service; South Dakota Department of Labor and Regulation

New Academic Program Request

Institution:

North Dakota State University

Program Name:

Computer Science Foundations

Degree Types:

Undergraduate Program Certificate

What day did AAC review the Academic Program Exploration Notice for this New Academic Program?

2023-05-26

CIP Code:

11.0701

Academic Program Code:

Will be determined by Registrar in consultation with CTS upon approval.

Academic Department/Division/College:

Department of Computer Science/College of Engineering

Semester of Program:

Fall

Year of Program:

2023

Other Participating Institutions:

Not Applicable

Delivery Method:

On Campus
Hybrid (on campus & distance)
Online Only

Describe the delivery methods and location(s) to which the program will be delivered:

These courses are already offered through the BS Computer Science program and will continue to be delivered using the same methods of online, in-person, and hybrid.

Funding Source:

Instructional Re-allocation

Describe the funding source:

No new courses are being created, so there will not be any additional funding needed.

Is the program eligible for Financial Aid?

No

Does the program require a criminal background check described in NDUS Procedure 511?

No

Describe a brief description of the program:

The certificate is intended to make our course offerings more flexibly accessible to a variety of

potential students: 1. High school students who want to start making progress towards an NDSU degree 2. Individuals who have completed high school but are not ready to commit to a four-year degree and treat a certificate as trial phase for enrollment into our B.S. program 3. Students who have enrolled in our B.S. program but are not ready for our flagship Computer Science I course. Currently such students take one course that may appear remedial. With the changed curriculum, they can take all three courses that make up Certificate 1 and gain a meaningful credential in their first term. 4. Professionals with baccalaureate degree in a different subject who would like to increase their computer science competencies 5. Professionals who engage in life-long learning, and would like to demonstrate their academic achievements 6. Students from other majors who would like to get credit for computer science material more flexibly than through our minor programs 7. Professionals with associate degrees who want to gain 4-year-college credentials 8. Students or professionals who are interested in pursuing a graduate degree, but do not have a Computer Science B.S. degree, and who 8.1. May or may not have software development experience 8.2. May or may not have a technical degree Note that the choice of courses is such that certificates only depend on other certificates for prerequisites, and not on other NDSU courses, such as those in mathematics.

Address student demand and employment availability for students completing the program:

Many of today's companies worldwide use websites and application portfolios (i.e., apps) as the primary means for customer applications; which makes them important members of the IT community. In general, Computer Scientists and Software Engineers work with other IT professions and apply the principles of engineering to design, test, implement, and evaluate software. There are many different factors that drive the need for Computer Science and Software Engineering, some of these include the accelerating growth of technology (which is led by fellow Computer Scientists and Engineers), the ever-increasing complexity of the IT sector (which continues to have a greater emphasis on security), the growing demand on custom and innovative website and mobile applications, and the continuous need to update code due to its limited lifespan. The proposed certificates are in the realm of Computer Science, Software Engineering, and Cybersecurity and thus fulfilling the need of the state as well as the nation.

Describe how this need was assessed and indicate sources for data used and indicated ancipated enrollment rates for the first five years:

With the help of NDSU-internal discussions, we have received feedback on the stackable certificates from 1. Employers and students at a breakfast that our department organized at the Career Expo 2. A group of alumni and employers with whom we met specifically to discuss the proposal We received many supportive comments and no major concerns. The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. Most of the certificates will be available to our current majors so we project the following enrollment rates: Year 1: 20 Year 2: 40 Year 3: 45 Year 4: 50 Year 5: 55

Describe how the program addresses the institutional strategic plan:

The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. The stackable certificates aligns with the university's strategic plan since it will help to increase undergraduate student enrollment and it will provide another attractive NDSU program for students to enroll in.

Describe how the program addresses the NDUS stategic plan:

This program addresses Goal 2 (Provide programs people want, where and when they need them) of the NDUS strategic plan. In particular, Objective 2.1 is addressed, which ensures programs are relevant, valuable, and timely (key indicator 2.1).

Are there similar programs that exist within NDUS or state?

No

What is the length of the program?

2-3 semesters

Identify the proposed program-level accreditation organization, if applicable:

NA

Cert 1: Fundamentals of Computing and Security

- CSCI 159: Computer Science Problem Solving
- CSCI 105: Introduction Cybersecurity
- CSCI 227: Computing Fundamentals I

- Math background equiv. to MATH 105
- ENGL 110
- ENGL 120
- COMM 110
- Wellness (2 cr)

Cert 2: Computer Science Foundations

- CSCI 160: Computer Science I
- CSCI 161: Computer Science II
- CSCI 277: Introduction to UNIX

- MATH 129: Basic Linear Algebra.
- MATH 165: Calculus I
- MATH 166: Calculus II

- Gen Eds in Humanities and Fine Arts (6 cr)
- Social and Behavioral Sc. (6 cr)
- Cultural Diversity
- Global Perspectives

Cert 3: Core Computer Science Competencies

- CSCI 366: Database Systems
- CSCI 372: Comparative Program-ming Languages
- CSCI 222: Discrete Mathematics

Cert 4: Software Development

- CSCI 213: Modern Software Develop-ment
- CSCI 313: Software Develop-ment with Frame-works
- CSCI 371: Web Scripting Languages

Cert 5: Computing Systems

- CSCI 374: Computer Organization and Architecture
- CSCI 336: Theoretical Computer Science
- CSCI 474: Operating Systems Concepts

- Science Gen Eds (7 cr)
- ENGL 321: Writing in the Tech. Profess.
- STAT 367: Proba-bility
- STAT 368: Statis-tics

Cert 6a: Cybersecurity

- CSCI 403: Defensive Network Security
- CSCI 405: Principles of Cybersecurity
- CSCI 404: Ethical Hacking
- Another elective from the Cybersecurity Track of the B.S. Degree

Cert 6b: Data Science

- CSCI 420: Introduction to Data Science in Python
- CSCI 422: Intro. to Data Engineering
- CSCI 425: Machine Learning
- CSCI 426: Intro to AI
- Another elective from the Data Science Track of the B.S. Degree

Cert 6c: Software Eng.

- CSCI 413: Principles of Software Engineering
- CSCI 419: Software Testing and Debugging
- Another elective from the Software Engineering Track of the B.S. Degree

- CSCI 467: Algorithm Analysis
- CSCI 455: Networking and Parallel Computation
- CSCI 489: Social Implications of Computers
- CSCI 445: Software Projects Capstone

Program Overview

Computer Science

Lightcast Q2 2023 Data Set

May 2023

1340 Administration Avenue
Fargo, North Dakota 58102
701-231-8011

Parameters

Completions Year: 2021

Jobs Timeframe: 2023 - 2033

Job Postings Timeframe: May 2022 - Apr 2023

Programs:

Code	Description
11.0701	Computer Science

Regions:

Code	Description
27	Minnesota
30	Montana

Code	Description
38	North Dakota
46	South Dakota

Education Level: Any

Tuition Type: Tuition & Fees

Graduate Status: Undergraduate

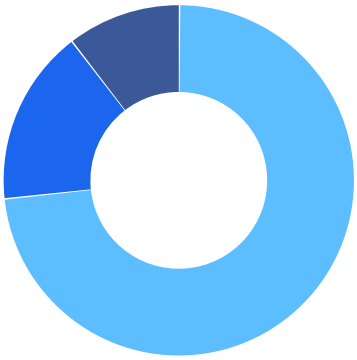
Residency: In-State

42	1,704	Completions Distribution
Institutions	Completions	Average: 40.6
0% Growth (2017-2021)	30% Growth (2017-2021)	1 — 645
		Median: 18.5

Program Overview

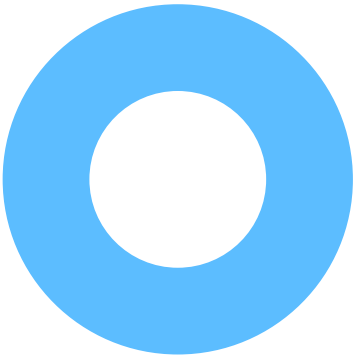
	Completions (2021)	% Completions	Institutions (2021)	% Institutions
All Programs	1,704	100%	42	100%
Distance Offered Programs	142	8%	4	10%
Non-Distance Offered Programs	1,562	92%	38	90%

Market Share by Institution Type



Institution Type	Completions (2021)	Market Share
Public, 4-year or above	1,248	73.2%
Private not-for-profit, 4-year or above	277	16.3%
Public, 2-year	179	10.5%

Market Share by Program

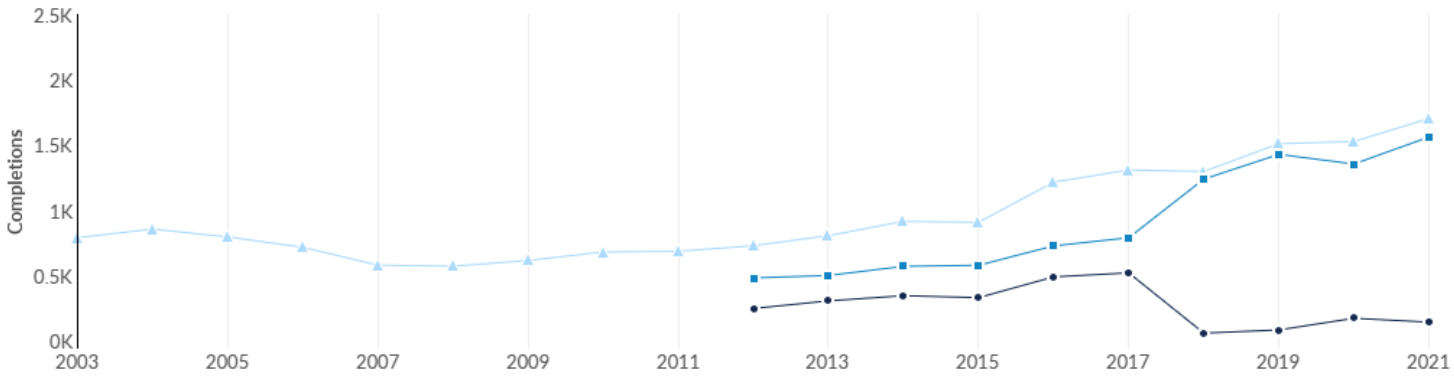


Program	Completions (2021)	Market Share
Computer Science (11.0701)	1,704	100.0%

Completions by Institution

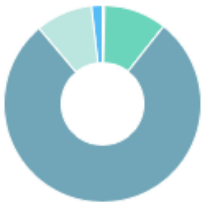
Institution	Completions (2021)	Growth % YOY (2021)	Market Share (2021)	IPEDS Tuition & Fees (2021)	Completions Trend (2017-2021)
University of Minnesota-Twin Cities	645	17.5%	37.9%	$15,254	
North Dakota State University-Main Campus	106	5.0%	6.2%	$10,401	
University of Minnesota-Duluth	92	15.0%	5.4%	$13,850	
Montana State University	89	-14.4%	5.2%	$7,528	
Metropolitan State University	83	-3.5%	4.9%	$9,394	
Saint Cloud State University	64	10.3%	3.8%	$9,170	
Winona State University	56	-3.4%	3.3%	$10,184	
University of St Thomas	55	61.8%	3.2%	$48,329	
Carleton College	54	-23.9%	3.2%	$60,225	
Normandale Community College	50	31.6%	2.9%	$5,789	

Regional Trends



	2012 Completions	2021 Completions	% Change
Distance Offered Programs	247	142	-42.5%
Non-Distance Offered Programs	481	1,562	+224.7%
All Programs	728	1,704	+134.1%

Regional Completions by Award Level



Award Level	Completions (2021)	Percent
Award of less than 1 academic year	6	0.4%
Associate's Degree	175	10.3%
Bachelor's Degree	1,333	78.2%
Master's Degree	159	9.3%
Doctor's Degree	31	1.8%
Award of at least 1 but less than 2 academic years	0	0.0%
Award of at least 2 but less than 4 academic years	0	0.0%
Postbaccalaureate certificate	0	0.0%
Post-masters certificate	0	0.0%

Similar Programs

125	37,867
Programs (2021)	Completions (2021)

CIP Code	Program	Completions (2021)
52.0201	Business Administration and Management, General	7,464
24.0101	Liberal Arts and Sciences/Liberal Studies	7,167
26.0101	Biology/Biological Sciences, General	2,434
51.0701	Health/Health Care Administration/Management	1,833
52.1401	Marketing/Marketing Management, General	1,485
30.9999	Multi-/Interdisciplinary Studies, Other	1,339
52.0101	Business/Commerce, General	1,148
43.0104	Criminal Justice/Safety Studies	1,050
24.0102	General Studies	1,043
27.0101	Mathematics, General	826

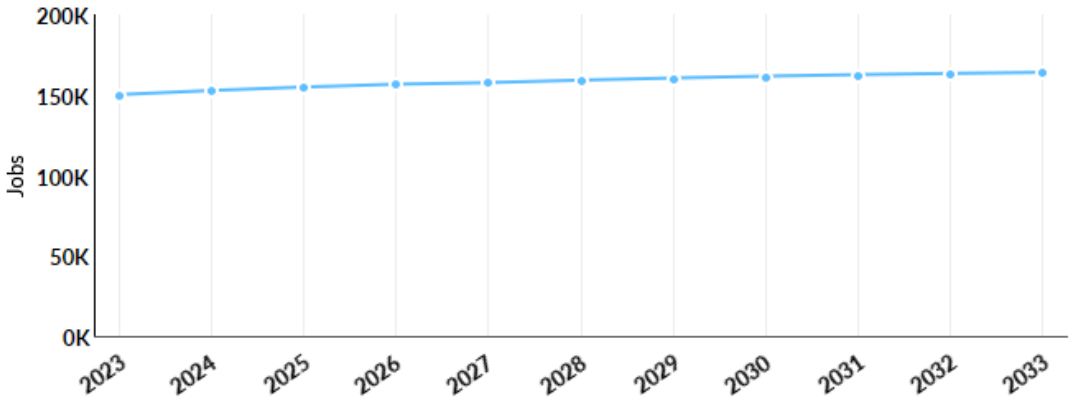
Target Occupations

150,061	+9.2%	$42.47/hr $88.3K/yr	12,640
Jobs (2023)	% Change (2023-2033)	Median Earnings	Annual Openings
9% below National average	Nation: +17.7%	Nation: $47.56/hr; $98.9K/yr	

Occupation	2023 Jobs	Annual Openings	Median Earnings	Growth (2023 - 2033)	Location Quotient (2023)
Software Developers	46,714	4,003	$48.00/hr	+14.45%	1.02
Computer User Support Specialists	18,304	1,563	$26.39/hr	+4.47%	0.86
Computer Systems Analysts	17,794	1,392	$46.88/hr	+4.82%	1.10
Computer and Information Systems Managers	12,177	1,089	$71.07/hr	+11.49%	0.77
Computer Network Support Specialists	10,796	900	$29.16/hr	+2.76%	1.93
Network and Computer Systems Administrators	8,969	658	$39.05/hr	+2.80%	0.90
Computer Occupations, All Other	7,768	660	$35.81/hr	+9.42%	0.60
Computer Network Architects	4,919	336	$52.51/hr	+1.75%	0.93
Information Security Analysts	3,989	414	$47.22/hr	+23.06%	0.74
Computer Programmers	3,653	255	$38.21/hr	-6.71%	0.72
Software Quality Assurance Analysts and Testers	3,182	303	$43.26/hr	+17.28%	0.52
Web Developers	2,872	275	$35.56/hr	+15.32%	0.87
Web and Digital Interface Designers	2,529	269	$32.42/hr	+15.70%	0.78
Database Administrators	2,321	179	$44.07/hr	+5.13%	0.86
Computer Hardware Engineers	1,546	115	$37.53/hr	+5.95%	0.65
Statisticians	1,158	115	$36.37/hr	+20.29%	1.08
Database Architects	1,084	85	$57.48/hr	+5.54%	0.69
Computer and Information Research Scientists	286	30	$62.78/hr	+24.48%	0.27

Growth

150,061	163,888	13,827	9.2%
2023 Jobs	2033 Jobs	Change (2023-2033)	% Change (2023-2033)

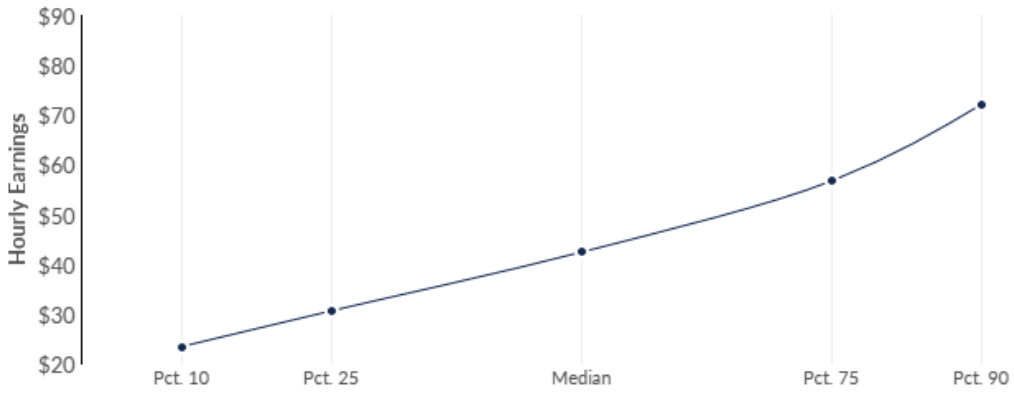


Occupation	2023 Jobs	2033 Jobs	Change	% Change
Computer and Information Systems Managers (11-3021)	12,177	13,576	1,399	11%
Computer Systems Analysts (15-1211)	17,794	18,651	857	5%
Information Security Analysts (15-1212)	3,989	4,909	920	23%
Computer and Information Research Scientists (15-1221)	286	356	70	24%
Computer Network Support Specialists (15-1231)	10,796	11,094	298	3%
Computer User Support Specialists (15-1232)	18,304	19,122	818	4%
Computer Network Architects (15-1241)	4,919	5,005	86	2%
Database Administrators (15-1242)	2,321	2,440	119	5%
Database Architects (15-1243)	1,084	1,144	60	6%
Network and Computer Systems Administrators (15-1244)	8,969	9,220	251	3%
Computer Programmers (15-1251)	3,653	3,408	-245	-7%
Software Developers (15-1252)	46,714	53,462	6,748	14%
Software Quality Assurance Analysts and Testers (15-1253)	3,182	3,732	550	17%
Web Developers (15-1254)	2,872	3,312	440	15%

Web and Digital Interface Designers (15-1255)	2,529	2,926	397	16%
Computer Occupations, All Other (15-1299)	7,768	8,500	732	9%
Statisticians (15-2041)	1,158	1,393	235	20%
Computer Hardware Engineers (17-2061)	1,546	1,638	92	6%

Percentile Earnings

$30.66/hr	$42.47/hr	$56.80/hr
25th Percentile Earnings	Median Earnings	75th Percentile Earnings



Occupation	25th Percentile Earnings	Median Earnings	75th Percentile Earnings
Computer and Information Systems Managers (11-3021)	$55.15	$71.07	$79.84
Computer Systems Analysts (15-1211)	$36.66	$46.88	$56.99
Information Security Analysts (15-1212)	$37.42	$47.22	$57.88
Computer and Information Research Scientists (15-1221)	$57.59	$62.78	$63.51
Computer Network Support Specialists (15-1231)	$23.34	$29.16	$37.37
Computer User Support Specialists (15-1232)	$20.12	$26.39	$30.75
Computer Network Architects (15-1241)	$48.02	$52.51	$64.99
Database Administrators (15-1242)	$32.60	$44.07	$57.93
Database Architects (15-1243)	$48.40	$57.48	$72.77
Network and Computer Systems Administrators (15-1244)	$30.61	$39.05	$47.26
Computer Programmers (15-1251)	$30.34	$38.21	$47.10
Software Developers (15-1252)	$37.55	$48.00	$61.25
Software Quality Assurance Analysts and Testers (15-1253)	$32.15	$43.26	$48.30

Web Developers (15-1254)	$24.25	$35.56	$49.67
Web and Digital Interface Designers (15-1255)	$22.54	$32.42	$45.81
Computer Occupations, All Other (15-1299)	$22.78	$35.81	$52.71
Statisticians (15-2041)	$29.54	$36.37	$47.86
Computer Hardware Engineers (17-2061)	$37.35	$37.53	$51.75

Job Postings Summary

75,604	2 : 1	6,756	27 days
Unique Postings	**Posting Intensity**	**Employers Competing**	**Median Posting Duration**
154,021 Total Postings		36,771 Total Employers	Regional Average: 30 days
	Regional Average: 3 : 1		

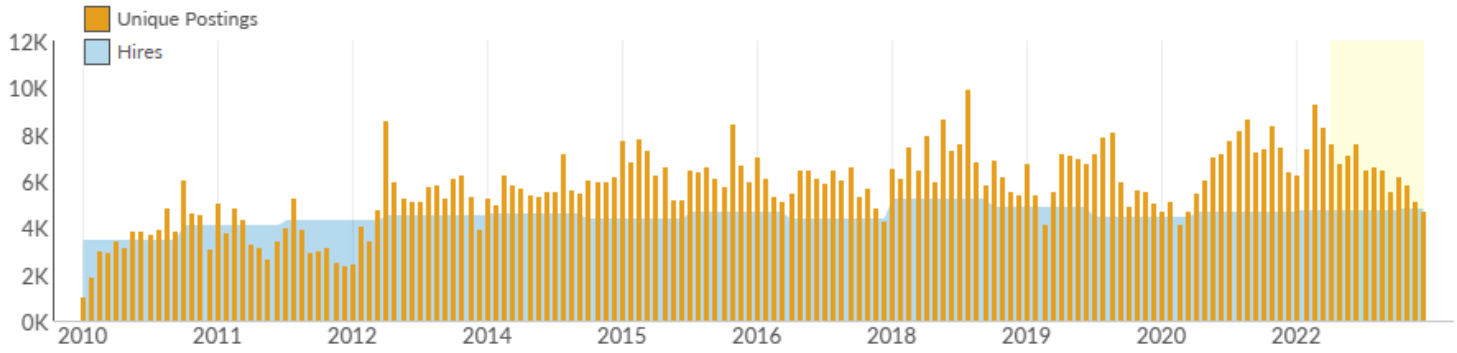
There were **154,021** total job postings for your selection from May 2022 to April 2023, of which **75,604** were unique. These numbers give us a Posting Intensity of **2-to-1**, meaning that for every 2 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

Job Postings vs. Hires

6,300	4,749
Avg. Monthly Postings (May 2022 - Apr 2023)	Avg. Monthly Hires (May 2022 - Apr 2023)

In an average month, there were **6,300** newly posted job postings for *18 Occupations*, and **4,749** actually hired. This means there was approximately 1 hire for every 1 unique job posting for *18 Occupations*.



Occupation	Avg Monthly Postings (May 2022 - Apr 2023)	Avg Monthly Hires (May 2022 - Apr 2023)
Software Developers	1,953	1,460
Computer Occupations, All Other	1,122	261
Computer User Support Specialists	733	659
Computer Systems Analysts	539	514
Information Security Analysts	266	150
Web Developers	259	94
Database Administrators	256	68
Software Quality Assurance Analysts and Testers	227	118
Network and Computer Systems Administrators	200	259
Computer Network Architects	182	136
Database Architects	153	32
Computer Programmers	128	98

Computer and Information Systems Managers	84	374
Computer Network Support Specialists	56	338
Computer and Information Research Scientists	45	12
Statisticians	42	43
Web and Digital Interface Designers	30	87
Computer Hardware Engineers	24	45

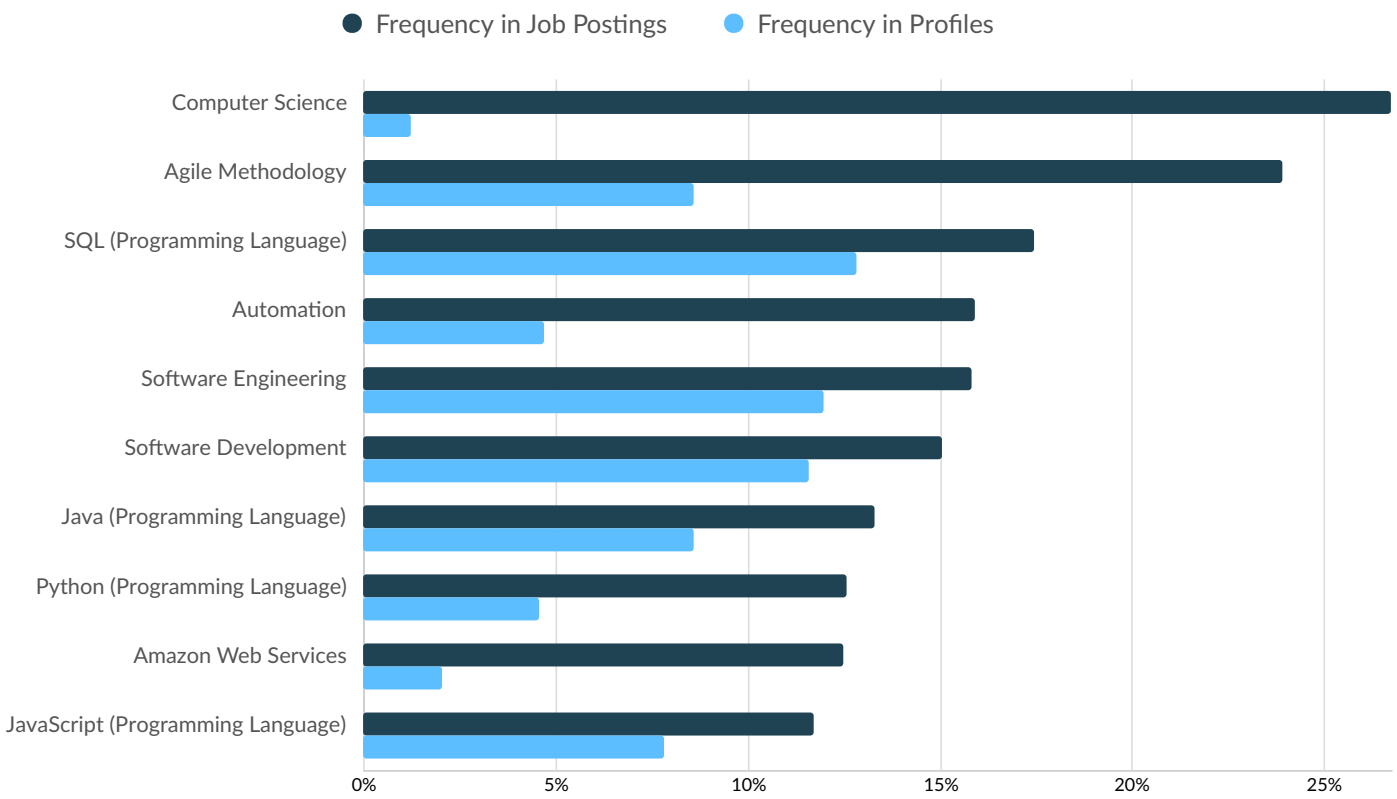
Top Companies Posting

Company	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Randstad	4,146 / 2,422	2 : 1 	20 days
Humana	4,627 / 2,002	2 : 1 	33 days
UnitedHealth Group	4,913 / 1,723	3 : 1 	26 days
Wells Fargo	4,190 / 1,139	4 : 1 	32 days
Robert Half	1,212 / 849	1 : 1 	30 days
US Bank	1,449 / 688	2 : 1 	29 days
General Dynamics	1,104 / 668	2 : 1 	33 days
CTG	742 / 627	1 : 1 	33 days
Optum	2,007 / 612	3 : 1 	36 days
Travelers	746 / 536	1 : 1 	33 days

Top Posted Job Titles

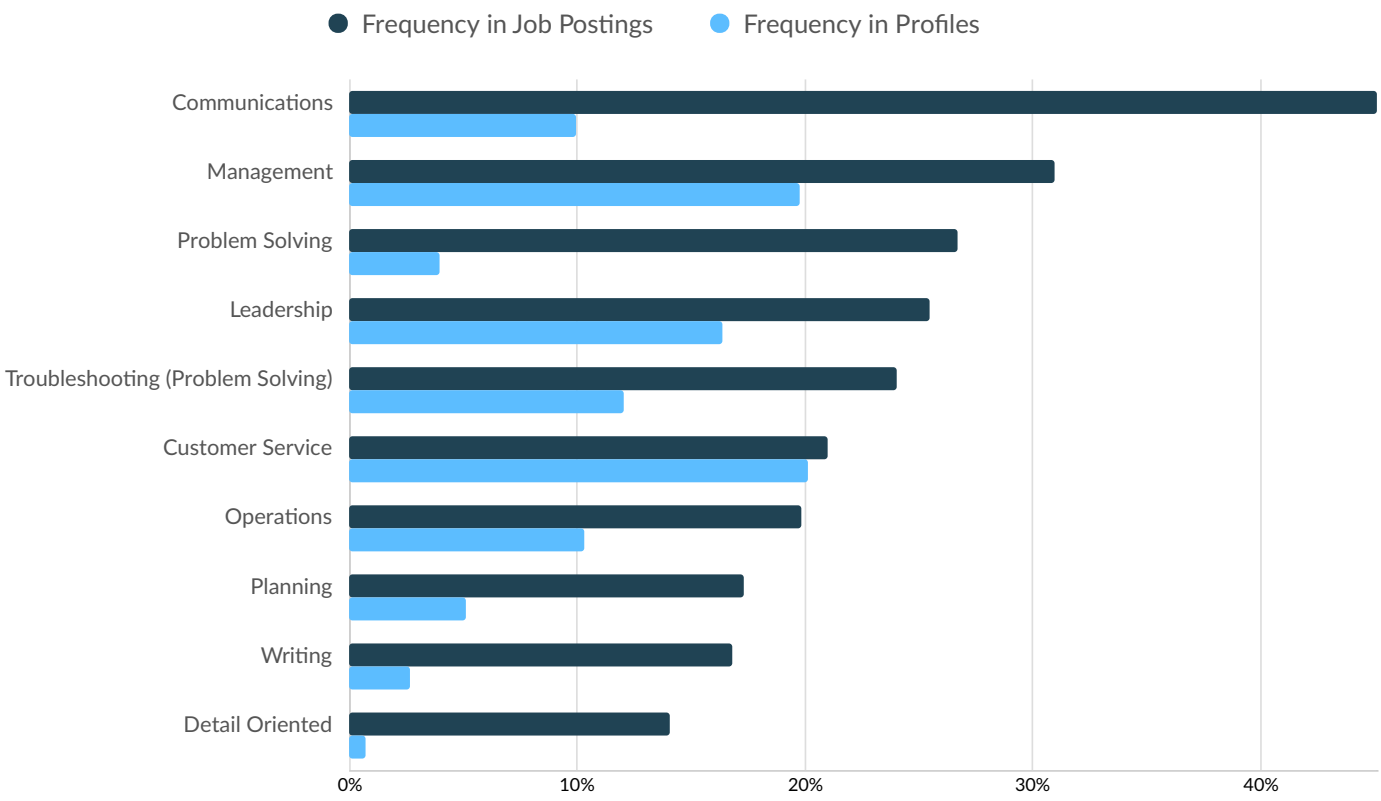
Job Title	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Software Engineers	6,186 / 2,558	2 : 1 	25 days
Data Engineers	1,521 / 811	2 : 1 	26 days
Systems Engineers	1,170 / 657	2 : 1 	23 days
Software Developers	1,107 / 640	2 : 1 	28 days
Business Systems Analysts	1,313 / 637	2 : 1 	25 days
Full Stack Developers	862 / 501	2 : 1 	23 days
Systems Administrators	860 / 477	2 : 1 	29 days
Solutions Architects	1,022 / 461	2 : 1 	30 days
Java Developers	663 / 439	2 : 1 	20 days
DevOps Engineers	706 / 433	2 : 1 	25 days

Top Specialized Skills



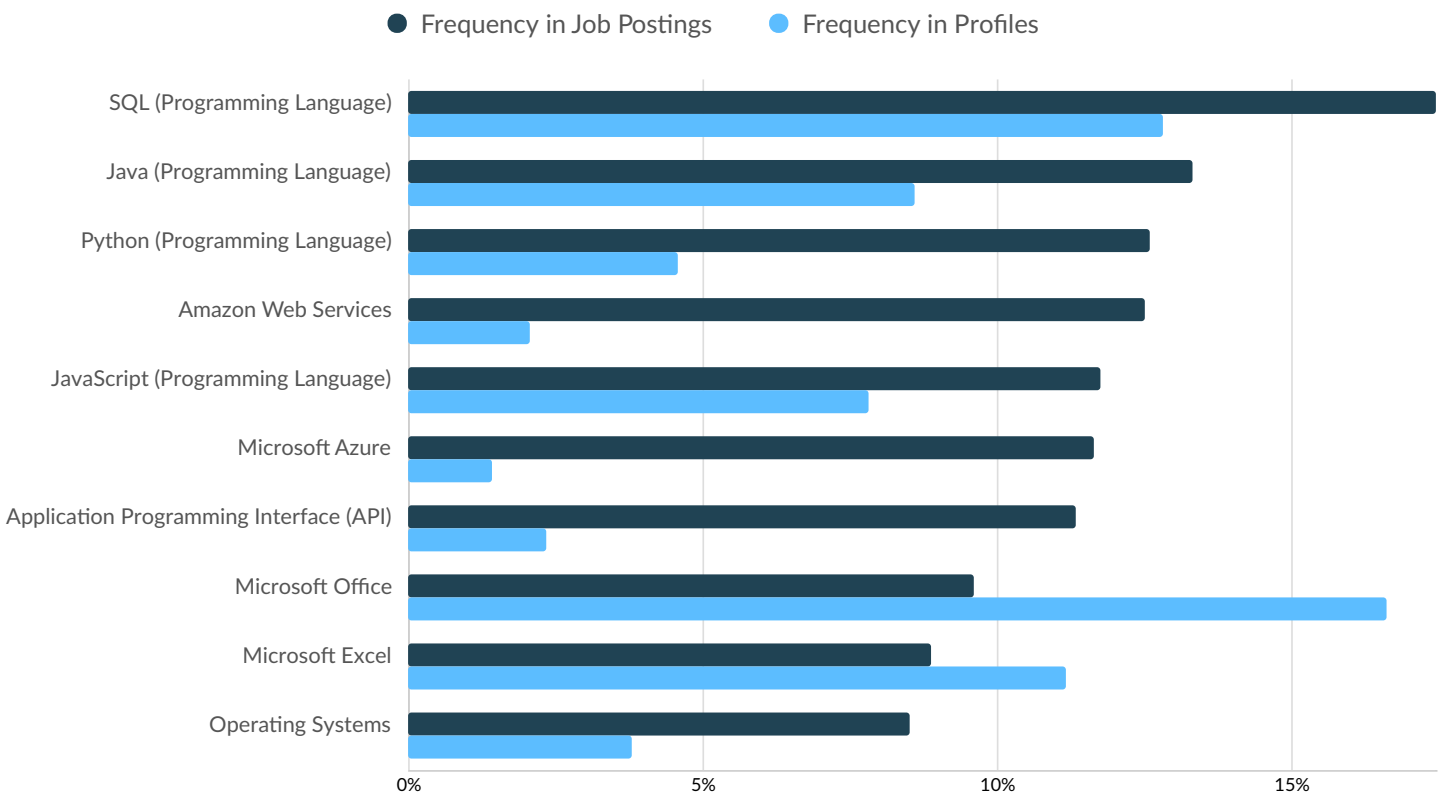
Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Computer Science	20,216	27%	2,405	1%
Agile Methodology	18,077	24%	16,520	9%
SQL (Programming Language)	13,187	17%	24,644	13%
Automation	12,028	16%	9,061	5%
Software Engineering	11,961	16%	23,039	12%
Software Development	11,388	15%	22,256	12%
Java (Programming Language)	10,067	13%	16,537	9%
Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%

Top Common Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Communications	34,137	45%	19,190	10%
Management	23,432	31%	38,058	20%
Problem Solving	20,205	27%	7,628	4%
Leadership	19,288	26%	31,481	16%
Troubleshooting (Problem Solving)	18,201	24%	23,160	12%
Customer Service	15,914	21%	38,687	20%
Operations	15,007	20%	19,906	10%
Planning	13,109	17%	9,810	5%
Writing	12,699	17%	5,142	3%
Detail Oriented	10,676	14%	1,454	1%

Top Software Skills



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Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%
Microsoft Azure	8,807	12%	2,755	1%
Application Programming Interface (API)	8,565	11%	4,486	2%
Microsoft Office	7,265	10%	31,933	17%
Microsoft Excel	6,717	9%	21,476	11%
Operating Systems	6,430	9%	7,318	4%

Top Qualifications

Qualification	Postings with Qualification
Valid Driver's License	3,407
Certified Information Systems Security Professional	1,593
Project Management Professional Certification	1,432
Security Clearance	1,118
CompTIA A+	1,084
Cisco Certified Network Associate	1,005
Master Of Business Administration (MBA)	841
CompTIA Security+	734
Certified Information System Auditor (CISA)	733
Certified Information Security Manager	681

Appendix A

Program Selection Details

CIP Code	Program Name
11.0701	Computer Science

Appendix B - Data Sources and Calculations

Institution Data

The institution data in this report is taken directly from the national IPEDS database published by the U.S. Department of Education's National Center for Education Statistics.

Location Quotient

Location quotient (LQ) is a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. It can reveal what makes a particular region unique in comparison to the national average.

Occupation Data

Emsi occupation employment data are based on final Emsi industry data and final Emsi staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Emsi earnings by industry.

Lightcast Job Postings

Job postings are collected from various sources and processed/enriched to provide information such as standardized company name, occupation, skills, and geography.

State Data Sources

This report uses state data from the following agencies: Minnesota Department of Employment and Economic Development; Montana Department of Labor and Industry; North Dakota Job Service; South Dakota Department of Labor and Regulation

New Academic Program Request

Institution:

North Dakota State University

Program Name:

Computing Systems

Degree Types:

Undergraduate Program Certificate

What day did AAC review the Academic Program Exploration Notice for this New Academic Program?

2023-05-26

CIP Code:

11.0701

Academic Program Code:

Will be determined by Registrar in consultation with CTS upon approval

Academic Department/Division/College:

Department of Computer Science/College of Engineering

Semester of Program:

Fall

Year of Program:

2023

Other Participating Institutions:

Not Applicable

Delivery Method:

On Campus
Hybrid (on campus & distance)
Online Only

Describe the delivery methods and location(s) to which the program will be delivered:

These courses are already offered through the BS Computer Science program and will continue to be delivered using the same methods of online, in-person, and hybrid.

Funding Source:

Instructional Re-allocation

Describe the funding source:

No new courses are being created, so there will not be any additional funding needed.

Is the program eligible for Financial Aid?

No

Does the program require a criminal background check described in NDUS Procedure 511?

No

Describe a brief description of the program:

The certificate is intended to make our course offerings more flexibly accessible to a variety of

potential students: 1. High school students who want to start making progress towards an NDSU degree 2. Individuals who have completed high school but are not ready to commit to a four-year degree and treat a certificate as trial phase for enrollment into our B.S. program 3. Students who have enrolled in our B.S. program but are not ready for our flagship Computer Science I course. Currently such students take one course that may appear remedial. With the changed curriculum, they can take all three courses that make up Certificate 1 and gain a meaningful credential in their first term. 4. Professionals with baccalaureate degree in a different subject who would like to increase their computer science competencies 5. Professionals who engage in life-long learning, and would like to demonstrate their academic achievements 6. Students from other majors who would like to get credit for computer science material more flexibly than through our minor programs 7. Professionals with associate degrees who want to gain 4-year-college credentials 8. Students or professionals who are interested in pursuing a graduate degree, but do not have a Computer Science B.S. degree, and who 8.1. May or may not have software development experience 8.2. May or may not have a technical degree Note that the choice of courses is such that certificates only depend on other certificates for prerequisites, and not on other NDSU courses, such as those in mathematics.

Address student demand and employment availability for students completing the program:

Many of today's companies worldwide use websites and application portfolios (i.e., apps) as the primary means for customer applications; which makes them important members of the IT community. In general, Computer Scientists and Software Engineers work with other IT professions and apply the principles of engineering to design, test, implement and evaluate software. There are many different factors that drive the need for Computer Science and Software Engineering, some of these include the accelerating growth of technology (which is led by fellow Computer Scientists and Engineers), the ever-increasing complexity of the IT sector (which continues to have a greater emphasis on security), the growing demand on custom and innovative website and mobile applications, and the continuous need to update code due to its limited lifespan. The proposed certificates are in the realm of Computer Science, Software Engineering, and Cybersecurity and thus fulfilling the need of the state as well as the nation.

Describe how this need was assessed and indicate sources for data used and indicated ancipated enrollment rates for the first five years:

With the help of NDSU-internal discussions, we have received feedback on the stackable certificates from 1. Employers and students at a breakfast that our department organized at the Career Expo 2. A group of alumni and employers with whom we met specifically to discuss the proposal We received many supportive comments and no major concerns. The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. Most of the certificates will be available to our current majors with focus on the specific specialization area so we project the following enrollment rates: Year 1: 15 Year 2: 30 Year 3: 40 Year 4: 45 Year 5: 50

Describe how the program addresses the institutional strategic plan:

The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. The stackable certificates aligns with the university's strategic plan since it will help to increase undergraduate student enrollment and it will provide another attractive NDSU program for students to enroll in.

Describe how the program addresses the NDUS stategic plan:

This program addresses Goal 2 (Provide programs people want, where and when they need them) of the NDUS strategic plan. In particular, Objective 2.1 is addressed, which ensures programs are relevant, valuable, and timely (key indicator 2.1).

Are there similar programs that exist within NDUS or state?

No

What is the length of the program?

2-3 semesters

Identify the proposed program-level accreditation organization, if applicable:

NA

Cert 1: Fundamentals of Computing and Security

- CSCI 159: Computer Science Problem Solving
- CSCI 105: Introduction Cybersecurity
- CSCI 227: Computing Fundamentals I

- Math background equiv. to MATH 105
- ENGL 110
- ENGL 120
- COMM 110
- Wellness (2 cr)

Cert 2: Computer Science Foundations

- CSCI 160: Computer Science I
- CSCI 161: Computer Science II
- CSCI 277: Introduction to UNIX

- MATH 129: Basic Linear Algebra.
- MATH 165: Calculus I
- MATH 166: Calculus II

- Gen Eds in Humanities and Fine Arts (6 cr)
- Social and Behavioral Sc. (6 cr)
- Cultural Diversity
- Global Perspectives

Cert 3: Core Computer Science Competencies

- CSCI 366: Database Systems
- CSCI 372: Comparative Program-ming Languages
- CSCI 222: Discrete Mathematics

Cert 4: Software Development

- CSCI 213: Modern Software Develop-ment
- CSCI 313: Software Develop-ment with Frame-works
- CSCI 371: Web Scripting Languages

Cert 5: Computing Systems

- CSCI 374: Computer Organization and Architecture
- CSCI 336: Theoretical Computer Science
- CSCI 474: Operating Systems Concepts

- Science Gen Eds (7 cr)
- ENGL 321: Writing in the Tech. Profess.
- STAT 367: Proba-bility
- STAT 368: Statis-tics

Cert 6a: Cybersecurity

- CSCI 403: Defensive Network Security
- CSCI 405: Principles of Cybersecurity
- CSCI 404: Ethical Hacking
- Another elective from the Cybersecurity Track of the B.S. Degree

Cert 6b: Data Science

- CSCI 420: Introduction to Data Science in Python
- CSCI 422: Intro. to Data Engineering
- CSCI 425: Machine Learning
- CSCI 426: Intro to AI
- Another elective from the Data Science Track of the B.S. Degree

Cert 6c: Software Eng.

- CSCI 413: Principles of Software Engineering
- CSCI 419: Software Testing and Debugging
- Another elective from the Software Engineering Track of the B.S. Degree

- CSCI 467: Algorithm Analysis
- CSCI 455: Networking and Parallel Computation
- CSCI 489: Social Implications of Computers
- CSCI 445: Software Projects Capstone

Program Overview

Computer Science

Lightcast Q2 2023 Data Set

May 2023

1340 Administration Avenue
Fargo, North Dakota 58102
701-231-8011

Parameters

Completions Year: 2021

Jobs Timeframe: 2023 - 2033

Job Postings Timeframe: May 2022 - Apr 2023

Programs:

Code	Description
11.0701	Computer Science

Regions:

Code	Description
27	Minnesota
30	Montana

Code	Description
38	North Dakota
46	South Dakota

Education Level: Any

Tuition Type: Tuition & Fees

Graduate Status: Undergraduate

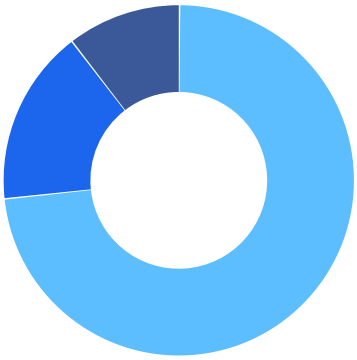
Residency: In-State

42	1,704	Completions Distribution
Institutions	Completions	Average: 40.6
0% Growth (2017-2021)	30% Growth (2017-2021)	1 — 645
		Median: 18.5

Program Overview

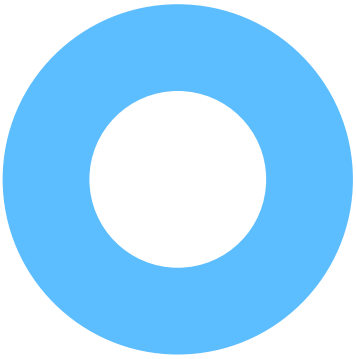
	Completions (2021)	% Completions	Institutions (2021)	% Institutions
All Programs	1,704	100%	42	100%
Distance Offered Programs	142	8%	4	10%
Non-Distance Offered Programs	1,562	92%	38	90%

Market Share by Institution Type



Institution Type	Completions (2021)	Market Share
Public, 4-year or above	1,248	73.2%
Private not-for-profit, 4-year or above	277	16.3%
Public, 2-year	179	10.5%

Market Share by Program

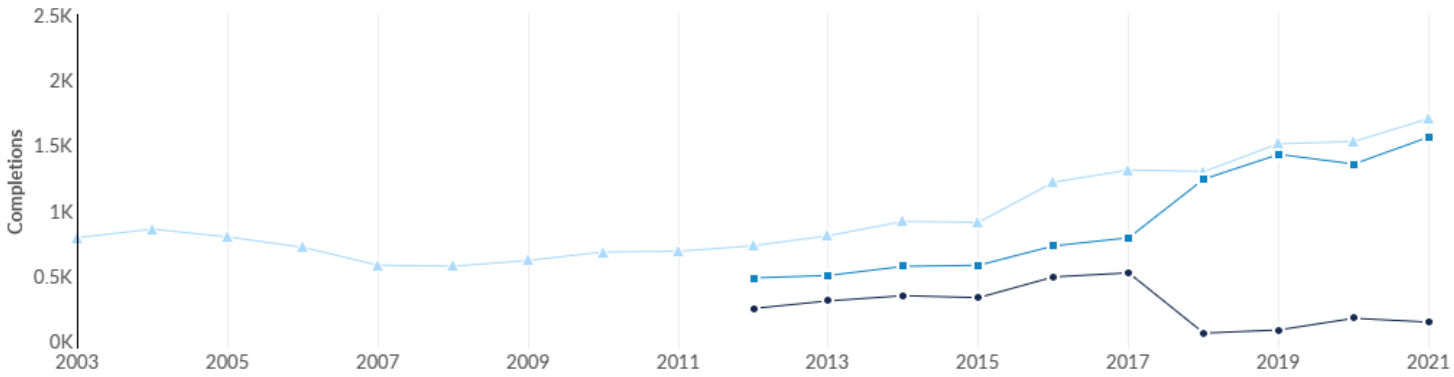


Program	Completions (2021)	Market Share
Computer Science (11.0701)	1,704	100.0%

Completions by Institution

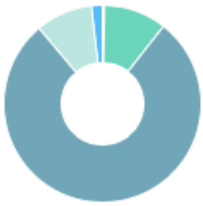
Institution	Completions (2021)	Growth % YOY (2021)	Market Share (2021)	IPEDS Tuition & Fees (2021)	Completions Trend (2017-2021)
University of Minnesota-Twin Cities	645	17.5%	37.9%	$15,254	
North Dakota State University-Main Campus	106	5.0%	6.2%	$10,401	
University of Minnesota-Duluth	92	15.0%	5.4%	$13,850	
Montana State University	89	-14.4%	5.2%	$7,528	
Metropolitan State University	83	-3.5%	4.9%	$9,394	
Saint Cloud State University	64	10.3%	3.8%	$9,170	
Winona State University	56	-3.4%	3.3%	$10,184	
University of St Thomas	55	61.8%	3.2%	$48,329	
Carleton College	54	-23.9%	3.2%	$60,225	
Normandale Community College	50	31.6%	2.9%	$5,789	

Regional Trends



	2012 Completions	2021 Completions	% Change
Distance Offered Programs	247	142	-42.5%
Non-Distance Offered Programs	481	1,562	+224.7%
All Programs	728	1,704	+134.1%

Regional Completions by Award Level



Award Level	Completions (2021)	Percent
Award of less than 1 academic year	6	0.4%
Associate's Degree	175	10.3%
Bachelor's Degree	1,333	78.2%
Master's Degree	159	9.3%
Doctor's Degree	31	1.8%
Award of at least 1 but less than 2 academic years	0	0.0%
Award of at least 2 but less than 4 academic years	0	0.0%
Postbaccalaureate certificate	0	0.0%
Post-masters certificate	0	0.0%

Similar Programs

125	37,867
Programs (2021)	Completions (2021)

CIP Code	Program	Completions (2021)
52.0201	Business Administration and Management, General	7,464
24.0101	Liberal Arts and Sciences/Liberal Studies	7,167
26.0101	Biology/Biological Sciences, General	2,434
51.0701	Health/Health Care Administration/Management	1,833
52.1401	Marketing/Marketing Management, General	1,485
30.9999	Multi-/Interdisciplinary Studies, Other	1,339
52.0101	Business/Commerce, General	1,148
43.0104	Criminal Justice/Safety Studies	1,050
24.0102	General Studies	1,043
27.0101	Mathematics, General	826

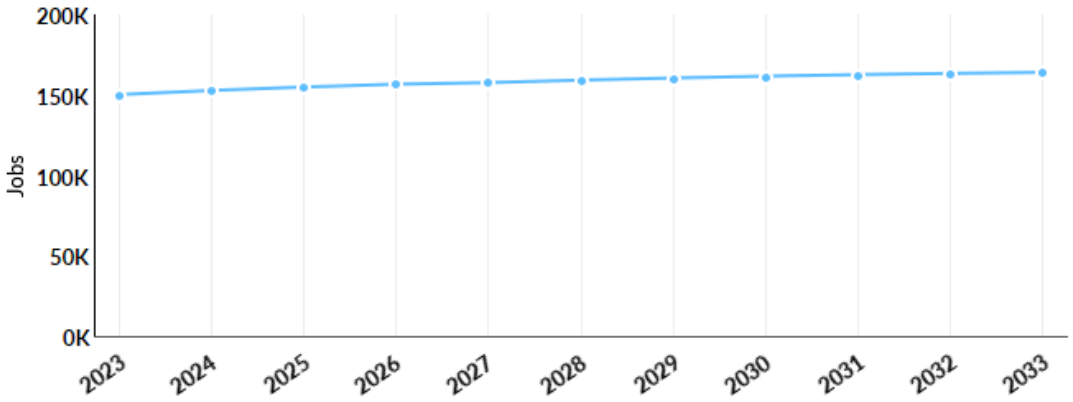
Target Occupations

150,061	+9.2%	$42.47/hr $88.3K/yr	12,640
Jobs (2023)	% Change (2023-2033)	Median Earnings	Annual Openings
9% below National average	Nation: +17.7%	Nation: $47.56/hr; $98.9K/yr	

Occupation	2023 Jobs	Annual Openings	Median Earnings	Growth (2023 - 2033)	Location Quotient (2023)
Software Developers	46,714	4,003	$48.00/hr	+14.45%	1.02
Computer User Support Specialists	18,304	1,563	$26.39/hr	+4.47%	0.86
Computer Systems Analysts	17,794	1,392	$46.88/hr	+4.82%	1.10
Computer and Information Systems Managers	12,177	1,089	$71.07/hr	+11.49%	0.77
Computer Network Support Specialists	10,796	900	$29.16/hr	+2.76%	1.93
Network and Computer Systems Administrators	8,969	658	$39.05/hr	+2.80%	0.90
Computer Occupations, All Other	7,768	660	$35.81/hr	+9.42%	0.60
Computer Network Architects	4,919	336	$52.51/hr	+1.75%	0.93
Information Security Analysts	3,989	414	$47.22/hr	+23.06%	0.74
Computer Programmers	3,653	255	$38.21/hr	-6.71%	0.72
Software Quality Assurance Analysts and Testers	3,182	303	$43.26/hr	+17.28%	0.52
Web Developers	2,872	275	$35.56/hr	+15.32%	0.87
Web and Digital Interface Designers	2,529	269	$32.42/hr	+15.70%	0.78
Database Administrators	2,321	179	$44.07/hr	+5.13%	0.86
Computer Hardware Engineers	1,546	115	$37.53/hr	+5.95%	0.65
Statisticians	1,158	115	$36.37/hr	+20.29%	1.08
Database Architects	1,084	85	$57.48/hr	+5.54%	0.69
Computer and Information Research Scientists	286	30	$62.78/hr	+24.48%	0.27

Growth

150,061	163,888	13,827	9.2%
2023 Jobs	2033 Jobs	Change (2023-2033)	% Change (2023-2033)

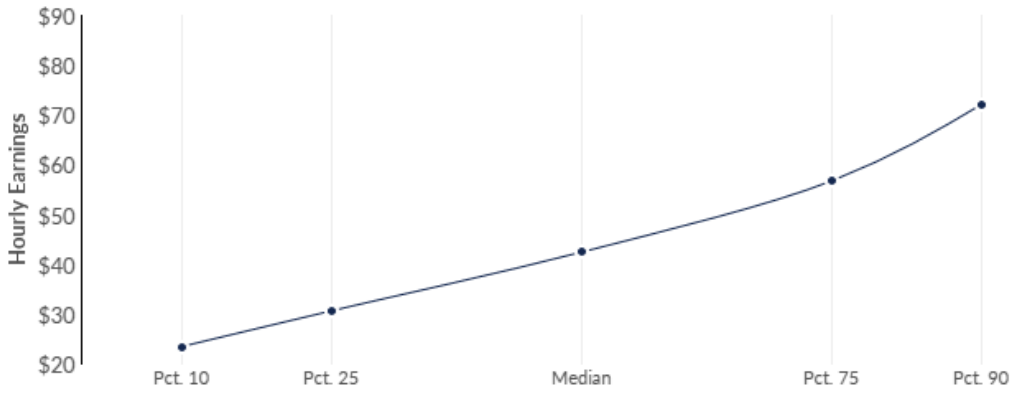


Occupation	2023 Jobs	2033 Jobs	Change	% Change
Computer and Information Systems Managers (11-3021)	12,177	13,576	1,399	11%
Computer Systems Analysts (15-1211)	17,794	18,651	857	5%
Information Security Analysts (15-1212)	3,989	4,909	920	23%
Computer and Information Research Scientists (15-1221)	286	356	70	24%
Computer Network Support Specialists (15-1231)	10,796	11,094	298	3%
Computer User Support Specialists (15-1232)	18,304	19,122	818	4%
Computer Network Architects (15-1241)	4,919	5,005	86	2%
Database Administrators (15-1242)	2,321	2,440	119	5%
Database Architects (15-1243)	1,084	1,144	60	6%
Network and Computer Systems Administrators (15-1244)	8,969	9,220	251	3%
Computer Programmers (15-1251)	3,653	3,408	-245	-7%
Software Developers (15-1252)	46,714	53,462	6,748	14%
Software Quality Assurance Analysts and Testers (15-1253)	3,182	3,732	550	17%
Web Developers (15-1254)	2,872	3,312	440	15%

Web and Digital Interface Designers (15-1255)	2,529	2,926	397	16%
Computer Occupations, All Other (15-1299)	7,768	8,500	732	9%
Statisticians (15-2041)	1,158	1,393	235	20%
Computer Hardware Engineers (17-2061)	1,546	1,638	92	6%

Percentile Earnings

$30.66/hr	$42.47/hr	$56.80/hr
25th Percentile Earnings	Median Earnings	75th Percentile Earnings



Occupation	25th Percentile Earnings	Median Earnings	75th Percentile Earnings
Computer and Information Systems Managers (11-3021)	$55.15	$71.07	$79.84
Computer Systems Analysts (15-1211)	$36.66	$46.88	$56.99
Information Security Analysts (15-1212)	$37.42	$47.22	$57.88
Computer and Information Research Scientists (15-1221)	$57.59	$62.78	$63.51
Computer Network Support Specialists (15-1231)	$23.34	$29.16	$37.37
Computer User Support Specialists (15-1232)	$20.12	$26.39	$30.75
Computer Network Architects (15-1241)	$48.02	$52.51	$64.99
Database Administrators (15-1242)	$32.60	$44.07	$57.93
Database Architects (15-1243)	$48.40	$57.48	$72.77
Network and Computer Systems Administrators (15-1244)	$30.61	$39.05	$47.26
Computer Programmers (15-1251)	$30.34	$38.21	$47.10
Software Developers (15-1252)	$37.55	$48.00	$61.25
Software Quality Assurance Analysts and Testers (15-1253)	$32.15	$43.26	$48.30

Web Developers (15-1254)	$24.25	$35.56	$49.67
Web and Digital Interface Designers (15-1255)	$22.54	$32.42	$45.81
Computer Occupations, All Other (15-1299)	$22.78	$35.81	$52.71
Statisticians (15-2041)	$29.54	$36.37	$47.86
Computer Hardware Engineers (17-2061)	$37.35	$37.53	$51.75

Job Postings Summary

75,604	2 : 1	6,756	27 days
Unique Postings	**Posting Intensity**	**Employers Competing**	**Median Posting Duration**
154,021 Total Postings		36,771 Total Employers	Regional Average: 30 days
	Regional Average: 3 : 1		

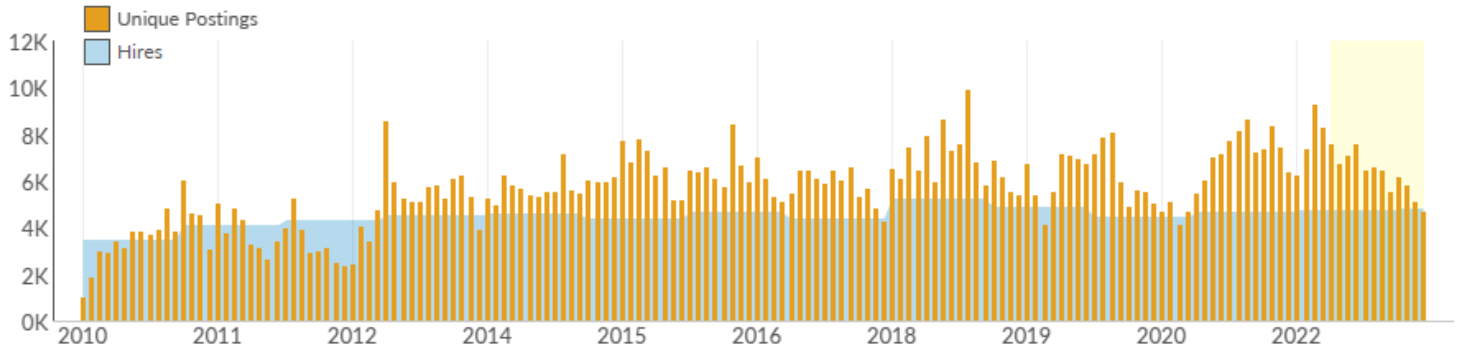
There were **154,021** total job postings for your selection from May 2022 to April 2023, of which **75,604** were unique. These numbers give us a Posting Intensity of **2-to-1**, meaning that for every 2 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

Job Postings vs. Hires

6,300	4,749
Avg. Monthly Postings (May 2022 - Apr 2023)	Avg. Monthly Hires (May 2022 - Apr 2023)

In an average month, there were **6,300** newly posted job postings for *18 Occupations*, and **4,749** actually hired. This means there was approximately 1 hire for every 1 unique job posting for *18 Occupations*.



Occupation	Avg Monthly Postings (May 2022 - Apr 2023)	Avg Monthly Hires (May 2022 - Apr 2023)
Software Developers	1,953	1,460
Computer Occupations, All Other	1,122	261
Computer User Support Specialists	733	659
Computer Systems Analysts	539	514
Information Security Analysts	266	150
Web Developers	259	94
Database Administrators	256	68
Software Quality Assurance Analysts and Testers	227	118
Network and Computer Systems Administrators	200	259
Computer Network Architects	182	136
Database Architects	153	32
Computer Programmers	128	98

Computer and Information Systems Managers	84	374
Computer Network Support Specialists	56	338
Computer and Information Research Scientists	45	12
Statisticians	42	43
Web and Digital Interface Designers	30	87
Computer Hardware Engineers	24	45

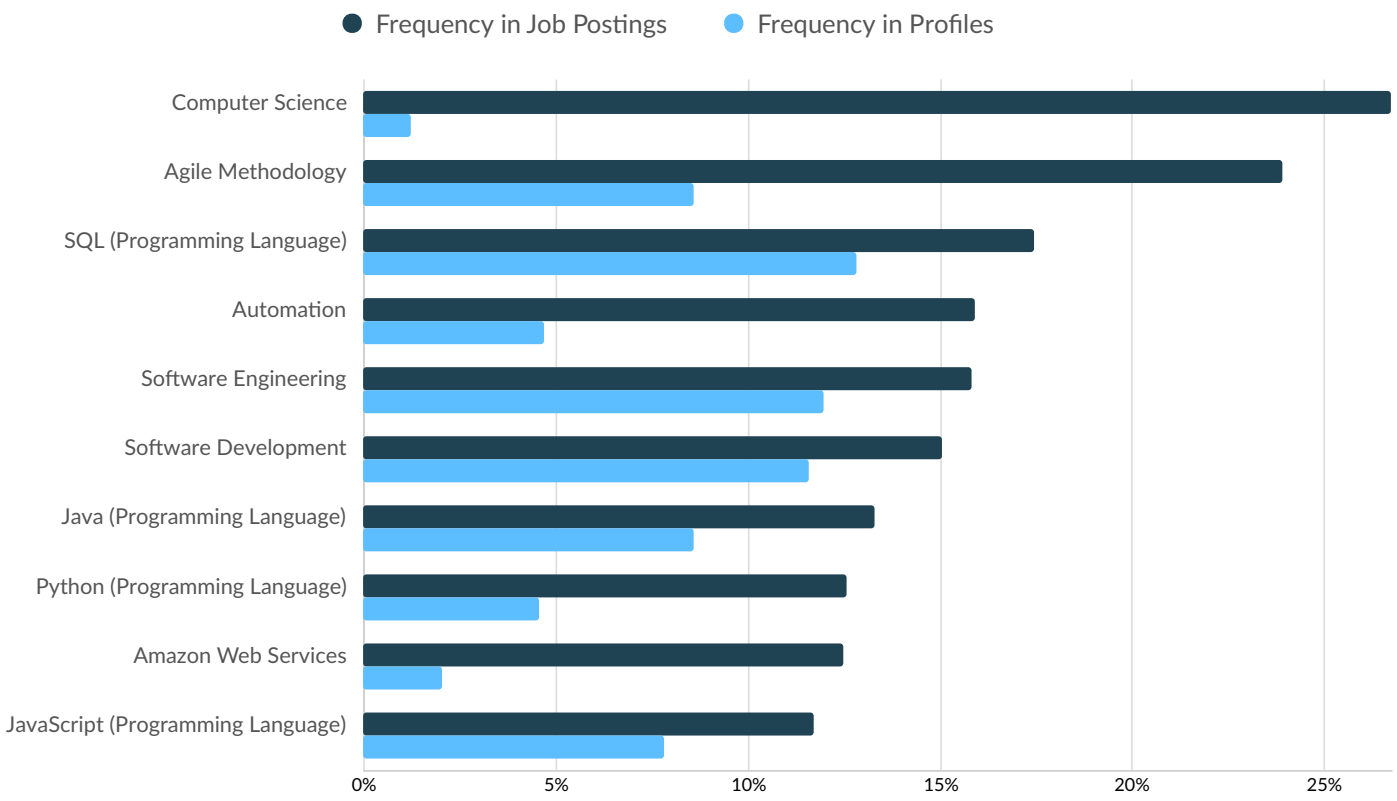
Top Companies Posting

Company	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Randstad	4,146 / 2,422	2 : 1 	20 days
Humana	4,627 / 2,002	2 : 1 	33 days
UnitedHealth Group	4,913 / 1,723	3 : 1 	26 days
Wells Fargo	4,190 / 1,139	4 : 1 	32 days
Robert Half	1,212 / 849	1 : 1 	30 days
US Bank	1,449 / 688	2 : 1 	29 days
General Dynamics	1,104 / 668	2 : 1 	33 days
CTG	742 / 627	1 : 1 	33 days
Optum	2,007 / 612	3 : 1 	36 days
Travelers	746 / 536	1 : 1 	33 days

Top Posted Job Titles

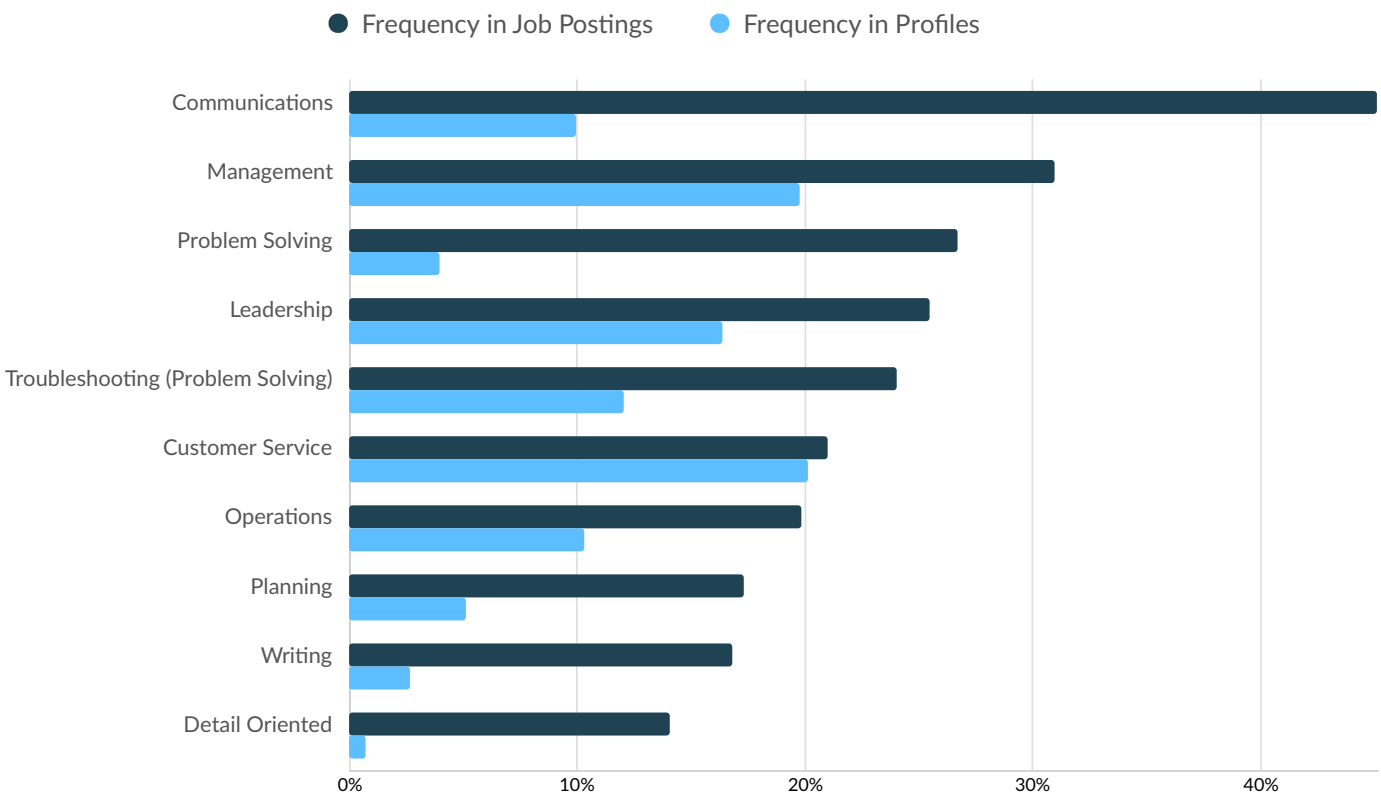
Job Title	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Software Engineers	6,186 / 2,558	2 : 1 	25 days
Data Engineers	1,521 / 811	2 : 1 	26 days
Systems Engineers	1,170 / 657	2 : 1 	23 days
Software Developers	1,107 / 640	2 : 1 	28 days
Business Systems Analysts	1,313 / 637	2 : 1 	25 days
Full Stack Developers	862 / 501	2 : 1 	23 days
Systems Administrators	860 / 477	2 : 1 	29 days
Solutions Architects	1,022 / 461	2 : 1 	30 days
Java Developers	663 / 439	2 : 1 	20 days
DevOps Engineers	706 / 433	2 : 1 	25 days

Top Specialized Skills



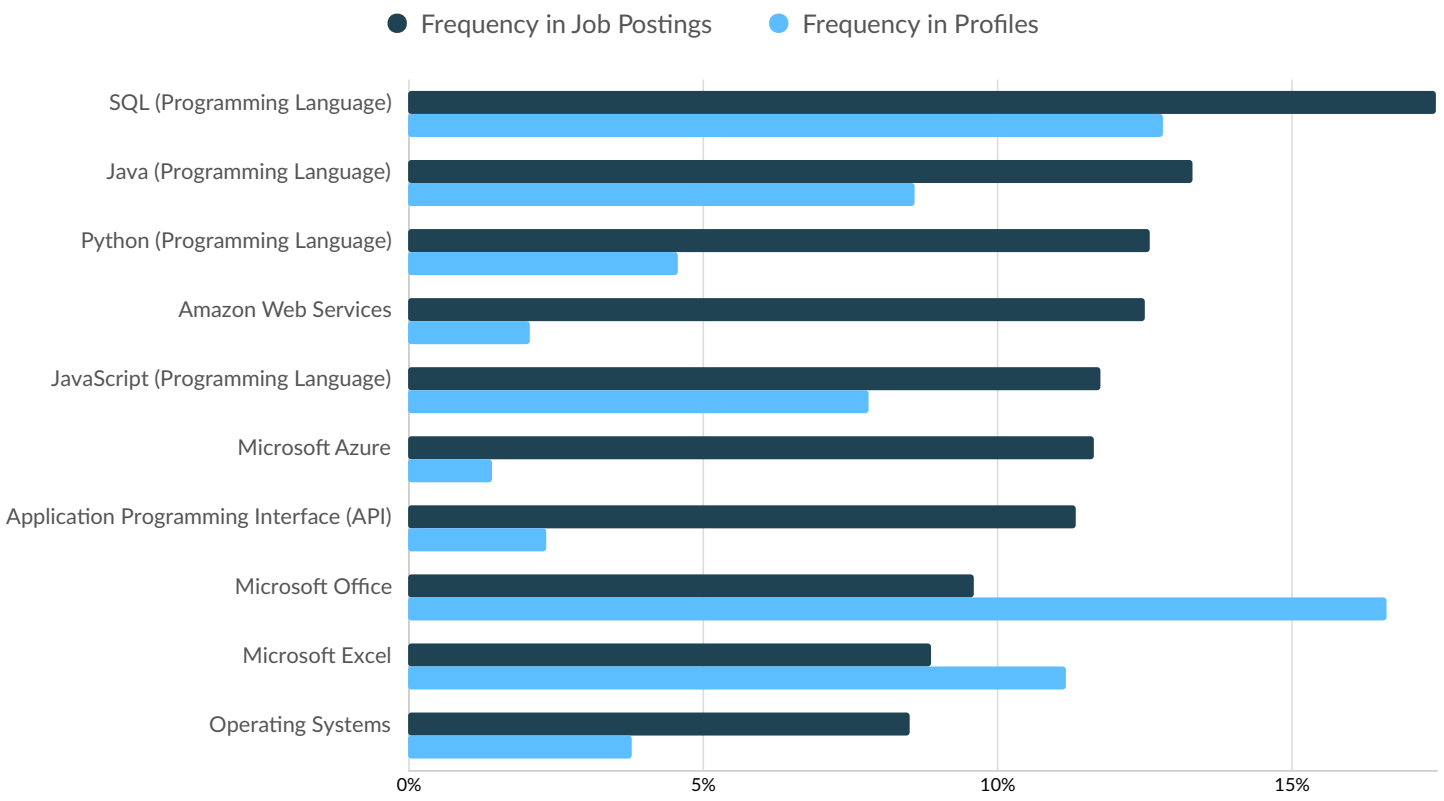
Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Computer Science	20,216	27%	2,405	1%
Agile Methodology	18,077	24%	16,520	9%
SQL (Programming Language)	13,187	17%	24,644	13%
Automation	12,028	16%	9,061	5%
Software Engineering	11,961	16%	23,039	12%
Software Development	11,388	15%	22,256	12%
Java (Programming Language)	10,067	13%	16,537	9%
Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%

Top Common Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Communications	34,137	45%	19,190	10%
Management	23,432	31%	38,058	20%
Problem Solving	20,205	27%	7,628	4%
Leadership	19,288	26%	31,481	16%
Troubleshooting (Problem Solving)	18,201	24%	23,160	12%
Customer Service	15,914	21%	38,687	20%
Operations	15,007	20%	19,906	10%
Planning	13,109	17%	9,810	5%
Writing	12,699	17%	5,142	3%
Detail Oriented	10,676	14%	1,454	1%

Top Software Skills



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Java (Programming Language)	10,067	13%	16,537	9%
Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%
Microsoft Azure	8,807	12%	2,755	1%
Application Programming Interface (API)	8,565	11%	4,486	2%
Microsoft Office	7,265	10%	31,933	17%
Microsoft Excel	6,717	9%	21,476	11%
Operating Systems	6,430	9%	7,318	4%

Top Qualifications

Qualification	Postings with Qualification
Valid Driver's License	3,407
Certified Information Systems Security Professional	1,593
Project Management Professional Certification	1,432
Security Clearance	1,118
CompTIA A+	1,084
Cisco Certified Network Associate	1,005
Master Of Business Administration (MBA)	841
CompTIA Security+	734
Certified Information System Auditor (CISA)	733
Certified Information Security Manager	681

Appendix A

Program Selection Details

CIP Code	Program Name
11.0701	Computer Science

Appendix B - Data Sources and Calculations

Institution Data

The institution data in this report is taken directly from the national IPEDS database published by the U.S. Department of Education's National Center for Education Statistics.

Location Quotient

Location quotient (LQ) is a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. It can reveal what makes a particular region unique in comparison to the national average.

Occupation Data

Emsi occupation employment data are based on final Emsi industry data and final Emsi staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Emsi earnings by industry.

Lightcast Job Postings

Job postings are collected from various sources and processed/enriched to provide information such as standardized company name, occupation, skills, and geography.

State Data Sources

This report uses state data from the following agencies: Minnesota Department of Employment and Economic Development; Montana Department of Labor and Industry; North Dakota Job Service; South Dakota Department of Labor and Regulation

New Academic Program Request

Institution:

North Dakota State University

Program Name:

Core Computer Science Competencies

Degree Types:

Undergraduate Program Certificate

What day did AAC review the Academic Program Exploration Notice for this New Academic Program?

2023-05-26

CIP Code:

11.0701

Academic Program Code:

Will be determined by Registrar in consultation with CTS upon approval.

Academic Department/Division/College:

Department of Computer Science/College of Engineering

Semester of Program:

Fall

Year of Program:

2023

Other Participating Institutions:

Not Applicable

Delivery Method:

On Campus
Hybrid (on campus & distance)
Online Only

Describe the delivery methods and location(s) to which the program will be delivered:

These courses are already offered through the BS Computer Science program and will continue to be delivered using the same methods of online, in-person, and hybrid.

Funding Source:

Instructional Re-allocation

Describe the funding source:

No new courses are being created, so there will not be any additional funding needed.

Is the program eligible for Financial Aid?

No

Does the program require a criminal background check described in NDUS Procedure 511?

No

Describe a brief description of the program:

The certificate is intended to make our course offerings more flexibly accessible to a variety of

potential students: 1. High school students who want to start making progress towards an NDSU degree 2. Individuals who have completed high school but are not ready to commit to a four-year degree and treat a certificate as trial phase for enrollment into our B.S. program 3. Students who have enrolled in our B.S. program but are not ready for our flagship Computer Science I course. Currently such students take one course that may appear remedial. With the changed curriculum, they can take all three courses that make up Certificate 1 and gain a meaningful credential in their first term. 4. Professionals with baccalaureate degree in a different subject who would like to increase their computer science competencies 5. Professionals who engage in life-long learning, and would like to demonstrate their academic achievements 6. Students from other majors who would like to get credit for computer science material more flexibly than through our minor programs 7. Professionals with associate degrees who want to gain 4-year-college credentials 8. Students or professionals who are interested in pursuing a graduate degree, but do not have a Computer Science B.S. degree, and who 8.1. May or may not have software development experience 8.2. May or may not have a technical degree Note that the choice of courses is such that certificates only depend on other certificates for prerequisites, and not on other NDSU courses, such as those in mathematics.

Address student demand and employment availability for students completing the program:

Many of today's companies worldwide use websites and application portfolios (i.e., apps) as the primary means for customer applications; which makes them important members of the IT community. In general, Computer Scientists and Software Engineers work with other IT professions and apply the principles of engineering to design, test, implement and evaluate software. There are many different factors that drive the need for Computer Science and Software Engineering, some of these include the accelerating growth of technology (which is led by fellow Computer Scientists and Engineers), the ever-increasing complexity of the IT sector (which continues to have a greater emphasis on security), the growing demand on custom and innovative website and mobile applications, and the continuous need to update code due to its limited lifespan. The proposed certificates are in the realm of Computer Science, Software Engineering, and Cybersecurity and thus fulfilling the need of the state as well as the nation.

Describe how this need was assessed and indicate sources for data used and indicated ancipated enrollment rates for the first five years:

With the help of NDSU-internal discussions, we have received feedback on the stackable certificates from 1. Employers and students at a breakfast that our department organized at the Career Expo 2. A group of alumni and employers with whom we met specifically to discuss the proposal We received many supportive comments and no major concerns. The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. Most of the certificates will be available to our current majors so we project the following enrollment rates: Year 1: 20 Year 2: 40 Year 3: 45 Year 4: 50 Year 5: 55

Describe how the program addresses the institutional strategic plan:

The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. The stackable certificates aligns with the university's strategic plan since it will help to increase undergraduate student enrollment and it will provide another attractive NDSU program for students to enroll in.

Describe how the program addresses the NDUS stategic plan:

This program addresses Goal 2 (Provide programs people want, where and when they need them) of the NDUS strategic plan. In particular, Objective 2.1 is addressed, which ensures programs are relevant, valuable, and timely (key indicator 2.1).

Are there similar programs that exist within NDUS or state?

No

What is the length of the program?

2-3 semesters

Identify the proposed program-level accreditation organization, if applicable:

NA

Cert 1: Fundamentals of Computing and Security

- CSCI 159: Computer Science Problem Solving
- CSCI 105: Introduction Cybersecurity
- CSCI 227: Computing Fundamentals I

- Math background equiv. to MATH 105
- ENGL 110
- ENGL 120
- COMM 110
- Wellness (2 cr)

Cert 2: Computer Science Foundations

- CSCI 160: Computer Science I
- CSCI 161: Computer Science II
- CSCI 277: Introduction to UNIX

- MATH 129: Basic Linear Algebra.
- MATH 165: Calculus I
- MATH 166: Calculus II

- Gen Eds in Humanities and Fine Arts (6 cr)
- Social and Behavioral Sc. (6 cr)
- Cultural Diversity
- Global Perspectives

Cert 3: Core Computer Science Competencies

- CSCI 366: Database Systems
- CSCI 372: Comparative Program-ming Languages
- CSCI 222: Discrete Mathematics

Cert 4: Software Development

- CSCI 213: Modern Software Develop-ment
- CSCI 313: Software Develop-ment with Frame-works
- CSCI 371: Web Scripting Languages

Cert 5: Computing Systems

- CSCI 374: Computer Organization and Architecture
- CSCI 336: Theoretical Computer Science
- CSCI 474: Operating Systems Concepts

- Science Gen Eds (7 cr)
- ENGL 321: Writing in the Tech. Profess.
- STAT 367: Proba-bility
- STAT 368: Statis-tics

Cert 6a: Cybersecurity

- CSCI 403: Defensive Network Security
- CSCI 405: Principles of Cybersecurity
- CSCI 404: Ethical Hacking
- Another elective from the Cybersecurity Track of the B.S. Degree

Cert 6b: Data Science

- CSCI 420: Introduction to Data Science in Python
- CSCI 422: Intro. to Data Engineering
- CSCI 425: Machine Learning
- CSCI 426: Intro to AI
- Another elective from the Data Science Track of the B.S. Degree

Cert 6c: Software Eng.

- CSCI 413: Principles of Software Engineering
- CSCI 419: Software Testing and Debugging
- Another elective from the Software Engineering Track of the B.S. Degree

- CSCI 467: Algorithm Analysis
- CSCI 455: Networking and Parallel Computation
- CSCI 489: Social Implications of Computers
- CSCI 445: Software Projects Capstone

Program Overview

Computer Science

Lightcast Q2 2023 Data Set

May 2023

1340 Administration Avenue
Fargo, North Dakota 58102
701-231-8011

Parameters

Completions Year: 2021

Jobs Timeframe: 2023 - 2033

Job Postings Timeframe: May 2022 - Apr 2023

Programs:

Code	Description
11.0701	Computer Science

Regions:

Code	Description
27	Minnesota
30	Montana

Code	Description
38	North Dakota
46	South Dakota

Education Level: Any

Tuition Type: Tuition & Fees

Graduate Status: Undergraduate

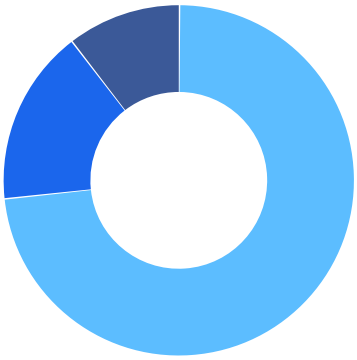
Residency: In-State

42	1,704	Completions Distribution
Institutions	Completions	Average: 40.6
0% Growth (2017-2021)	30% Growth (2017-2021)	1 — 645
		Median: 18.5

Program Overview

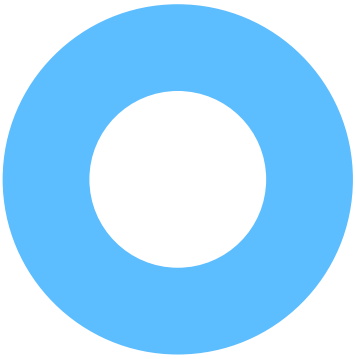
	Completions (2021)	% Completions	Institutions (2021)	% Institutions
All Programs	1,704	100%	42	100%
Distance Offered Programs	142	8%	4	10%
Non-Distance Offered Programs	1,562	92%	38	90%

Market Share by Institution Type



Institution Type	Completions (2021)	Market Share
Public, 4-year or above	1,248	73.2%
Private not-for-profit, 4-year or above	277	16.3%
Public, 2-year	179	10.5%

Market Share by Program

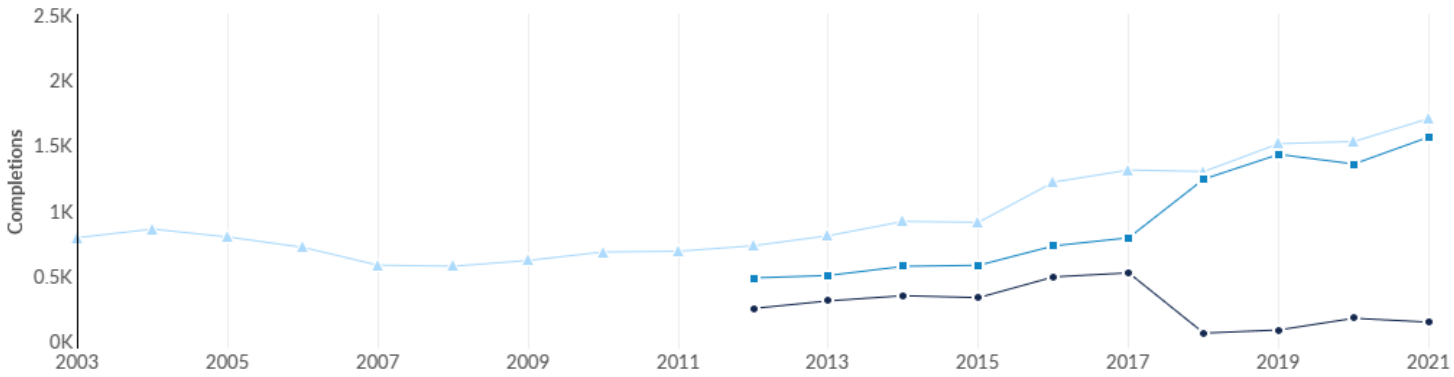


Program	Completions (2021)	Market Share
Computer Science (11.0701)	1,704	100.0%

Completions by Institution

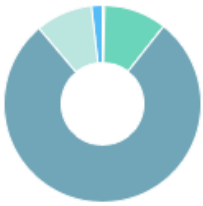
Institution	Completions (2021)	Growth % YOY (2021)	Market Share (2021)	IPEDS Tuition & Fees (2021)	Completions Trend (2017-2021)
University of Minnesota-Twin Cities	645	17.5%	37.9%	$15,254	
North Dakota State University-Main Campus	106	5.0%	6.2%	$10,401	
University of Minnesota-Duluth	92	15.0%	5.4%	$13,850	
Montana State University	89	-14.4%	5.2%	$7,528	
Metropolitan State University	83	-3.5%	4.9%	$9,394	
Saint Cloud State University	64	10.3%	3.8%	$9,170	
Winona State University	56	-3.4%	3.3%	$10,184	
University of St Thomas	55	61.8%	3.2%	$48,329	
Carleton College	54	-23.9%	3.2%	$60,225	
Normandale Community College	50	31.6%	2.9%	$5,789	

Regional Trends



	2012 Completions	2021 Completions	% Change
Distance Offered Programs	247	142	-42.5%
Non-Distance Offered Programs	481	1,562	+224.7%
All Programs	728	1,704	+134.1%

Regional Completions by Award Level



Award Level	Completions (2021)	Percent
Award of less than 1 academic year	6	0.4%
Associate's Degree	175	10.3%
Bachelor's Degree	1,333	78.2%
Master's Degree	159	9.3%
Doctor's Degree	31	1.8%
Award of at least 1 but less than 2 academic years	0	0.0%
Award of at least 2 but less than 4 academic years	0	0.0%
Postbaccalaureate certificate	0	0.0%
Post-masters certificate	0	0.0%

Similar Programs

125	37,867
Programs (2021)	Completions (2021)

CIP Code	Program	Completions (2021)
52.0201	Business Administration and Management, General	7,464
24.0101	Liberal Arts and Sciences/Liberal Studies	7,167
26.0101	Biology/Biological Sciences, General	2,434
51.0701	Health/Health Care Administration/Management	1,833
52.1401	Marketing/Marketing Management, General	1,485
30.9999	Multi-/Interdisciplinary Studies, Other	1,339
52.0101	Business/Commerce, General	1,148
43.0104	Criminal Justice/Safety Studies	1,050
24.0102	General Studies	1,043
27.0101	Mathematics, General	826

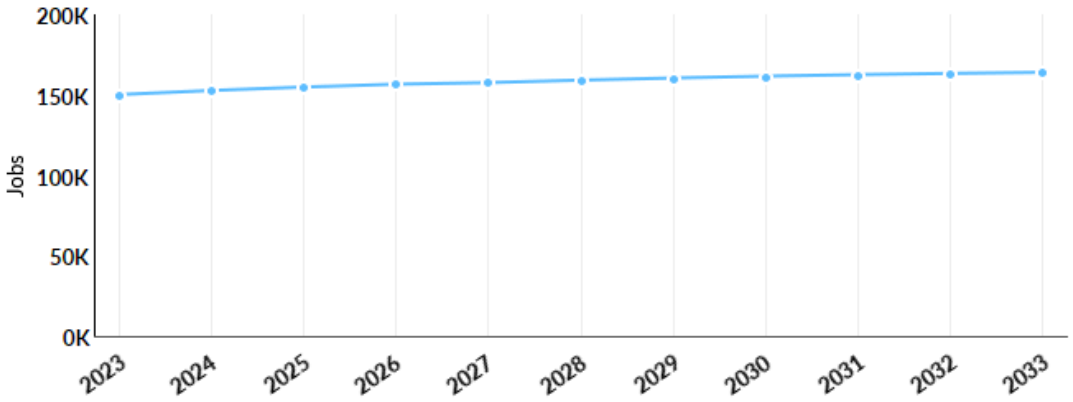
Target Occupations

150,061	+9.2%	$42.47/hr $88.3K/yr	12,640
Jobs (2023)	% Change (2023-2033)	Median Earnings	Annual Openings
9% below National average	Nation: +17.7%	Nation: $47.56/hr; $98.9K/yr	

Occupation	2023 Jobs	Annual Openings	Median Earnings	Growth (2023 - 2033)	Location Quotient (2023)
Software Developers	46,714	4,003	$48.00/hr	+14.45%	1.02
Computer User Support Specialists	18,304	1,563	$26.39/hr	+4.47%	0.86
Computer Systems Analysts	17,794	1,392	$46.88/hr	+4.82%	1.10
Computer and Information Systems Managers	12,177	1,089	$71.07/hr	+11.49%	0.77
Computer Network Support Specialists	10,796	900	$29.16/hr	+2.76%	1.93
Network and Computer Systems Administrators	8,969	658	$39.05/hr	+2.80%	0.90
Computer Occupations, All Other	7,768	660	$35.81/hr	+9.42%	0.60
Computer Network Architects	4,919	336	$52.51/hr	+1.75%	0.93
Information Security Analysts	3,989	414	$47.22/hr	+23.06%	0.74
Computer Programmers	3,653	255	$38.21/hr	-6.71%	0.72
Software Quality Assurance Analysts and Testers	3,182	303	$43.26/hr	+17.28%	0.52
Web Developers	2,872	275	$35.56/hr	+15.32%	0.87
Web and Digital Interface Designers	2,529	269	$32.42/hr	+15.70%	0.78
Database Administrators	2,321	179	$44.07/hr	+5.13%	0.86
Computer Hardware Engineers	1,546	115	$37.53/hr	+5.95%	0.65
Statisticians	1,158	115	$36.37/hr	+20.29%	1.08
Database Architects	1,084	85	$57.48/hr	+5.54%	0.69
Computer and Information Research Scientists	286	30	$62.78/hr	+24.48%	0.27

Growth

150,061	163,888	13,827	9.2%
2023 Jobs	2033 Jobs	Change (2023-2033)	% Change (2023-2033)

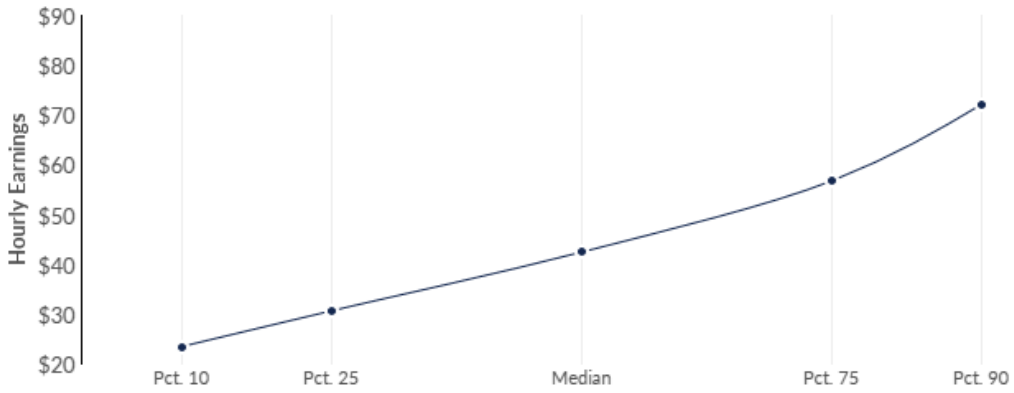


Occupation	2023 Jobs	2033 Jobs	Change	% Change
Computer and Information Systems Managers (11-3021)	12,177	13,576	1,399	11%
Computer Systems Analysts (15-1211)	17,794	18,651	857	5%
Information Security Analysts (15-1212)	3,989	4,909	920	23%
Computer and Information Research Scientists (15-1221)	286	356	70	24%
Computer Network Support Specialists (15-1231)	10,796	11,094	298	3%
Computer User Support Specialists (15-1232)	18,304	19,122	818	4%
Computer Network Architects (15-1241)	4,919	5,005	86	2%
Database Administrators (15-1242)	2,321	2,440	119	5%
Database Architects (15-1243)	1,084	1,144	60	6%
Network and Computer Systems Administrators (15-1244)	8,969	9,220	251	3%
Computer Programmers (15-1251)	3,653	3,408	-245	-7%
Software Developers (15-1252)	46,714	53,462	6,748	14%
Software Quality Assurance Analysts and Testers (15-1253)	3,182	3,732	550	17%
Web Developers (15-1254)	2,872	3,312	440	15%

Web and Digital Interface Designers (15-1255)	2,529	2,926	397	16%
Computer Occupations, All Other (15-1299)	7,768	8,500	732	9%
Statisticians (15-2041)	1,158	1,393	235	20%
Computer Hardware Engineers (17-2061)	1,546	1,638	92	6%

Percentile Earnings

$30.66/hr	$42.47/hr	$56.80/hr
25th Percentile Earnings	Median Earnings	75th Percentile Earnings



Occupation	25th Percentile Earnings	Median Earnings	75th Percentile Earnings
Computer and Information Systems Managers (11-3021)	$55.15	$71.07	$79.84
Computer Systems Analysts (15-1211)	$36.66	$46.88	$56.99
Information Security Analysts (15-1212)	$37.42	$47.22	$57.88
Computer and Information Research Scientists (15-1221)	$57.59	$62.78	$63.51
Computer Network Support Specialists (15-1231)	$23.34	$29.16	$37.37
Computer User Support Specialists (15-1232)	$20.12	$26.39	$30.75
Computer Network Architects (15-1241)	$48.02	$52.51	$64.99
Database Administrators (15-1242)	$32.60	$44.07	$57.93
Database Architects (15-1243)	$48.40	$57.48	$72.77
Network and Computer Systems Administrators (15-1244)	$30.61	$39.05	$47.26
Computer Programmers (15-1251)	$30.34	$38.21	$47.10
Software Developers (15-1252)	$37.55	$48.00	$61.25
Software Quality Assurance Analysts and Testers (15-1253)	$32.15	$43.26	$48.30

Web Developers (15-1254)	$24.25	$35.56	$49.67
Web and Digital Interface Designers (15-1255)	$22.54	$32.42	$45.81
Computer Occupations, All Other (15-1299)	$22.78	$35.81	$52.71
Statisticians (15-2041)	$29.54	$36.37	$47.86
Computer Hardware Engineers (17-2061)	$37.35	$37.53	$51.75

Job Postings Summary

75,604	2 : 1	6,756	27 days
Unique Postings	**Posting Intensity**	**Employers Competing**	**Median Posting Duration**
154,021 Total Postings		36,771 Total Employers	Regional Average: 30 days
	Regional Average: 3 : 1		

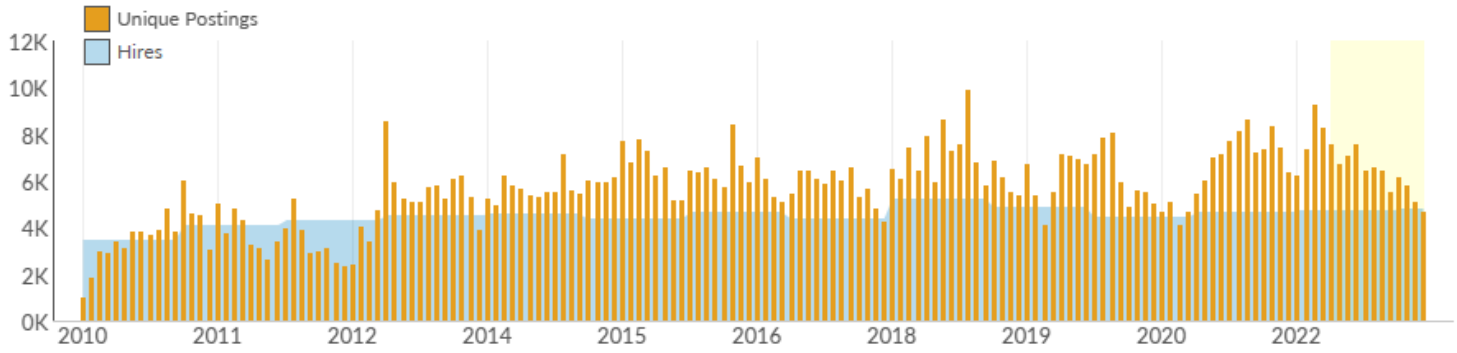
There were **154,021** total job postings for your selection from May 2022 to April 2023, of which **75,604** were unique. These numbers give us a Posting Intensity of **2-to-1**, meaning that for every 2 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

Job Postings vs. Hires

6,300	4,749
Avg. Monthly Postings (May 2022 - Apr 2023)	Avg. Monthly Hires (May 2022 - Apr 2023)

In an average month, there were **6,300** newly posted job postings for *18 Occupations*, and **4,749** actually hired. This means there was approximately 1 hire for every 1 unique job posting for *18 Occupations*.



Occupation	Avg Monthly Postings (May 2022 - Apr 2023)	Avg Monthly Hires (May 2022 - Apr 2023)
Software Developers	1,953	1,460
Computer Occupations, All Other	1,122	261
Computer User Support Specialists	733	659
Computer Systems Analysts	539	514
Information Security Analysts	266	150
Web Developers	259	94
Database Administrators	256	68
Software Quality Assurance Analysts and Testers	227	118
Network and Computer Systems Administrators	200	259
Computer Network Architects	182	136
Database Architects	153	32
Computer Programmers	128	98

Computer and Information Systems Managers	84	374
Computer Network Support Specialists	56	338
Computer and Information Research Scientists	45	12
Statisticians	42	43
Web and Digital Interface Designers	30	87
Computer Hardware Engineers	24	45

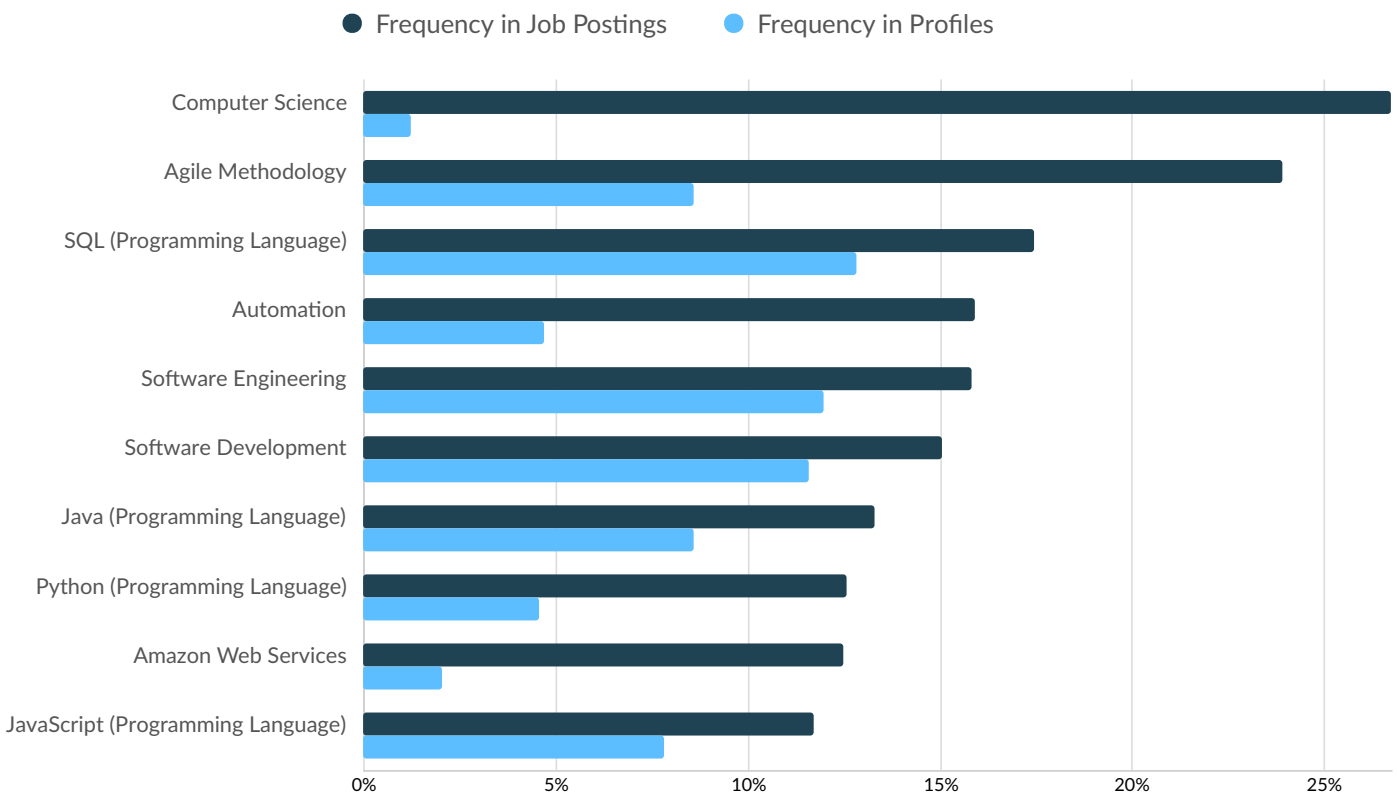
Top Companies Posting

Company	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Randstad	4,146 / 2,422	2 : 1 	20 days
Humana	4,627 / 2,002	2 : 1 	33 days
UnitedHealth Group	4,913 / 1,723	3 : 1 	26 days
Wells Fargo	4,190 / 1,139	4 : 1 	32 days
Robert Half	1,212 / 849	1 : 1 	30 days
US Bank	1,449 / 688	2 : 1 	29 days
General Dynamics	1,104 / 668	2 : 1 	33 days
CTG	742 / 627	1 : 1 	33 days
Optum	2,007 / 612	3 : 1 	36 days
Travelers	746 / 536	1 : 1 	33 days

Top Posted Job Titles

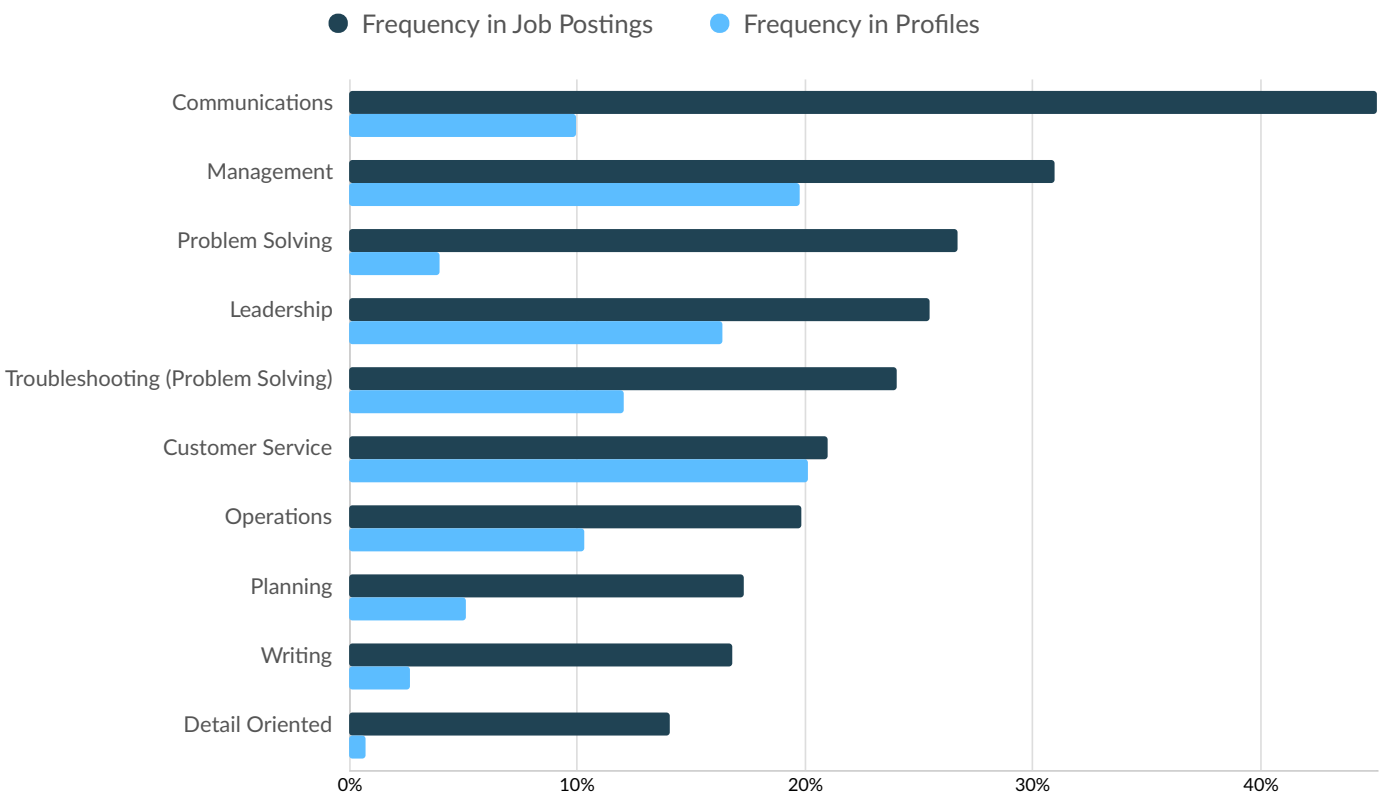
Job Title	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Software Engineers	6,186 / 2,558	2 : 1 	25 days
Data Engineers	1,521 / 811	2 : 1 	26 days
Systems Engineers	1,170 / 657	2 : 1 	23 days
Software Developers	1,107 / 640	2 : 1 	28 days
Business Systems Analysts	1,313 / 637	2 : 1 	25 days
Full Stack Developers	862 / 501	2 : 1 	23 days
Systems Administrators	860 / 477	2 : 1 	29 days
Solutions Architects	1,022 / 461	2 : 1 	30 days
Java Developers	663 / 439	2 : 1 	20 days
DevOps Engineers	706 / 433	2 : 1 	25 days

Top Specialized Skills



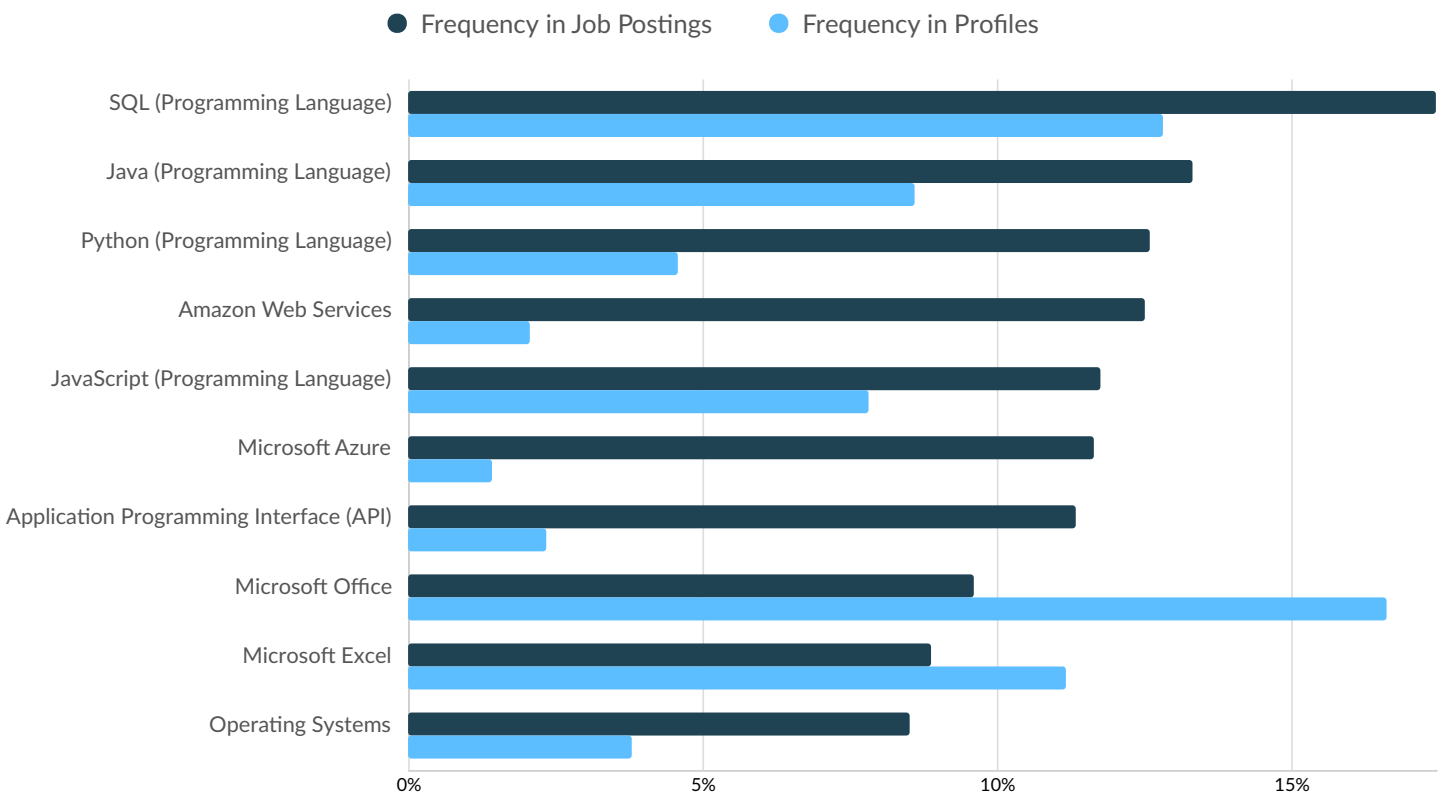
Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Computer Science	20,216	27%	2,405	1%
Agile Methodology	18,077	24%	16,520	9%
SQL (Programming Language)	13,187	17%	24,644	13%
Automation	12,028	16%	9,061	5%
Software Engineering	11,961	16%	23,039	12%
Software Development	11,388	15%	22,256	12%
Java (Programming Language)	10,067	13%	16,537	9%
Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%

Top Common Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Communications	34,137	45%	19,190	10%
Management	23,432	31%	38,058	20%
Problem Solving	20,205	27%	7,628	4%
Leadership	19,288	26%	31,481	16%
Troubleshooting (Problem Solving)	18,201	24%	23,160	12%
Customer Service	15,914	21%	38,687	20%
Operations	15,007	20%	19,906	10%
Planning	13,109	17%	9,810	5%
Writing	12,699	17%	5,142	3%
Detail Oriented	10,676	14%	1,454	1%

Top Software Skills



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Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%
Microsoft Azure	8,807	12%	2,755	1%
Application Programming Interface (API)	8,565	11%	4,486	2%
Microsoft Office	7,265	10%	31,933	17%
Microsoft Excel	6,717	9%	21,476	11%
Operating Systems	6,430	9%	7,318	4%

Top Qualifications

Qualification	Postings with Qualification
Valid Driver's License	3,407
Certified Information Systems Security Professional	1,593
Project Management Professional Certification	1,432
Security Clearance	1,118
CompTIA A+	1,084
Cisco Certified Network Associate	1,005
Master Of Business Administration (MBA)	841
CompTIA Security+	734
Certified Information System Auditor (CISA)	733
Certified Information Security Manager	681

Appendix A

Program Selection Details

CIP Code	Program Name
11.0701	Computer Science

Appendix B - Data Sources and Calculations

Institution Data

The institution data in this report is taken directly from the national IPEDS database published by the U.S. Department of Education's National Center for Education Statistics.

Location Quotient

Location quotient (LQ) is a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. It can reveal what makes a particular region unique in comparison to the national average.

Occupation Data

Emsi occupation employment data are based on final Emsi industry data and final Emsi staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Emsi earnings by industry.

Lightcast Job Postings

Job postings are collected from various sources and processed/enriched to provide information such as standardized company name, occupation, skills, and geography.

State Data Sources

This report uses state data from the following agencies: Minnesota Department of Employment and Economic Development; Montana Department of Labor and Industry; North Dakota Job Service; South Dakota Department of Labor and Regulation

New Academic Program Request

Institution:

North Dakota State University

Program Name:

Data Science

Degree Types:

Undergraduate Program Certificate

What day did AAC review the Academic Program Exploration Notice for this New Academic Program?

2023-05-26

CIP Code:

11.0102

Academic Program Code:

Will be determined by Registrar in consultation with CTS upon approval.

Academic Department/Division/College:

Department of Computer Science/College of Engineering

Semester of Program:

Fall

Year of Program:

2023

Other Participating Institutions:

Not Applicable

Delivery Method:

On Campus
Hybrid (on campus & distance)
Online Only

Describe the delivery methods and location(s) to which the program will be delivered:

These courses are already offered through the BS Computer Science program and will continue to be delivered using the same methods of online, in-person, and hybrid.

Funding Source:

Instructional Re-allocation

Describe the funding source:

No new courses are being created, so there will not be any additional funding needed.

Is the program eligible for Financial Aid?

No

Does the program require a criminal background check described in NDUS Procedure 511?

No

Describe a brief description of the program:

The certificate is intended to make our course offerings more flexibly accessible to a variety of

potential students: 1. High school students who want to start making progress towards an NDSU degree 2. Individuals who have completed high school but are not ready to commit to a four-year degree and treat a certificate as trial phase for enrollment into our B.S. program 3. Students who have enrolled in our B.S. program but are not ready for our flagship Computer Science I course. Currently such students take one course that may appear remedial. With the changed curriculum, they can take all three courses that make up Certificate 1 and gain a meaningful credential in their first term. 4. Professionals with baccalaureate degree in a different subject who would like to increase their computer science competencies 5. Professionals who engage in life-long learning, and would like to demonstrate their academic achievements 6. Students from other majors who would like to get credit for computer science material more flexibly than through our minor programs 7. Professionals with associate degrees who want to gain 4-year-college credentials 8. Students or professionals who are interested in pursuing a graduate degree, but do not have a Computer Science B.S. degree, and who 8.1. May or may not have software development experience 8.2. May or may not have a technical degree Note that the choice of courses is such that certificates only depend on other certificates for prerequisites, and not on other NDSU courses, such as those in mathematics.

Address student demand and employment availability for students completing the program:

Many of today's companies worldwide use websites and application portfolios (i.e., apps) as the primary means for customer applications; which makes them important members of the IT community. In general, Computer Scientists and Software Engineers work with other IT professions and apply the principles of engineering to design, test, implement and evaluate software. There are many different factors that drive the need for Computer Science and Software Engineering, some of these include the accelerating growth of technology (which is led by fellow Computer Scientists and Engineers), the ever-increasing complexity of the IT sector (which continues to have a greater emphasis on security), the growing demand on custom and innovative website and mobile applications, and the continuous need to update code due to its limited lifespan. The proposed certificates are in the realm of Computer Science, Software Engineering, and Cybersecurity and thus fulfilling the need of the state as well as the nation.

Describe how this need was assessed and indicate sources for data used and indicated ancipated enrollment rates for the first five years:

With the help of NDSU-internal discussions, we have received feedback on the stackable certificates from 1. Employers and students at a breakfast that our department organized at the Career Expo 2. A group of alumni and employers with whom we met specifically to discuss the proposal We received many supportive comments and no major concerns. The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. Most of the certificates will be available to our current majors with focus on the specific specialization area so we project the following enrollment rates: Year 1: 15 Year 2: 30 Year 3: 40 Year 4: 45 Year 5: 50

Describe how the program addresses the institutional strategic plan:

The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. The stackable certificates aligns with the university's strategic plan since it will help to increase undergraduate student enrollment and it will provide another attractive NDSU program for students to enroll in.

Describe how the program addresses the NDUS stategic plan:

This program addresses Goal 2 (Provide programs people want, where and when they need them) of the NDUS strategic plan. In particular, Objective 2.1 is addressed, which ensures programs are relevant, valuable, and timely (key indicator 2.1).

Are there similar programs that exist within NDUS or state?

No

What is the length of the program?

2-3 Semesters

Identify the proposed program-level accreditation organization, if applicable:

NA

Cert 1: Fundamentals of Computing and Security

- CSCI 159: Computer Science Problem Solving
- CSCI 105: Introduction Cybersecurity
- CSCI 227: Computing Fundamentals I

- Math background equiv. to MATH 105
- ENGL 110
- ENGL 120
- COMM 110
- Wellness (2 cr)

Cert 2: Computer Science Foundations

- CSCI 160: Computer Science I
- CSCI 161: Computer Science II
- CSCI 277: Introduction to UNIX

- MATH 129: Basic Linear Algebra.
- MATH 165: Calculus I
- MATH 166: Calculus II

- Gen Eds in Humanities and Fine Arts (6 cr)
- Social and Behavioral Sc. (6 cr)
- Cultural Diversity
- Global Perspectives

Cert 3: Core Computer Science Competencies

- CSCI 366: Database Systems
- CSCI 372: Comparative Program-ming Languages
- CSCI 222: Discrete Mathematics

Cert 4: Software Development

- CSCI 213: Modern Software Develop-ment
- CSCI 313: Software Develop-ment with Frame-works
- CSCI 371: Web Scripting Languages

Cert 5: Computing Systems

- CSCI 374: Computer Organization and Architecture
- CSCI 336: Theoretical Computer Science
- CSCI 474: Operating Systems Concepts

- Science Gen Eds (7 cr)
- ENGL 321: Writing in the Tech. Profess.
- STAT 367: Proba-bility
- STAT 368: Statis-tics

Cert 6a: Cybersecurity

- CSCI 403: Defensive Network Security
- CSCI 405: Principles of Cybersecurity
- CSCI 404: Ethical Hacking
- Another elective from the Cybersecurity Track of the B.S. Degree

Cert 6b: Data Science

- CSCI 420: Introduction to Data Science in Python
- CSCI 422: Intro. to Data Engineering
- CSCI 425: Machine Learning
- CSCI 426: Intro to AI
- Another elective from the Data Science Track of the B.S. Degree

Cert 6c: Software Eng.

- CSCI 413: Principles of Software Engineering
- CSCI 419: Software Testing and Debugging
- Another elective from the Software Engineering Track of the B.S. Degree

- CSCI 467: Algorithm Analysis
- CSCI 455: Networking and Parallel Computation
- CSCI 489: Social Implications of Computers
- CSCI 445: Software Projects Capstone

Program Overview

Computer Science

Lightcast Q2 2023 Data Set

May 2023

1340 Administration Avenue
Fargo, North Dakota 58102
701-231-8011

Parameters

Completions Year: 2021

Jobs Timeframe: 2023 - 2033

Job Postings Timeframe: May 2022 - Apr 2023

Programs:

Code	Description
11.0701	Computer Science

Regions:

Code	Description
27	Minnesota
30	Montana

Code	Description
38	North Dakota
46	South Dakota

Education Level: Any

Tuition Type: Tuition & Fees

Graduate Status: Undergraduate

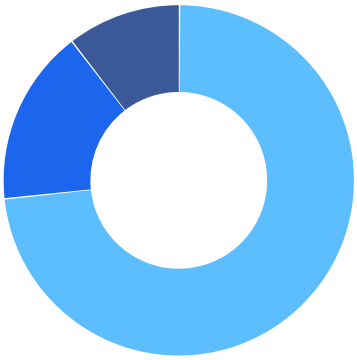
Residency: In-State

42	1,704	Completions Distribution
Institutions	Completions	Average: 40.6
0% Growth (2017-2021)	30% Growth (2017-2021)	1 — 645
		Median: 18.5

Program Overview

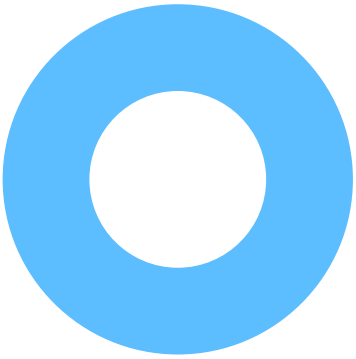
	Completions (2021)	% Completions	Institutions (2021)	% Institutions
All Programs	1,704	100%	42	100%
Distance Offered Programs	142	8%	4	10%
Non-Distance Offered Programs	1,562	92%	38	90%

Market Share by Institution Type



Institution Type	Completions (2021)	Market Share
Public, 4-year or above	1,248	73.2%
Private not-for-profit, 4-year or above	277	16.3%
Public, 2-year	179	10.5%

Market Share by Program

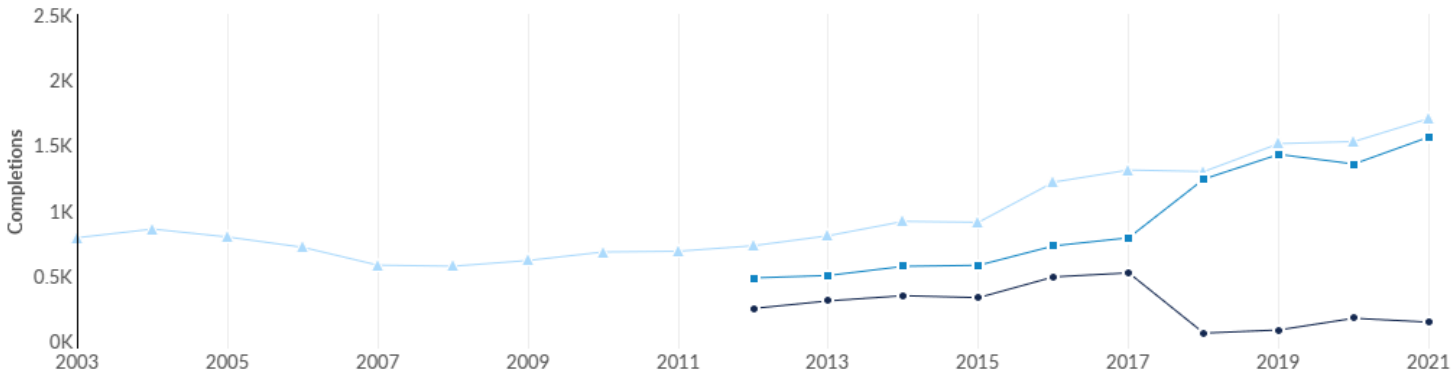


Program	Completions (2021)	Market Share
Computer Science (11.0701)	1,704	100.0%

Completions by Institution

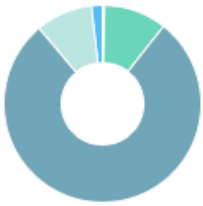
Institution	Completions (2021)	Growth % YOY (2021)	Market Share (2021)	IPEDS Tuition & Fees (2021)	Completions Trend (2017-2021)
University of Minnesota-Twin Cities	645	17.5%	37.9%	$15,254	
North Dakota State University-Main Campus	106	5.0%	6.2%	$10,401	
University of Minnesota-Duluth	92	15.0%	5.4%	$13,850	
Montana State University	89	-14.4%	5.2%	$7,528	
Metropolitan State University	83	-3.5%	4.9%	$9,394	
Saint Cloud State University	64	10.3%	3.8%	$9,170	
Winona State University	56	-3.4%	3.3%	$10,184	
University of St Thomas	55	61.8%	3.2%	$48,329	
Carleton College	54	-23.9%	3.2%	$60,225	
Normandale Community College	50	31.6%	2.9%	$5,789	

Regional Trends



	2012 Completions	2021 Completions	% Change
Distance Offered Programs	247	142	-42.5%
Non-Distance Offered Programs	481	1,562	+224.7%
All Programs	728	1,704	+134.1%

Regional Completions by Award Level



Award Level	Completions (2021)	Percent
Award of less than 1 academic year	6	0.4%
Associate's Degree	175	10.3%
Bachelor's Degree	1,333	78.2%
Master's Degree	159	9.3%
Doctor's Degree	31	1.8%
Award of at least 1 but less than 2 academic years	0	0.0%
Award of at least 2 but less than 4 academic years	0	0.0%
Postbaccalaureate certificate	0	0.0%
Post-masters certificate	0	0.0%

Similar Programs

125	37,867
Programs (2021)	Completions (2021)

CIP Code	Program	Completions (2021)
52.0201	Business Administration and Management, General	7,464
24.0101	Liberal Arts and Sciences/Liberal Studies	7,167
26.0101	Biology/Biological Sciences, General	2,434
51.0701	Health/Health Care Administration/Management	1,833
52.1401	Marketing/Marketing Management, General	1,485
30.9999	Multi-/Interdisciplinary Studies, Other	1,339
52.0101	Business/Commerce, General	1,148
43.0104	Criminal Justice/Safety Studies	1,050
24.0102	General Studies	1,043
27.0101	Mathematics, General	826

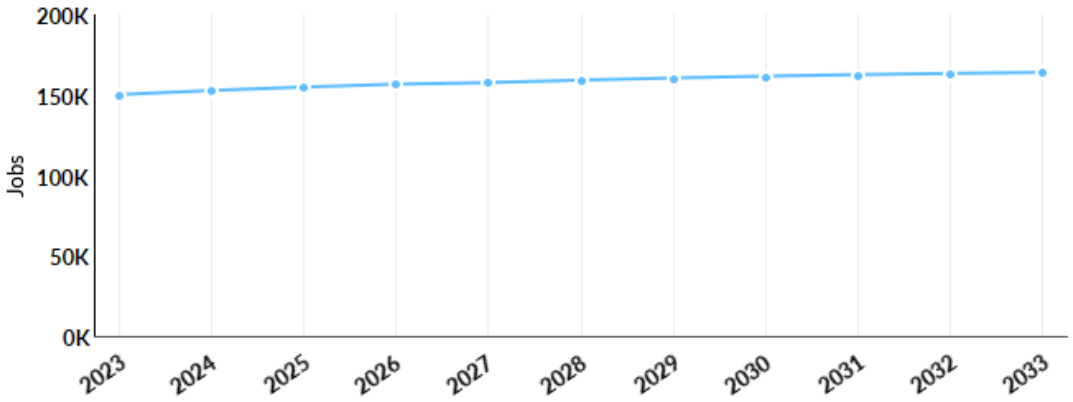
Target Occupations

150,061	+9.2%	$42.47/hr $88.3K/yr	12,640
Jobs (2023)	% Change (2023-2033)	Median Earnings	Annual Openings
9% below National average	Nation: +17.7%	Nation: $47.56/hr; $98.9K/yr	

Occupation	2023 Jobs	Annual Openings	Median Earnings	Growth (2023 - 2033)	Location Quotient (2023)
Software Developers	46,714	4,003	$48.00/hr	+14.45%	1.02
Computer User Support Specialists	18,304	1,563	$26.39/hr	+4.47%	0.86
Computer Systems Analysts	17,794	1,392	$46.88/hr	+4.82%	1.10
Computer and Information Systems Managers	12,177	1,089	$71.07/hr	+11.49%	0.77
Computer Network Support Specialists	10,796	900	$29.16/hr	+2.76%	1.93
Network and Computer Systems Administrators	8,969	658	$39.05/hr	+2.80%	0.90
Computer Occupations, All Other	7,768	660	$35.81/hr	+9.42%	0.60
Computer Network Architects	4,919	336	$52.51/hr	+1.75%	0.93
Information Security Analysts	3,989	414	$47.22/hr	+23.06%	0.74
Computer Programmers	3,653	255	$38.21/hr	-6.71%	0.72
Software Quality Assurance Analysts and Testers	3,182	303	$43.26/hr	+17.28%	0.52
Web Developers	2,872	275	$35.56/hr	+15.32%	0.87
Web and Digital Interface Designers	2,529	269	$32.42/hr	+15.70%	0.78
Database Administrators	2,321	179	$44.07/hr	+5.13%	0.86
Computer Hardware Engineers	1,546	115	$37.53/hr	+5.95%	0.65
Statisticians	1,158	115	$36.37/hr	+20.29%	1.08
Database Architects	1,084	85	$57.48/hr	+5.54%	0.69
Computer and Information Research Scientists	286	30	$62.78/hr	+24.48%	0.27

Growth

150,061	163,888	13,827	9.2%
2023 Jobs	2033 Jobs	Change (2023-2033)	% Change (2023-2033)

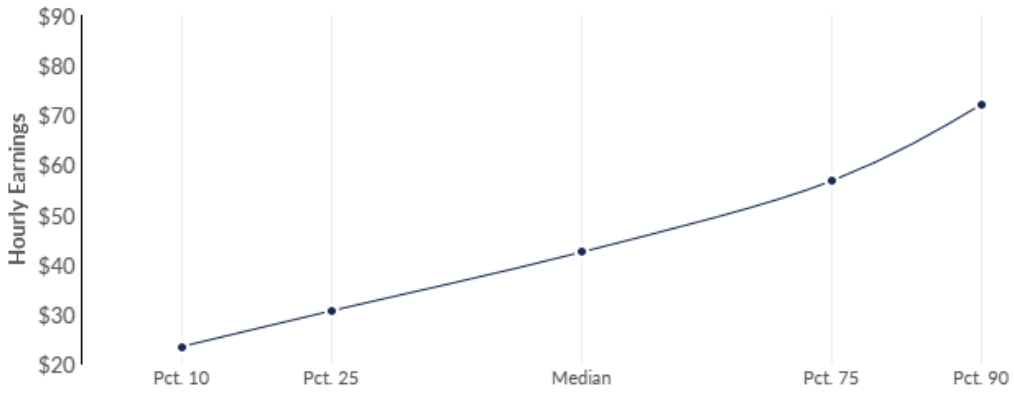


Occupation	2023 Jobs	2033 Jobs	Change	% Change
Computer and Information Systems Managers (11-3021)	12,177	13,576	1,399	11%
Computer Systems Analysts (15-1211)	17,794	18,651	857	5%
Information Security Analysts (15-1212)	3,989	4,909	920	23%
Computer and Information Research Scientists (15-1221)	286	356	70	24%
Computer Network Support Specialists (15-1231)	10,796	11,094	298	3%
Computer User Support Specialists (15-1232)	18,304	19,122	818	4%
Computer Network Architects (15-1241)	4,919	5,005	86	2%
Database Administrators (15-1242)	2,321	2,440	119	5%
Database Architects (15-1243)	1,084	1,144	60	6%
Network and Computer Systems Administrators (15-1244)	8,969	9,220	251	3%
Computer Programmers (15-1251)	3,653	3,408	-245	-7%
Software Developers (15-1252)	46,714	53,462	6,748	14%
Software Quality Assurance Analysts and Testers (15-1253)	3,182	3,732	550	17%
Web Developers (15-1254)	2,872	3,312	440	15%

Web and Digital Interface Designers (15-1255)	2,529	2,926	397	16%
Computer Occupations, All Other (15-1299)	7,768	8,500	732	9%
Statisticians (15-2041)	1,158	1,393	235	20%
Computer Hardware Engineers (17-2061)	1,546	1,638	92	6%

Percentile Earnings

$30.66/hr	$42.47/hr	$56.80/hr
25th Percentile Earnings	Median Earnings	75th Percentile Earnings



Occupation	25th Percentile Earnings	Median Earnings	75th Percentile Earnings
Computer and Information Systems Managers (11-3021)	$55.15	$71.07	$79.84
Computer Systems Analysts (15-1211)	$36.66	$46.88	$56.99
Information Security Analysts (15-1212)	$37.42	$47.22	$57.88
Computer and Information Research Scientists (15-1221)	$57.59	$62.78	$63.51
Computer Network Support Specialists (15-1231)	$23.34	$29.16	$37.37
Computer User Support Specialists (15-1232)	$20.12	$26.39	$30.75
Computer Network Architects (15-1241)	$48.02	$52.51	$64.99
Database Administrators (15-1242)	$32.60	$44.07	$57.93
Database Architects (15-1243)	$48.40	$57.48	$72.77
Network and Computer Systems Administrators (15-1244)	$30.61	$39.05	$47.26
Computer Programmers (15-1251)	$30.34	$38.21	$47.10
Software Developers (15-1252)	$37.55	$48.00	$61.25
Software Quality Assurance Analysts and Testers (15-1253)	$32.15	$43.26	$48.30

Web Developers (15-1254)	$24.25	$35.56	$49.67
Web and Digital Interface Designers (15-1255)	$22.54	$32.42	$45.81
Computer Occupations, All Other (15-1299)	$22.78	$35.81	$52.71
Statisticians (15-2041)	$29.54	$36.37	$47.86
Computer Hardware Engineers (17-2061)	$37.35	$37.53	$51.75

Job Postings Summary

75,604	2 : 1	6,756	27 days
Unique Postings	**Posting Intensity**	**Employers Competing**	**Median Posting Duration**
154,021 Total Postings		36,771 Total Employers	Regional Average: 30 days
	Regional Average: 3 : 1		

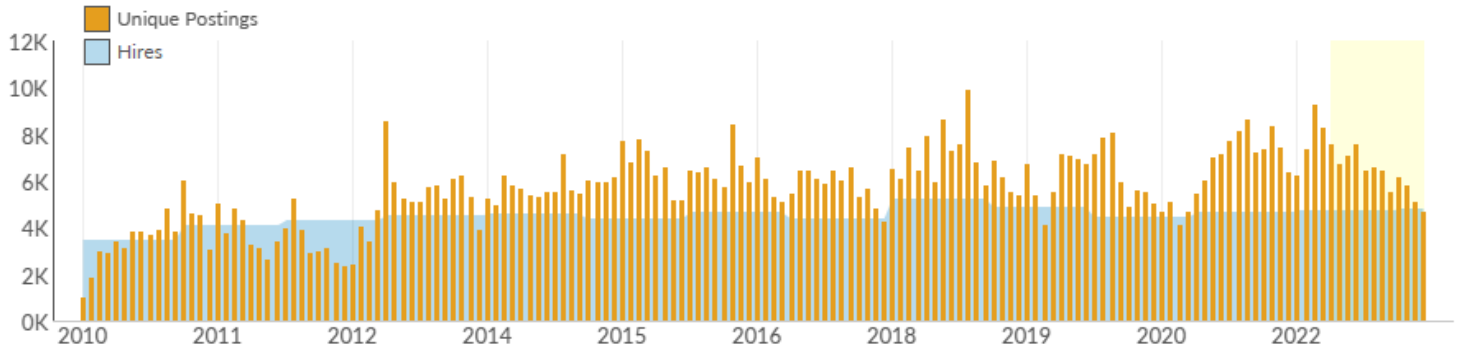
There were **154,021** total job postings for your selection from May 2022 to April 2023, of which **75,604** were unique. These numbers give us a Posting Intensity of **2-to-1**, meaning that for every 2 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

Job Postings vs. Hires

6,300	4,749
Avg. Monthly Postings (May 2022 - Apr 2023)	Avg. Monthly Hires (May 2022 - Apr 2023)

In an average month, there were **6,300** newly posted job postings for *18 Occupations*, and **4,749** actually hired. This means there was approximately 1 hire for every 1 unique job posting for *18 Occupations*.



Occupation	Avg Monthly Postings (May 2022 - Apr 2023)	Avg Monthly Hires (May 2022 - Apr 2023)
Software Developers	1,953	1,460
Computer Occupations, All Other	1,122	261
Computer User Support Specialists	733	659
Computer Systems Analysts	539	514
Information Security Analysts	266	150
Web Developers	259	94
Database Administrators	256	68
Software Quality Assurance Analysts and Testers	227	118
Network and Computer Systems Administrators	200	259
Computer Network Architects	182	136
Database Architects	153	32
Computer Programmers	128	98

Computer and Information Systems Managers	84	374
Computer Network Support Specialists	56	338
Computer and Information Research Scientists	45	12
Statisticians	42	43
Web and Digital Interface Designers	30	87
Computer Hardware Engineers	24	45

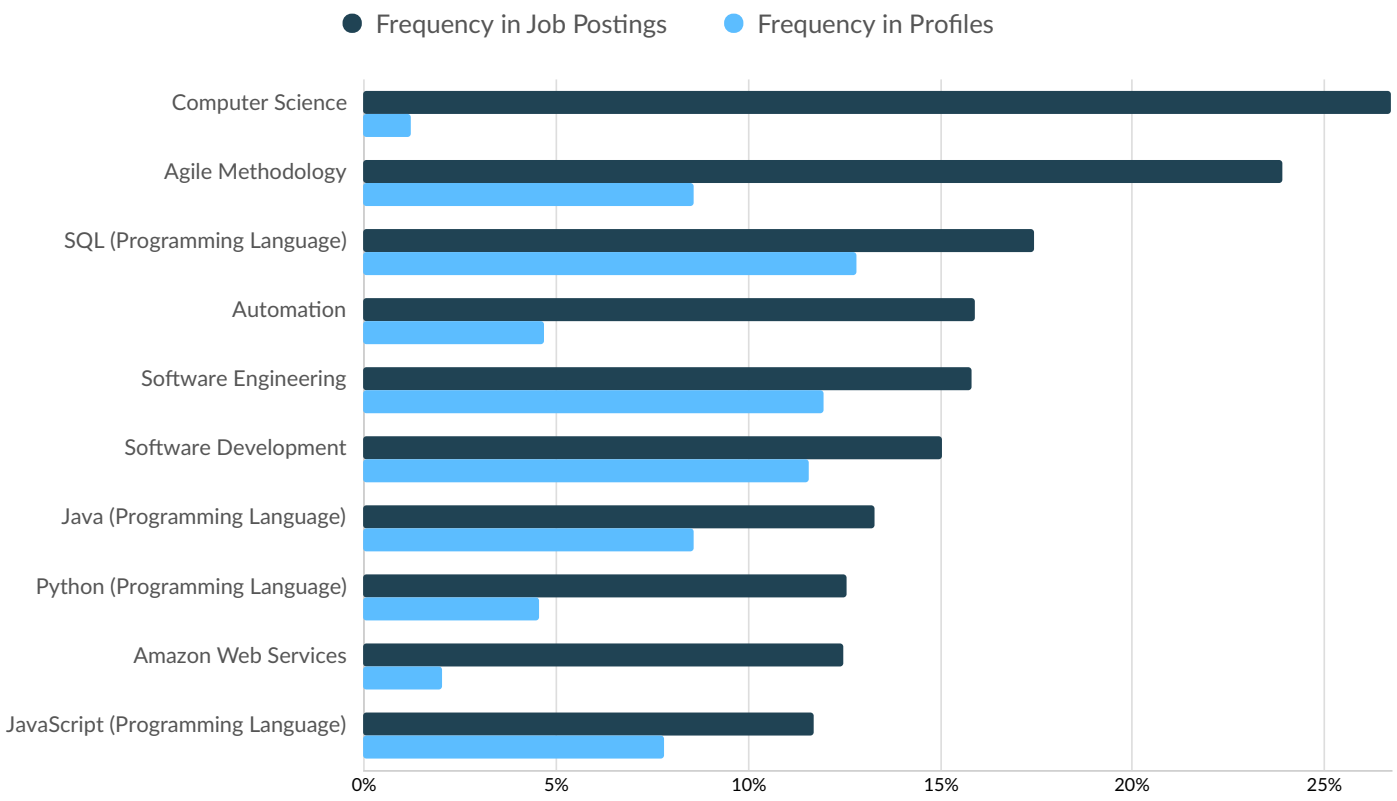
Top Companies Posting

Company	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Randstad	4,146 / 2,422	2 : 1 	20 days
Humana	4,627 / 2,002	2 : 1 	33 days
UnitedHealth Group	4,913 / 1,723	3 : 1 	26 days
Wells Fargo	4,190 / 1,139	4 : 1 	32 days
Robert Half	1,212 / 849	1 : 1 	30 days
US Bank	1,449 / 688	2 : 1 	29 days
General Dynamics	1,104 / 668	2 : 1 	33 days
CTG	742 / 627	1 : 1 	33 days
Optum	2,007 / 612	3 : 1 	36 days
Travelers	746 / 536	1 : 1 	33 days

Top Posted Job Titles

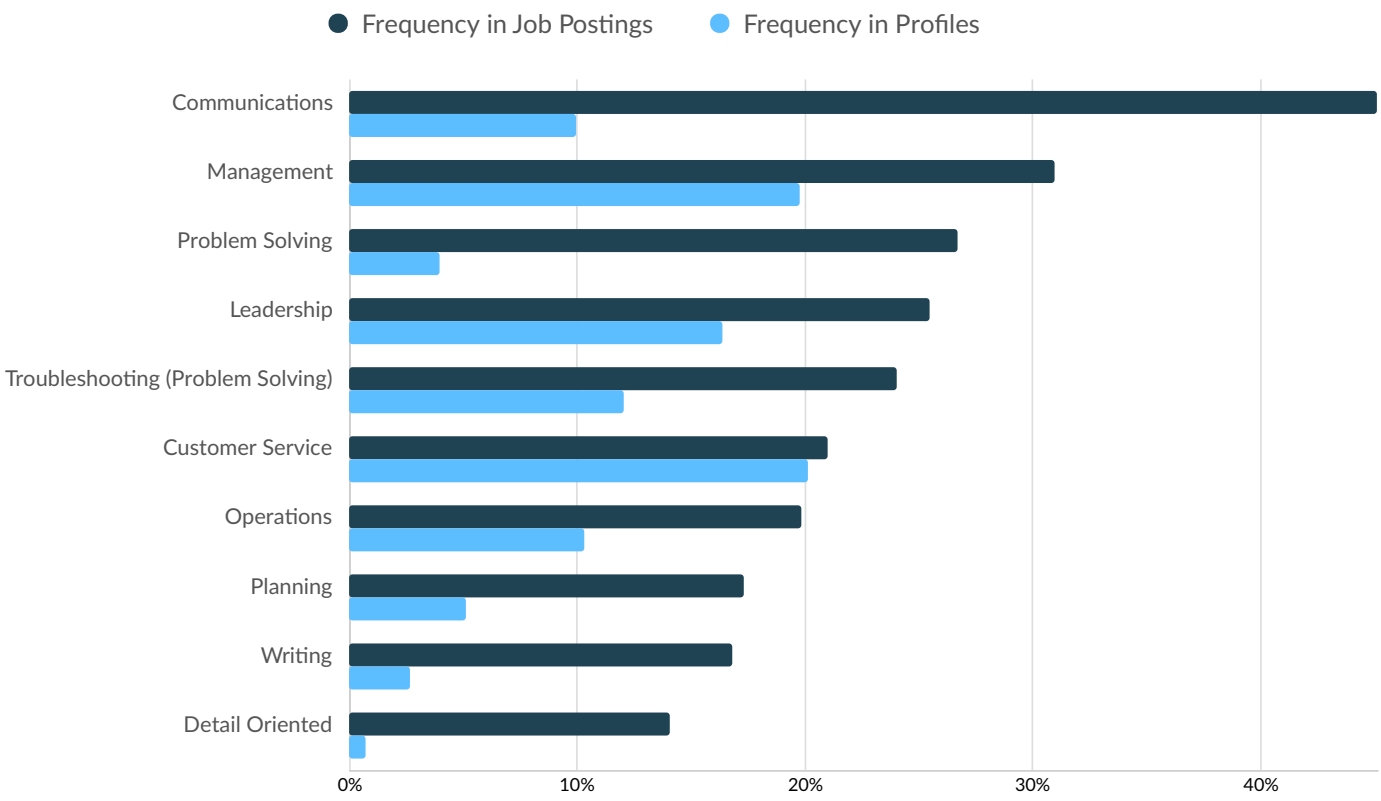
Job Title	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Software Engineers	6,186 / 2,558	2 : 1 	25 days
Data Engineers	1,521 / 811	2 : 1 	26 days
Systems Engineers	1,170 / 657	2 : 1 	23 days
Software Developers	1,107 / 640	2 : 1 	28 days
Business Systems Analysts	1,313 / 637	2 : 1 	25 days
Full Stack Developers	862 / 501	2 : 1 	23 days
Systems Administrators	860 / 477	2 : 1 	29 days
Solutions Architects	1,022 / 461	2 : 1 	30 days
Java Developers	663 / 439	2 : 1 	20 days
DevOps Engineers	706 / 433	2 : 1 	25 days

Top Specialized Skills



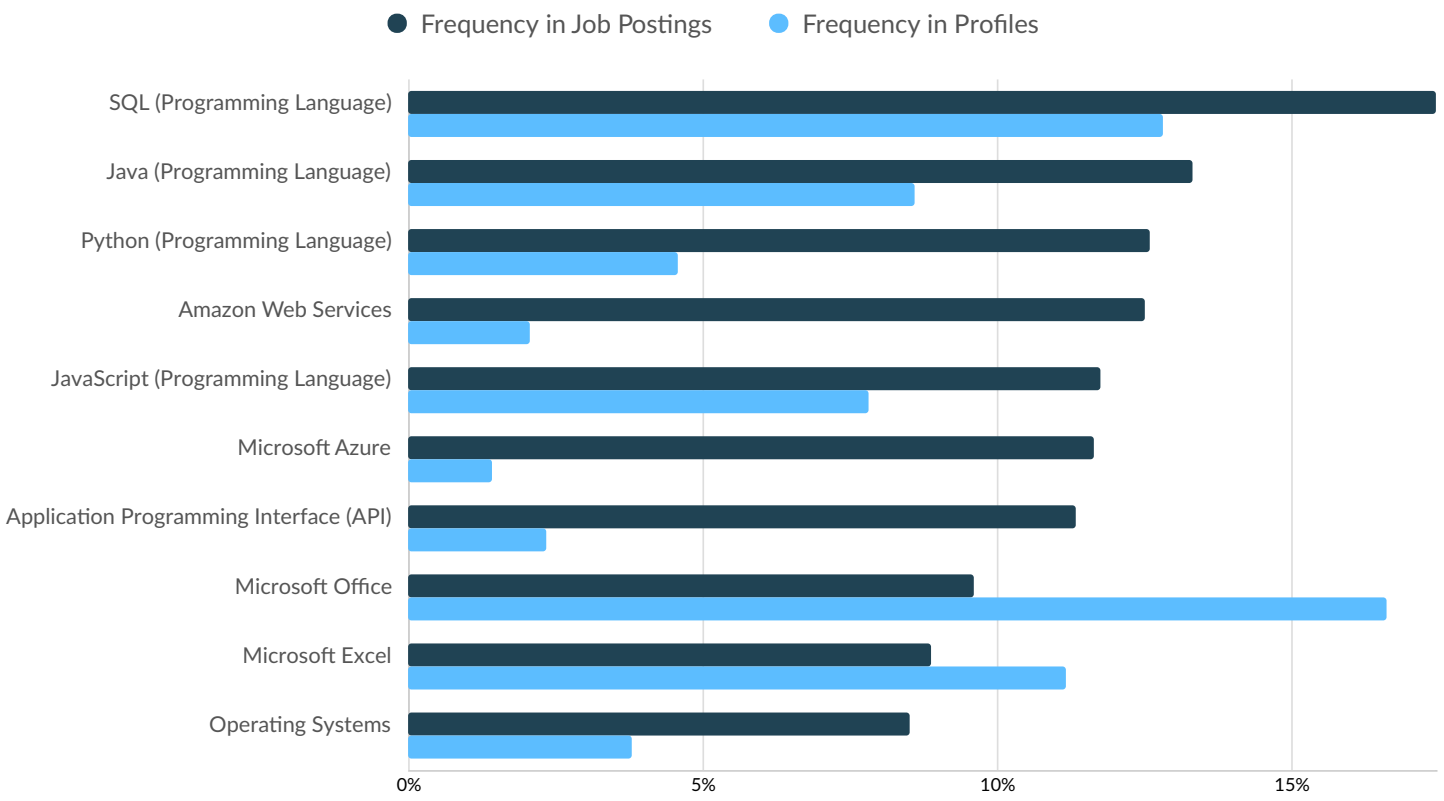
Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Computer Science	20,216	27%	2,405	1%
Agile Methodology	18,077	24%	16,520	9%
SQL (Programming Language)	13,187	17%	24,644	13%
Automation	12,028	16%	9,061	5%
Software Engineering	11,961	16%	23,039	12%
Software Development	11,388	15%	22,256	12%
Java (Programming Language)	10,067	13%	16,537	9%
Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%

Top Common Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Communications	34,137	45%	19,190	10%
Management	23,432	31%	38,058	20%
Problem Solving	20,205	27%	7,628	4%
Leadership	19,288	26%	31,481	16%
Troubleshooting (Problem Solving)	18,201	24%	23,160	12%
Customer Service	15,914	21%	38,687	20%
Operations	15,007	20%	19,906	10%
Planning	13,109	17%	9,810	5%
Writing	12,699	17%	5,142	3%
Detail Oriented	10,676	14%	1,454	1%

Top Software Skills



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JavaScript (Programming Language)	8,878	12%	15,034	8%
Microsoft Azure	8,807	12%	2,755	1%
Application Programming Interface (API)	8,565	11%	4,486	2%
Microsoft Office	7,265	10%	31,933	17%
Microsoft Excel	6,717	9%	21,476	11%
Operating Systems	6,430	9%	7,318	4%

Top Qualifications

Qualification	Postings with Qualification
Valid Driver's License	3,407
Certified Information Systems Security Professional	1,593
Project Management Professional Certification	1,432
Security Clearance	1,118
CompTIA A+	1,084
Cisco Certified Network Associate	1,005
Master Of Business Administration (MBA)	841
CompTIA Security+	734
Certified Information System Auditor (CISA)	733
Certified Information Security Manager	681

Appendix A

Program Selection Details

CIP Code	Program Name
11.0701	Computer Science

Appendix B - Data Sources and Calculations

Institution Data

The institution data in this report is taken directly from the national IPEDS database published by the U.S. Department of Education's National Center for Education Statistics.

Location Quotient

Location quotient (LQ) is a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. It can reveal what makes a particular region unique in comparison to the national average.

Occupation Data

Emsi occupation employment data are based on final Emsi industry data and final Emsi staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Emsi earnings by industry.

Lightcast Job Postings

Job postings are collected from various sources and processed/enriched to provide information such as standardized company name, occupation, skills, and geography.

State Data Sources

This report uses state data from the following agencies: Minnesota Department of Employment and Economic Development; Montana Department of Labor and Industry; North Dakota Job Service; South Dakota Department of Labor and Regulation

New Academic Program Request

Institution:

North Dakota State University

Program Name:

Fundamentals of Computing and Security

Degree Types:

Undergraduate Program Certificate

What day did AAC review the Academic Program Exploration Notice for this New Academic Program?

2023-05-26

CIP Code:

11.0101

Academic Program Code:

Will be determined by Registrar in consultation with

Academic Department/Division/College:

Department of Computer Science/College of Engineering

Semester of Program:

Fall

Year of Program:

2023

Other Participating Institutions:

Not Applicable

Delivery Method:

On Campus
Hybrid (on campus & distance)
Online Only

Describe the delivery methods and location(s) to which the program will be delivered:

These courses are already offered through the BS Computer Science program and will continue to be delivered using the same methods of online, in-person, and hybrid.

Funding Source:

Instructional Re-allocation

Describe the funding source:

No new courses are being created, so there will not be any additional funding needed.

Is the program eligible for Financial Aid?

No

Does the program require a criminal background check described in NDUS Procedure 511?

No

Describe a brief description of the program:

The certificate is intended to make our course offerings more flexibly accessible to a variety of

potential students: 1. High school students who want to start making progress towards an NDSU degree 2. Individuals who have completed high school but are not ready to commit to a four-year degree and treat a certificate as trial phase for enrollment into our B.S. program 3. Students who have enrolled in our B.S. program but are not ready for our flagship Computer Science I course. Currently such students take one course that may appear remedial. With the changed curriculum, they can take all three courses that make up Certificate 1 and gain a meaningful credential in their first term. 4. Professionals with baccalaureate degree in a different subject who would like to increase their computer science competencies 5. Professionals who engage in life-long learning, and would like to demonstrate their academic achievements 6. Students from other majors who would like to get credit for computer science material more flexibly than through our minor programs 7. Professionals with associate degrees who want to gain 4-year-college credentials 8. Students or professionals who are interested in pursuing a graduate degree, but do not have a Computer Science B.S. degree, and who 8.1. May or may not have software development experience 8.2. May or may not have a technical degree Note that the choice of courses is such that certificates only depend on other certificates for prerequisites, and not on other NDSU courses, such as those in mathematics.

Address student demand and employment availability for students completing the program:

Many of today's companies worldwide use websites and application portfolios (i.e., apps) as the primary means for customer applications; which makes them important members of the IT community. In general, Computer Scientists and Software Engineers work with other IT professions and apply the principles of engineering to design, test, implement and evaluate software. There are many different factors that drive the need for Computer Science and Software Engineering, some of these include the accelerating growth of technology (which is led by fellow Computer Scientists and Engineers), the ever-increasing complexity of the IT sector (which continues to have a greater emphasis on security), the growing demand on custom and innovative website and mobile applications, and the continuous need to update code due to its limited lifespan. The proposed certificates are in the realm of Computer Science, Software Engineering, and Cybersecurity and thus fulfilling the need of the state as well as the nation.

Describe how this need was assessed and indicate sources for data used and indicated ancipated enrollment rates for the first five years:

With the help of NDSU-internal discussions, we have received feedback on the stackable certificates from 1. Employers and students at a breakfast that our department organized at the Career Expo 2. A group of alumni and employers with whom we met specifically to discuss the proposal We received many supportive comments and no major concerns. The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. We envision the following enrollment numbers: Year 1: 10 Year 2: 20 Year 3: 30 Year 4: 35 Year 5: 40

Describe how the program addresses the institutional strategic plan:

The general idea of stackable credentials was first introduced by community and technical colleges,

which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. The stackable certificates aligns with the university's strategic plan since it will help to increase undergraduate student enrollment and it will provide another attractive NDSU program for students to enroll in.

Describe how the program addresses the NDUS stategic plan:

This program addresses Goal 2 (Provide programs people want, where and when they need them) of the NDUS strategic plan. In particular, Objective 2.1 is addressed, which ensures programs are relevant, valuable, and timely (key indicator 2.1).

Are there similar programs that exist within NDUS or state?

No

What is the length of the program?

2-3 semesters

Identify the proposed program-level accreditation organization, if applicable:

NA

Cert 1: Fundamentals of Computing and Security

- CSCI 159: Computer Science Problem Solving
- CSCI 105: Introduction Cybersecurity
- CSCI 227: Computing Fundamentals I

- Math background equiv. to MATH 105
- ENGL 110
- ENGL 120
- COMM 110
- Wellness (2 cr)

Cert 2: Computer Science Foundations

- CSCI 160: Computer Science I
- CSCI 161: Computer Science II
- CSCI 277: Introduction to UNIX

- MATH 129: Basic Linear Algebra.
- MATH 165: Calculus I
- MATH 166: Calculus II

- Gen Eds in Humanities and Fine Arts (6 cr)
- Social and Behavioral Sc. (6 cr)
- Cultural Diversity
- Global Perspectives

Cert 3: Core Computer Science Competencies

- CSCI 366: Database Systems
- CSCI 372: Comparative Program-ming Languages
- CSCI 222: Discrete Mathematics

Cert 4: Software Development

- CSCI 213: Modern Software Develop-ment
- CSCI 313: Software Develop-ment with Frame-works
- CSCI 371: Web Scripting Languages

Cert 5: Computing Systems

- CSCI 374: Computer Organization and Architecture
- CSCI 336: Theoretical Computer Science
- CSCI 474: Operating Systems Concepts

- Science Gen Eds (7 cr)
- ENGL 321: Writing in the Tech. Profess.
- STAT 367: Proba-bility
- STAT 368: Statis-tics

Cert 6a: Cybersecurity

- CSCI 403: Defensive Network Security
- CSCI 405: Principles of Cybersecurity
- CSCI 404: Ethical Hacking
- Another elective from the Cybersecurity Track of the B.S. Degree

Cert 6b: Data Science

- CSCI 420: Introduction to Data Science in Python
- CSCI 422: Intro. to Data Engineering
- CSCI 425: Machine Learning
- CSCI 426: Intro to AI
- Another elective from the Data Science Track of the B.S. Degree

Cert 6c: Software Eng.

- CSCI 413: Principles of Software Engineering
- CSCI 419: Software Testing and Debugging
- Another elective from the Software Engineering Track of the B.S. Degree

- CSCI 467: Algorithm Analysis
- CSCI 455: Networking and Parallel Computation
- CSCI 489: Social Implications of Computers
- CSCI 445: Software Projects Capstone

Program Overview

Computer Science

Lightcast Q2 2023 Data Set

May 2023

1340 Administration Avenue
Fargo, North Dakota 58102
701-231-8011

Parameters

Completions Year: 2021

Jobs Timeframe: 2023 - 2033

Job Postings Timeframe: May 2022 - Apr 2023

Programs:

Code	Description
11.0701	Computer Science

Regions:

Code	Description
27	Minnesota
30	Montana

Code	Description
38	North Dakota
46	South Dakota

Education Level: Any

Tuition Type: Tuition & Fees

Graduate Status: Undergraduate

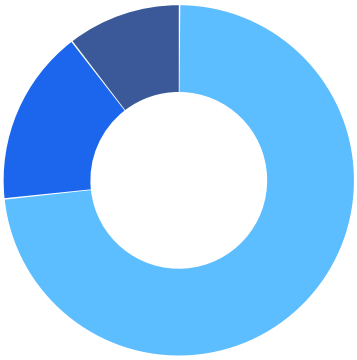
Residency: In-State

42	1,704	Completions Distribution
Institutions	Completions	Average: 40.6
0% Growth (2017-2021)	30% Growth (2017-2021)	1 — 645
		Median: 18.5

Program Overview

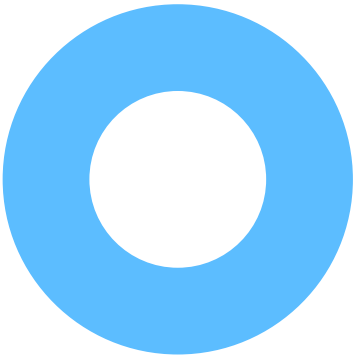
	Completions (2021)	% Completions	Institutions (2021)	% Institutions
All Programs	1,704	100%	42	100%
Distance Offered Programs	142	8%	4	10%
Non-Distance Offered Programs	1,562	92%	38	90%

Market Share by Institution Type



Institution Type	Completions (2021)	Market Share
Public, 4-year or above	1,248	73.2%
Private not-for-profit, 4-year or above	277	16.3%
Public, 2-year	179	10.5%

Market Share by Program

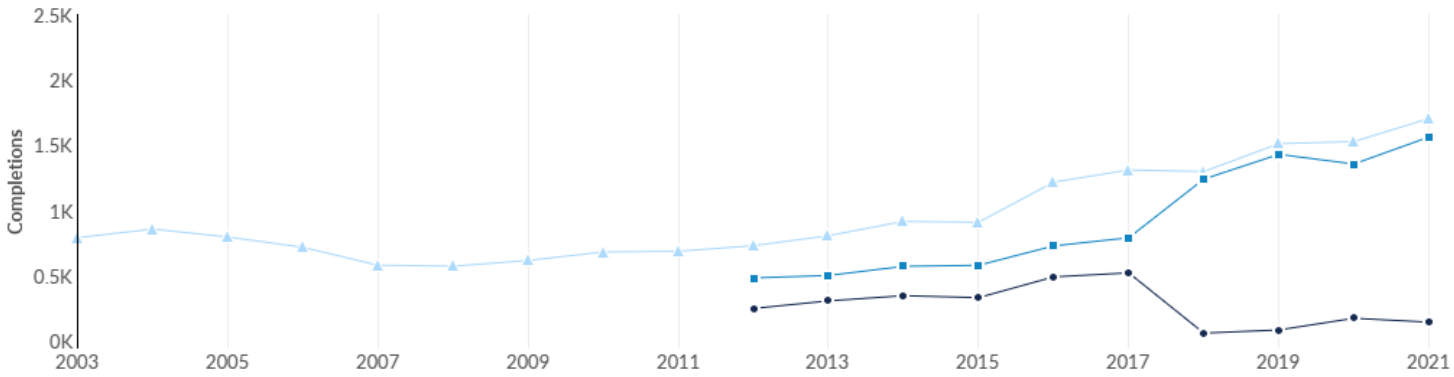


Program	Completions (2021)	Market Share
Computer Science (11.0701)	1,704	100.0%

Completions by Institution

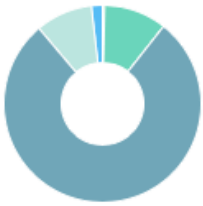
Institution	Completions (2021)	Growth % YOY (2021)	Market Share (2021)	IPEDS Tuition & Fees (2021)	Completions Trend (2017-2021)
University of Minnesota-Twin Cities	645	17.5%	37.9%	$15,254	
North Dakota State University-Main Campus	106	5.0%	6.2%	$10,401	
University of Minnesota-Duluth	92	15.0%	5.4%	$13,850	
Montana State University	89	-14.4%	5.2%	$7,528	
Metropolitan State University	83	-3.5%	4.9%	$9,394	
Saint Cloud State University	64	10.3%	3.8%	$9,170	
Winona State University	56	-3.4%	3.3%	$10,184	
University of St Thomas	55	61.8%	3.2%	$48,329	
Carleton College	54	-23.9%	3.2%	$60,225	
Normandale Community College	50	31.6%	2.9%	$5,789	

Regional Trends



	2012 Completions	2021 Completions	% Change
Distance Offered Programs	247	142	-42.5%
Non-Distance Offered Programs	481	1,562	+224.7%
All Programs	728	1,704	+134.1%

Regional Completions by Award Level



Award Level	Completions (2021)	Percent
Award of less than 1 academic year	6	0.4%
Associate's Degree	175	10.3%
Bachelor's Degree	1,333	78.2%
Master's Degree	159	9.3%
Doctor's Degree	31	1.8%
Award of at least 1 but less than 2 academic years	0	0.0%
Award of at least 2 but less than 4 academic years	0	0.0%
Postbaccalaureate certificate	0	0.0%
Post-masters certificate	0	0.0%

Similar Programs

125	37,867
Programs (2021)	Completions (2021)

CIP Code	Program	Completions (2021)
52.0201	Business Administration and Management, General	7,464
24.0101	Liberal Arts and Sciences/Liberal Studies	7,167
26.0101	Biology/Biological Sciences, General	2,434
51.0701	Health/Health Care Administration/Management	1,833
52.1401	Marketing/Marketing Management, General	1,485
30.9999	Multi-/Interdisciplinary Studies, Other	1,339
52.0101	Business/Commerce, General	1,148
43.0104	Criminal Justice/Safety Studies	1,050
24.0102	General Studies	1,043
27.0101	Mathematics, General	826

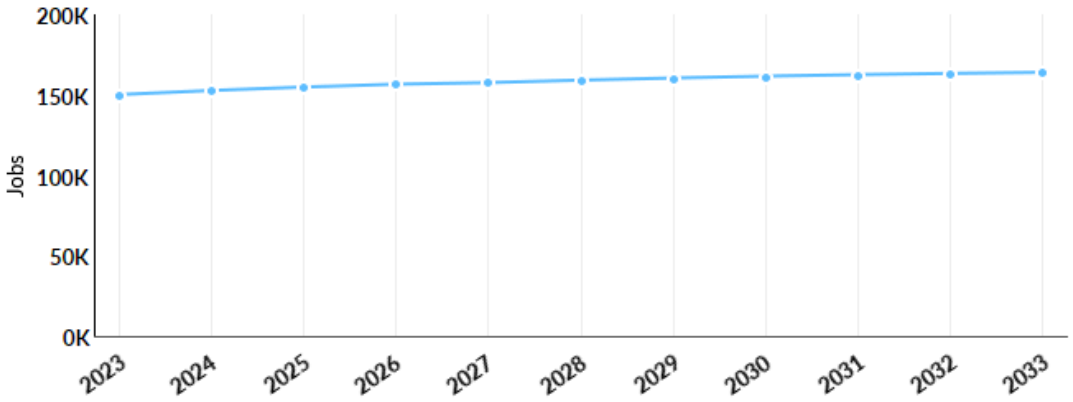
Target Occupations

150,061	+9.2%	$42.47/hr $88.3K/yr	12,640
Jobs (2023)	% Change (2023-2033)	Median Earnings	Annual Openings
9% below National average	Nation: +17.7%	Nation: $47.56/hr; $98.9K/yr	

Occupation	2023 Jobs	Annual Openings	Median Earnings	Growth (2023 - 2033)	Location Quotient (2023)
Software Developers	46,714	4,003	$48.00/hr	+14.45%	1.02
Computer User Support Specialists	18,304	1,563	$26.39/hr	+4.47%	0.86
Computer Systems Analysts	17,794	1,392	$46.88/hr	+4.82%	1.10
Computer and Information Systems Managers	12,177	1,089	$71.07/hr	+11.49%	0.77
Computer Network Support Specialists	10,796	900	$29.16/hr	+2.76%	1.93
Network and Computer Systems Administrators	8,969	658	$39.05/hr	+2.80%	0.90
Computer Occupations, All Other	7,768	660	$35.81/hr	+9.42%	0.60
Computer Network Architects	4,919	336	$52.51/hr	+1.75%	0.93
Information Security Analysts	3,989	414	$47.22/hr	+23.06%	0.74
Computer Programmers	3,653	255	$38.21/hr	-6.71%	0.72
Software Quality Assurance Analysts and Testers	3,182	303	$43.26/hr	+17.28%	0.52
Web Developers	2,872	275	$35.56/hr	+15.32%	0.87
Web and Digital Interface Designers	2,529	269	$32.42/hr	+15.70%	0.78
Database Administrators	2,321	179	$44.07/hr	+5.13%	0.86
Computer Hardware Engineers	1,546	115	$37.53/hr	+5.95%	0.65
Statisticians	1,158	115	$36.37/hr	+20.29%	1.08
Database Architects	1,084	85	$57.48/hr	+5.54%	0.69
Computer and Information Research Scientists	286	30	$62.78/hr	+24.48%	0.27

Growth

150,061	163,888	13,827	9.2%
2023 Jobs	2033 Jobs	Change (2023-2033)	% Change (2023-2033)

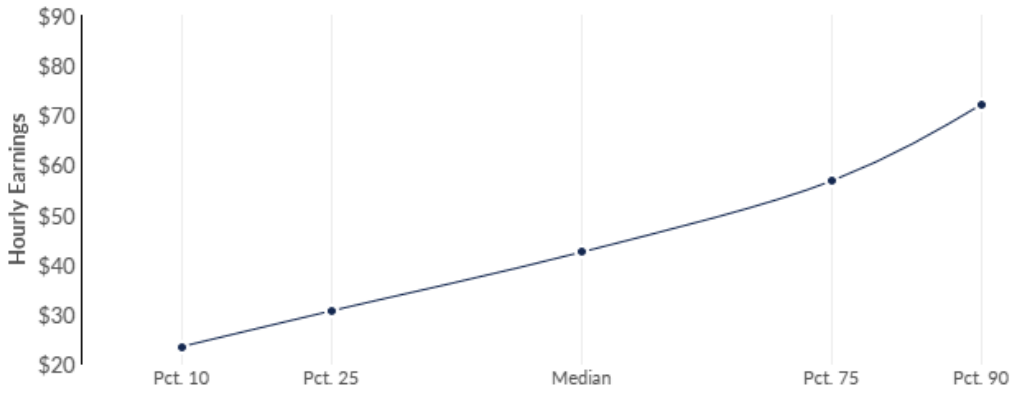


Occupation	2023 Jobs	2033 Jobs	Change	% Change
Computer and Information Systems Managers (11-3021)	12,177	13,576	1,399	11%
Computer Systems Analysts (15-1211)	17,794	18,651	857	5%
Information Security Analysts (15-1212)	3,989	4,909	920	23%
Computer and Information Research Scientists (15-1221)	286	356	70	24%
Computer Network Support Specialists (15-1231)	10,796	11,094	298	3%
Computer User Support Specialists (15-1232)	18,304	19,122	818	4%
Computer Network Architects (15-1241)	4,919	5,005	86	2%
Database Administrators (15-1242)	2,321	2,440	119	5%
Database Architects (15-1243)	1,084	1,144	60	6%
Network and Computer Systems Administrators (15-1244)	8,969	9,220	251	3%
Computer Programmers (15-1251)	3,653	3,408	-245	-7%
Software Developers (15-1252)	46,714	53,462	6,748	14%
Software Quality Assurance Analysts and Testers (15-1253)	3,182	3,732	550	17%
Web Developers (15-1254)	2,872	3,312	440	15%

Web and Digital Interface Designers (15-1255)	2,529	2,926	397	16%
Computer Occupations, All Other (15-1299)	7,768	8,500	732	9%
Statisticians (15-2041)	1,158	1,393	235	20%
Computer Hardware Engineers (17-2061)	1,546	1,638	92	6%

Percentile Earnings

$30.66/hr	$42.47/hr	$56.80/hr
25th Percentile Earnings	Median Earnings	75th Percentile Earnings



Occupation	25th Percentile Earnings	Median Earnings	75th Percentile Earnings
Computer and Information Systems Managers (11-3021)	$55.15	$71.07	$79.84
Computer Systems Analysts (15-1211)	$36.66	$46.88	$56.99
Information Security Analysts (15-1212)	$37.42	$47.22	$57.88
Computer and Information Research Scientists (15-1221)	$57.59	$62.78	$63.51
Computer Network Support Specialists (15-1231)	$23.34	$29.16	$37.37
Computer User Support Specialists (15-1232)	$20.12	$26.39	$30.75
Computer Network Architects (15-1241)	$48.02	$52.51	$64.99
Database Administrators (15-1242)	$32.60	$44.07	$57.93
Database Architects (15-1243)	$48.40	$57.48	$72.77
Network and Computer Systems Administrators (15-1244)	$30.61	$39.05	$47.26
Computer Programmers (15-1251)	$30.34	$38.21	$47.10
Software Developers (15-1252)	$37.55	$48.00	$61.25
Software Quality Assurance Analysts and Testers (15-1253)	$32.15	$43.26	$48.30

Web Developers (15-1254)	$24.25	$35.56	$49.67
Web and Digital Interface Designers (15-1255)	$22.54	$32.42	$45.81
Computer Occupations, All Other (15-1299)	$22.78	$35.81	$52.71
Statisticians (15-2041)	$29.54	$36.37	$47.86
Computer Hardware Engineers (17-2061)	$37.35	$37.53	$51.75

Job Postings Summary

75,604	2 : 1	6,756	27 days
Unique Postings	**Posting Intensity**	**Employers Competing**	**Median Posting Duration**
154,021 Total Postings		36,771 Total Employers	Regional Average: 30 days
	Regional Average: 3 : 1		

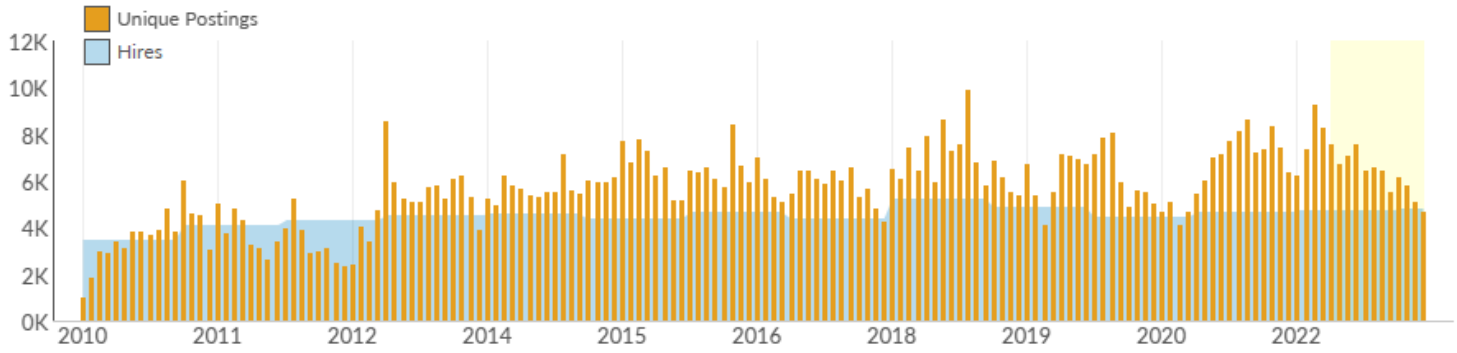
There were **154,021** total job postings for your selection from May 2022 to April 2023, of which **75,604** were unique. These numbers give us a Posting Intensity of **2-to-1**, meaning that for every 2 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

Job Postings vs. Hires

6,300	4,749
Avg. Monthly Postings (May 2022 - Apr 2023)	Avg. Monthly Hires (May 2022 - Apr 2023)

In an average month, there were **6,300** newly posted job postings for *18 Occupations*, and **4,749** actually hired. This means there was approximately 1 hire for every 1 unique job posting for *18 Occupations*.



Occupation	Avg Monthly Postings (May 2022 - Apr 2023)	Avg Monthly Hires (May 2022 - Apr 2023)
Software Developers	1,953	1,460
Computer Occupations, All Other	1,122	261
Computer User Support Specialists	733	659
Computer Systems Analysts	539	514
Information Security Analysts	266	150
Web Developers	259	94
Database Administrators	256	68
Software Quality Assurance Analysts and Testers	227	118
Network and Computer Systems Administrators	200	259
Computer Network Architects	182	136
Database Architects	153	32
Computer Programmers	128	98

Computer and Information Systems Managers	84	374
Computer Network Support Specialists	56	338
Computer and Information Research Scientists	45	12
Statisticians	42	43
Web and Digital Interface Designers	30	87
Computer Hardware Engineers	24	45

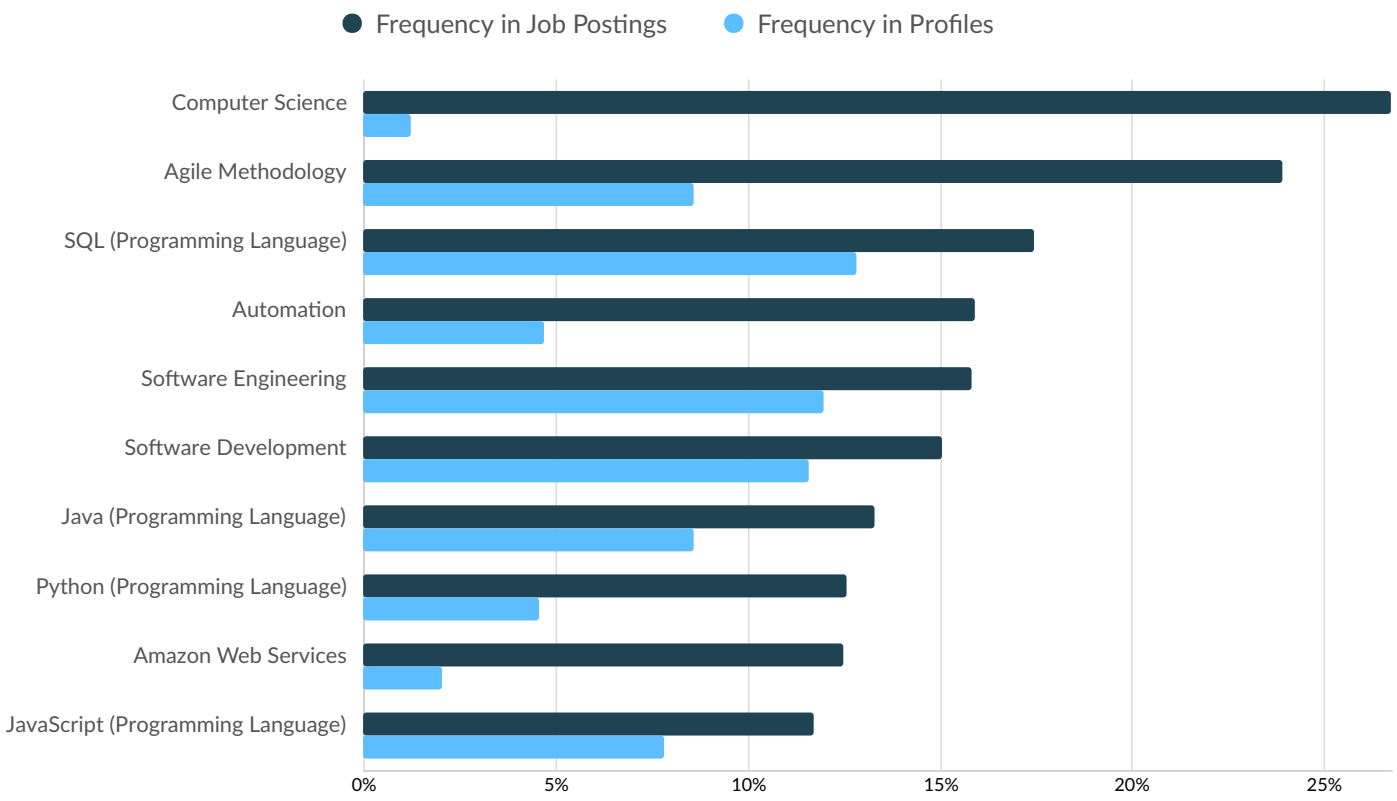
Top Companies Posting

Company	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Randstad	4,146 / 2,422	2 : 1 	20 days
Humana	4,627 / 2,002	2 : 1 	33 days
UnitedHealth Group	4,913 / 1,723	3 : 1 	26 days
Wells Fargo	4,190 / 1,139	4 : 1 	32 days
Robert Half	1,212 / 849	1 : 1 	30 days
US Bank	1,449 / 688	2 : 1 	29 days
General Dynamics	1,104 / 668	2 : 1 	33 days
CTG	742 / 627	1 : 1 	33 days
Optum	2,007 / 612	3 : 1 	36 days
Travelers	746 / 536	1 : 1 	33 days

Top Posted Job Titles

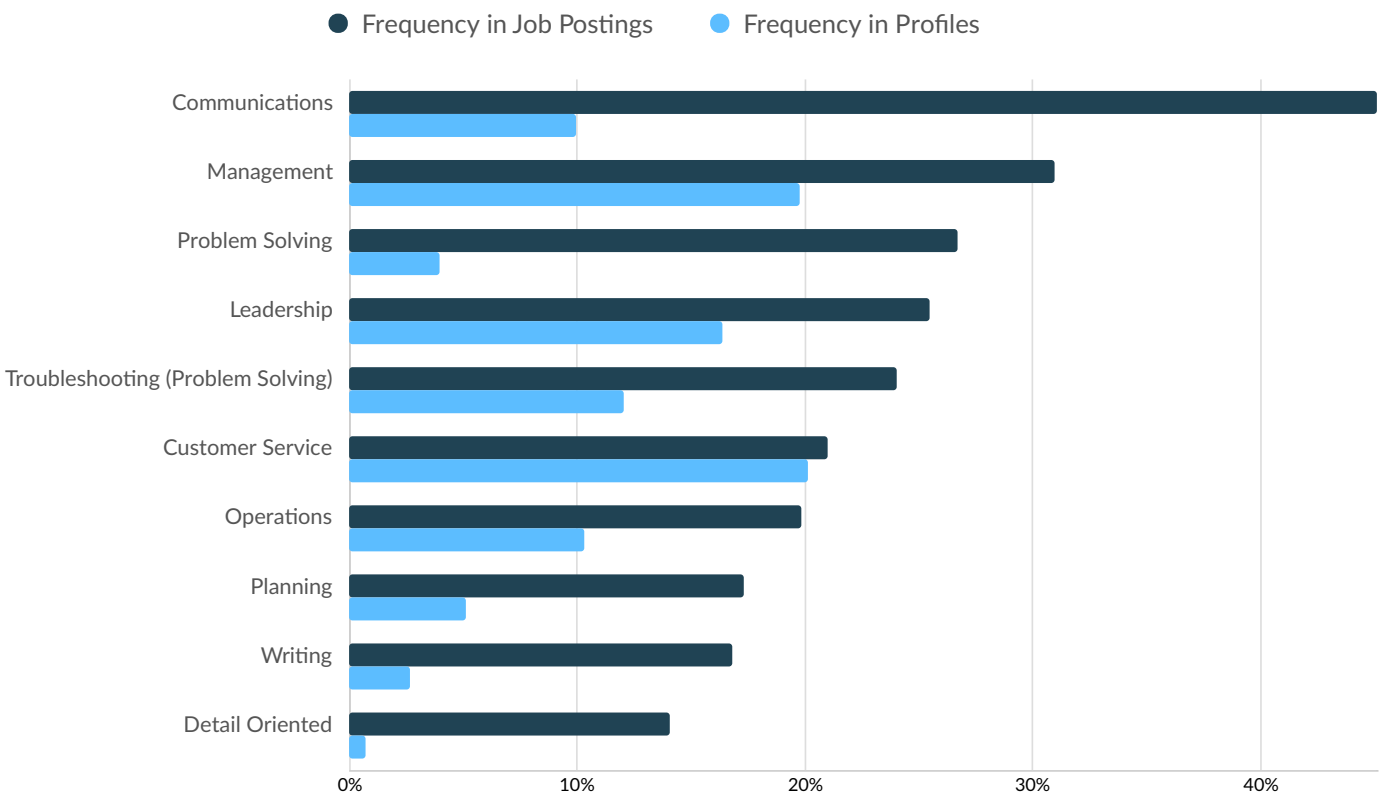
Job Title	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Software Engineers	6,186 / 2,558	2 : 1 	25 days
Data Engineers	1,521 / 811	2 : 1 	26 days
Systems Engineers	1,170 / 657	2 : 1 	23 days
Software Developers	1,107 / 640	2 : 1 	28 days
Business Systems Analysts	1,313 / 637	2 : 1 	25 days
Full Stack Developers	862 / 501	2 : 1 	23 days
Systems Administrators	860 / 477	2 : 1 	29 days
Solutions Architects	1,022 / 461	2 : 1 	30 days
Java Developers	663 / 439	2 : 1 	20 days
DevOps Engineers	706 / 433	2 : 1 	25 days

Top Specialized Skills



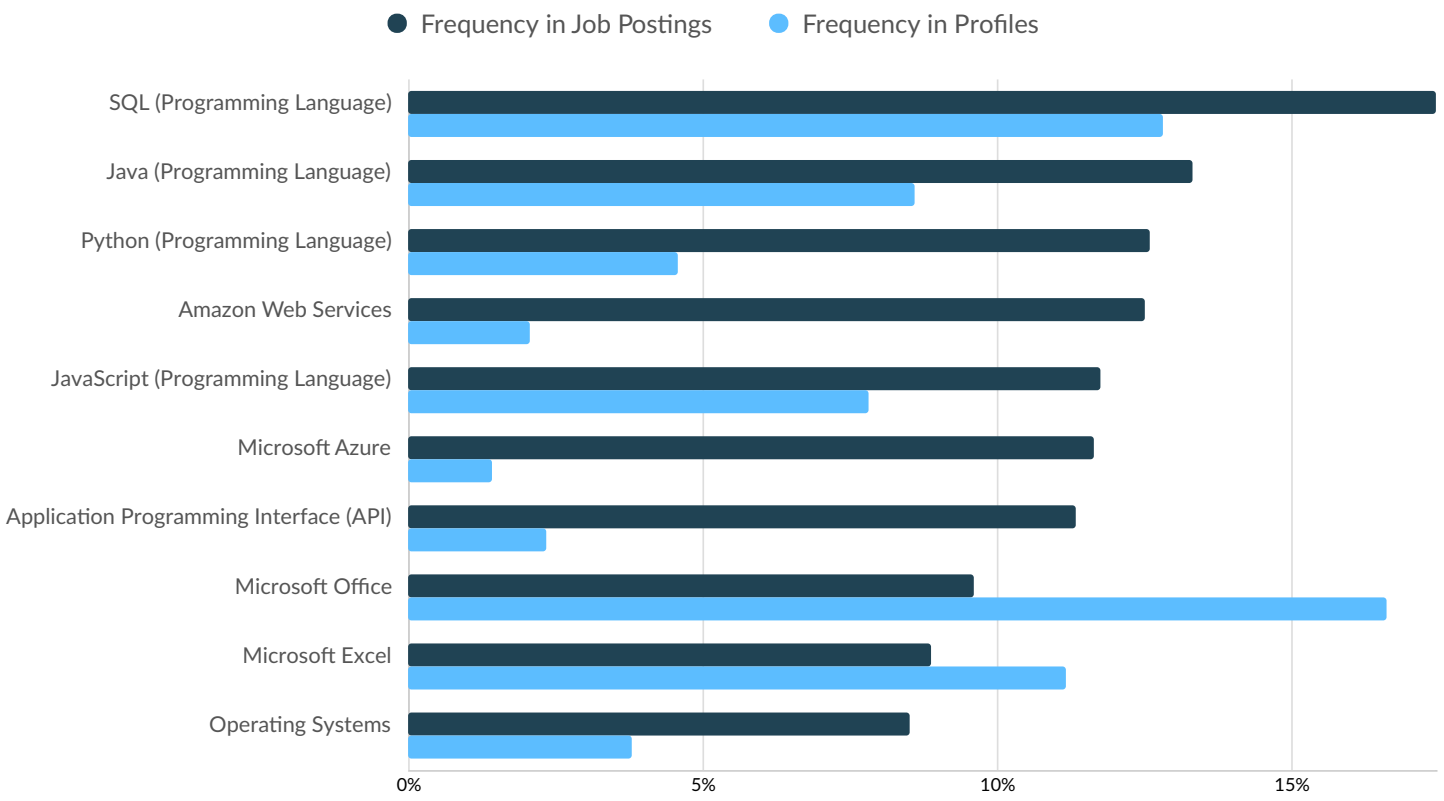
Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Computer Science	20,216	27%	2,405	1%
Agile Methodology	18,077	24%	16,520	9%
SQL (Programming Language)	13,187	17%	24,644	13%
Automation	12,028	16%	9,061	5%
Software Engineering	11,961	16%	23,039	12%
Software Development	11,388	15%	22,256	12%
Java (Programming Language)	10,067	13%	16,537	9%
Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%

Top Common Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Communications	34,137	45%	19,190	10%
Management	23,432	31%	38,058	20%
Problem Solving	20,205	27%	7,628	4%
Leadership	19,288	26%	31,481	16%
Troubleshooting (Problem Solving)	18,201	24%	23,160	12%
Customer Service	15,914	21%	38,687	20%
Operations	15,007	20%	19,906	10%
Planning	13,109	17%	9,810	5%
Writing	12,699	17%	5,142	3%
Detail Oriented	10,676	14%	1,454	1%

Top Software Skills



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SQL (Programming Language)	13,187	17%	24,644	13%
Java (Programming Language)	10,067	13%	16,537	9%
Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%
Microsoft Azure	8,807	12%	2,755	1%
Application Programming Interface (API)	8,565	11%	4,486	2%
Microsoft Office	7,265	10%	31,933	17%
Microsoft Excel	6,717	9%	21,476	11%
Operating Systems	6,430	9%	7,318	4%

Top Qualifications

Qualification	Postings with Qualification
Valid Driver's License	3,407
Certified Information Systems Security Professional	1,593
Project Management Professional Certification	1,432
Security Clearance	1,118
CompTIA A+	1,084
Cisco Certified Network Associate	1,005
Master Of Business Administration (MBA)	841
CompTIA Security+	734
Certified Information System Auditor (CISA)	733
Certified Information Security Manager	681

Appendix A

Program Selection Details

CIP Code	Program Name
11.0701	Computer Science

Appendix B - Data Sources and Calculations

Institution Data

The institution data in this report is taken directly from the national IPEDS database published by the U.S. Department of Education's National Center for Education Statistics.

Location Quotient

Location quotient (LQ) is a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. It can reveal what makes a particular region unique in comparison to the national average.

Occupation Data

Emsi occupation employment data are based on final Emsi industry data and final Emsi staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Emsi earnings by industry.

Lightcast Job Postings

Job postings are collected from various sources and processed/enriched to provide information such as standardized company name, occupation, skills, and geography.

State Data Sources

This report uses state data from the following agencies: Minnesota Department of Employment and Economic Development; Montana Department of Labor and Industry; North Dakota Job Service; South Dakota Department of Labor and Regulation

New Academic Program Request

Institution:

North Dakota State University

Program Name:

Software Development

Degree Types:

Undergraduate Program Certificate

What day did AAC review the Academic Program Exploration Notice for this New Academic Program?

2023-05-26

CIP Code:

11.0701

Academic Program Code:

Will be determined by Registrar in consultation with CTS upon approval.

Academic Department/Division/College:

Department of Computer Science/College of Engineering

Semester of Program:

Fall

Year of Program:

2023

Other Participating Institutions:

Not Applicable

Delivery Method:

On Campus
Hybrid (on campus & distance)
Online Only

Describe the delivery methods and location(s) to which the program will be delivered:

These courses are already offered through the BS Computer Science program and will continue to be delivered using the same methods of online, in-person, and hybrid.

Funding Source:

Instructional Re-allocation

Describe the funding source:

No new courses are being created, so there will not be any additional funding needed.

Is the program eligible for Financial Aid?

No

Does the program require a criminal background check described in NDUS Procedure 511?

No

Describe a brief description of the program:

The certificate is intended to make our course offerings more flexibly accessible to a variety of

potential students: 1. High school students who want to start making progress towards an NDSU degree 2. Individuals who have completed high school but are not ready to commit to a four-year degree and treat a certificate as trial phase for enrollment into our B.S. program 3. Students who have enrolled in our B.S. program but are not ready for our flagship Computer Science I course. Currently such students take one course that may appear remedial. With the changed curriculum, they can take all three courses that make up Certificate 1 and gain a meaningful credential in their first term. 4. Professionals with baccalaureate degree in a different subject who would like to increase their computer science competencies 5. Professionals who engage in life-long learning, and would like to demonstrate their academic achievements 6. Students from other majors who would like to get credit for computer science material more flexibly than through our minor programs 7. Professionals with associate degrees who want to gain 4-year-college credentials 8. Students or professionals who are interested in pursuing a graduate degree, but do not have a Computer Science B.S. degree, and who 8.1. May or may not have software development experience 8.2. May or may not have a technical degree Note that the choice of courses is such that certificates only depend on other certificates for prerequisites, and not on other NDSU courses, such as those in mathematics.

Address student demand and employment availability for students completing the program:

Many of today's companies worldwide use websites and application portfolios (i.e., apps) as the primary means for customer applications; which makes them important members of the IT community. In general, Computer Scientists and Software Engineers work with other IT professions and apply the principles of engineering to design, test, implement and evaluate software. There are many different factors that drive the need for Computer Science and Software Engineering, some of these include the accelerating growth of technology (which is led by fellow Computer Scientists and Engineers), the ever-increasing complexity of the IT sector (which continues to have a greater emphasis on security), the growing demand on custom and innovative website and mobile applications, and the continuous need to update code due to its limited lifespan. The proposed certificates are in the realm of Computer Science, Software Engineering, and Cybersecurity and thus fulfilling the need of the state as well as the nation.

Describe how this need was assessed and indicate sources for data used and indicated ancipated enrollment rates for the first five years:

With the help of NDSU-internal discussions, we have received feedback on the stackable certificates from 1. Employers and students at a breakfast that our department organized at the Career Expo 2. A group of alumni and employers with whom we met specifically to discuss the proposal We received many supportive comments and no major concerns. The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. Most of the certificates will be available to our current majors with focus on the specific specialization area so we project the following enrollment rates: Year 1: 15 Year 2: 30 Year 3: 40 Year 4: 45 Year 5: 50

Describe how the program addresses the institutional strategic plan:

The general idea of stackable credentials was first introduced by community and technical colleges, which often align their certificates with industry certification. In computer science, industry certifications often lack the cohesive concept development and structuring that is characteristic of a university education. Many software development and software engineering jobs, moreover, require mathematics, communication, and other quantitative skills, as well as the cultural competency that comes with a 4-year university education. With the proposed certificate stack, we tap into NDSU's existing concept of undergraduate certificates, to create a set of stackable credentials that closely aligns with our baccalaureate requirements. As such, working on completing certificates not only serves to demonstrate proficiency in the respective areas of study, but also constitutes progress towards our B.S. degree. The certificates already closely align with the Computer Science major and minor and, once approved, we will revisit our B.A. and dual majors to complete the degree alignment process. The stackable certificates aligns with the university's strategic plan since it will help to increase undergraduate student enrollment and it will provide another attractive NDSU program for students to enroll in.

Describe how the program addresses the NDUS stategic plan:

This program addresses Goal 2 (Provide programs people want, where and when they need them) of the NDUS strategic plan. In particular, Objective 2.1 is addressed, which ensures programs are relevant, valuable, and timely (key indicator 2.1).

Are there similar programs that exist within NDUS or state?

No

What is the length of the program?

2-3 semesters

Identify the proposed program-level accreditation organization, if applicable:

NA

Cert 1: Fundamentals of Computing and Security

- CSCI 159: Computer Science Problem Solving
- CSCI 105: Introduction Cybersecurity
- CSCI 227: Computing Fundamentals I

- Math background equiv. to MATH 105
- ENGL 110
- ENGL 120
- COMM 110
- Wellness (2 cr)

Cert 2: Computer Science Foundations

- CSCI 160: Computer Science I
- CSCI 161: Computer Science II
- CSCI 277: Introduction to UNIX

- MATH 129: Basic Linear Algebra.
- MATH 165: Calculus I
- MATH 166: Calculus II

- Gen Eds in Humanities and Fine Arts (6 cr)
- Social and Behavioral Sc. (6 cr)
- Cultural Diversity
- Global Perspectives

Cert 3: Core Computer Science Competencies

- CSCI 366: Database Systems
- CSCI 372: Comparative Program-ming Languages
- CSCI 222: Discrete Mathematics

Cert 4: Software Development

- CSCI 213: Modern Software Develop-ment
- CSCI 313: Software Develop-ment with Frame-works
- CSCI 371: Web Scripting Languages

Cert 5: Computing Systems

- CSCI 374: Computer Organization and Architecture
- CSCI 336: Theoretical Computer Science
- CSCI 474: Operating Systems Concepts

- Science Gen Eds (7 cr)
- ENGL 321: Writing in the Tech. Profess.
- STAT 367: Proba-bility
- STAT 368: Statis-tics

Cert 6a: Cybersecurity

- CSCI 403: Defensive Network Security
- CSCI 405: Principles of Cybersecurity
- CSCI 404: Ethical Hacking
- Another elective from the Cybersecurity Track of the B.S. Degree

Cert 6b: Data Science

- CSCI 420: Introduction to Data Science in Python
- CSCI 422: Intro. to Data Engineering
- CSCI 425: Machine Learning
- CSCI 426: Intro to AI
- Another elective from the Data Science Track of the B.S. Degree

Cert 6c: Software Eng.

- CSCI 413: Principles of Software Engineering
- CSCI 419: Software Testing and Debugging
- Another elective from the Software Engineering Track of the B.S. Degree

- CSCI 467: Algorithm Analysis
- CSCI 455: Networking and Parallel Computation
- CSCI 489: Social Implications of Computers
- CSCI 445: Software Projects Capstone

Program Overview

Computer Science

Lightcast Q2 2023 Data Set

May 2023

1340 Administration Avenue
Fargo, North Dakota 58102
701-231-8011

Parameters

Completions Year: 2021

Jobs Timeframe: 2023 - 2033

Job Postings Timeframe: May 2022 - Apr 2023

Programs:

Code	Description
11.0701	Computer Science

Regions:

Code	Description
27	Minnesota
30	Montana

Code	Description
38	North Dakota
46	South Dakota

Education Level: Any

Tuition Type: Tuition & Fees

Graduate Status: Undergraduate

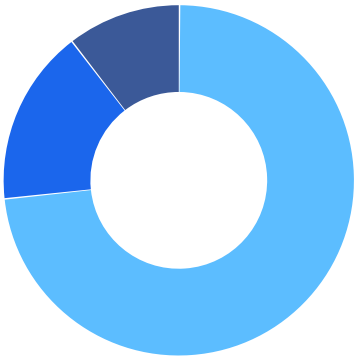
Residency: In-State

42	1,704	Completions Distribution
Institutions	Completions	Average: 40.6
0% Growth (2017-2021)	30% Growth (2017-2021)	1 — 645
		Median: 18.5

Program Overview

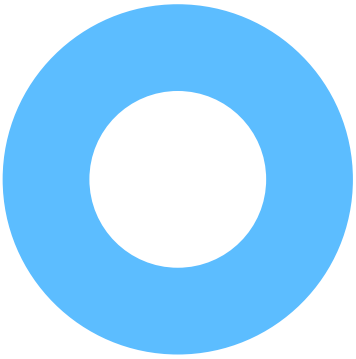
	Completions (2021)	% Completions	Institutions (2021)	% Institutions
All Programs	1,704	100%	42	100%
Distance Offered Programs	142	8%	4	10%
Non-Distance Offered Programs	1,562	92%	38	90%

Market Share by Institution Type



Institution Type	Completions (2021)	Market Share
Public, 4-year or above	1,248	73.2%
Private not-for-profit, 4-year or above	277	16.3%
Public, 2-year	179	10.5%

Market Share by Program

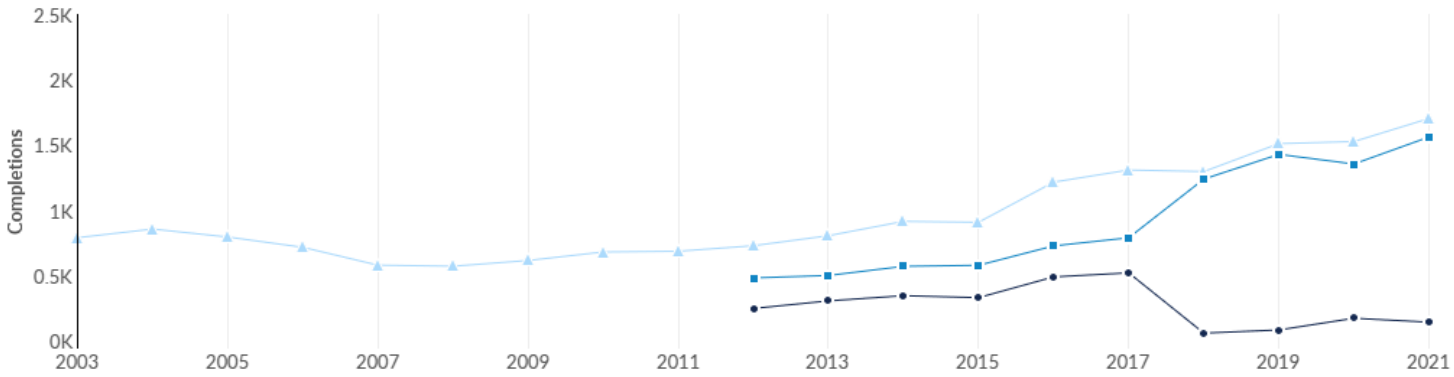


Program	Completions (2021)	Market Share
Computer Science (11.0701)	1,704	100.0%

Completions by Institution

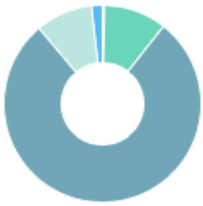
Institution	Completions (2021)	Growth % YOY (2021)	Market Share (2021)	IPEDS Tuition & Fees (2021)	Completions Trend (2017-2021)
University of Minnesota-Twin Cities	645	17.5%	37.9%	$15,254	
North Dakota State University-Main Campus	106	5.0%	6.2%	$10,401	
University of Minnesota-Duluth	92	15.0%	5.4%	$13,850	
Montana State University	89	-14.4%	5.2%	$7,528	
Metropolitan State University	83	-3.5%	4.9%	$9,394	
Saint Cloud State University	64	10.3%	3.8%	$9,170	
Winona State University	56	-3.4%	3.3%	$10,184	
University of St Thomas	55	61.8%	3.2%	$48,329	
Carleton College	54	-23.9%	3.2%	$60,225	
Normandale Community College	50	31.6%	2.9%	$5,789	

Regional Trends



	2012 Completions	2021 Completions	% Change
Distance Offered Programs	247	142	-42.5%
Non-Distance Offered Programs	481	1,562	+224.7%
All Programs	728	1,704	+134.1%

Regional Completions by Award Level



Award Level	Completions (2021)	Percent
Award of less than 1 academic year	6	0.4%
Associate's Degree	175	10.3%
Bachelor's Degree	1,333	78.2%
Master's Degree	159	9.3%
Doctor's Degree	31	1.8%
Award of at least 1 but less than 2 academic years	0	0.0%
Award of at least 2 but less than 4 academic years	0	0.0%
Postbaccalaureate certificate	0	0.0%
Post-masters certificate	0	0.0%

Similar Programs

125	37,867
Programs (2021)	Completions (2021)

CIP Code	Program	Completions (2021)
52.0201	Business Administration and Management, General	7,464
24.0101	Liberal Arts and Sciences/Liberal Studies	7,167
26.0101	Biology/Biological Sciences, General	2,434
51.0701	Health/Health Care Administration/Management	1,833
52.1401	Marketing/Marketing Management, General	1,485
30.9999	Multi-/Interdisciplinary Studies, Other	1,339
52.0101	Business/Commerce, General	1,148
43.0104	Criminal Justice/Safety Studies	1,050
24.0102	General Studies	1,043
27.0101	Mathematics, General	826

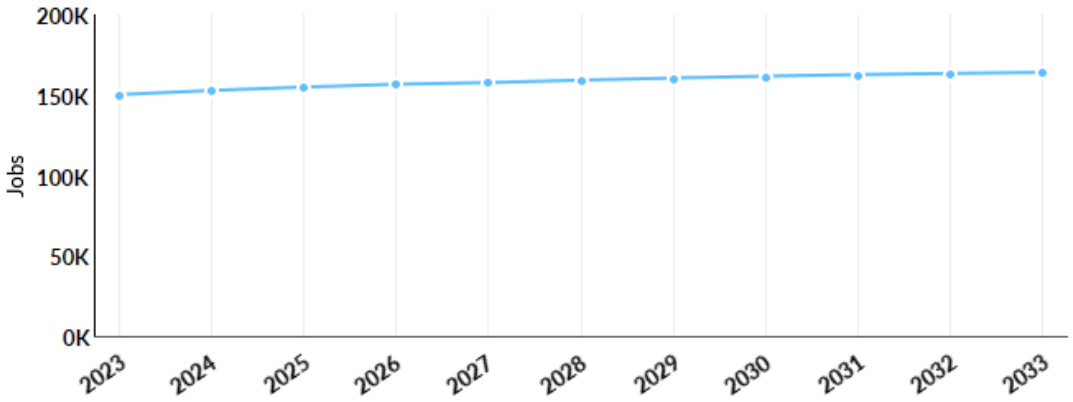
Target Occupations

150,061	+9.2%	$42.47/hr $88.3K/yr	12,640
Jobs (2023)	% Change (2023-2033)	Median Earnings	Annual Openings
9% below National average	Nation: +17.7%	Nation: $47.56/hr; $98.9K/yr	

Occupation	2023 Jobs	Annual Openings	Median Earnings	Growth (2023 - 2033)	Location Quotient (2023)
Software Developers	46,714	4,003	$48.00/hr	+14.45%	1.02
Computer User Support Specialists	18,304	1,563	$26.39/hr	+4.47%	0.86
Computer Systems Analysts	17,794	1,392	$46.88/hr	+4.82%	1.10
Computer and Information Systems Managers	12,177	1,089	$71.07/hr	+11.49%	0.77
Computer Network Support Specialists	10,796	900	$29.16/hr	+2.76%	1.93
Network and Computer Systems Administrators	8,969	658	$39.05/hr	+2.80%	0.90
Computer Occupations, All Other	7,768	660	$35.81/hr	+9.42%	0.60
Computer Network Architects	4,919	336	$52.51/hr	+1.75%	0.93
Information Security Analysts	3,989	414	$47.22/hr	+23.06%	0.74
Computer Programmers	3,653	255	$38.21/hr	-6.71%	0.72
Software Quality Assurance Analysts and Testers	3,182	303	$43.26/hr	+17.28%	0.52
Web Developers	2,872	275	$35.56/hr	+15.32%	0.87
Web and Digital Interface Designers	2,529	269	$32.42/hr	+15.70%	0.78
Database Administrators	2,321	179	$44.07/hr	+5.13%	0.86
Computer Hardware Engineers	1,546	115	$37.53/hr	+5.95%	0.65
Statisticians	1,158	115	$36.37/hr	+20.29%	1.08
Database Architects	1,084	85	$57.48/hr	+5.54%	0.69
Computer and Information Research Scientists	286	30	$62.78/hr	+24.48%	0.27

Growth

150,061	163,888	13,827	9.2%
2023 Jobs	2033 Jobs	Change (2023-2033)	% Change (2023-2033)

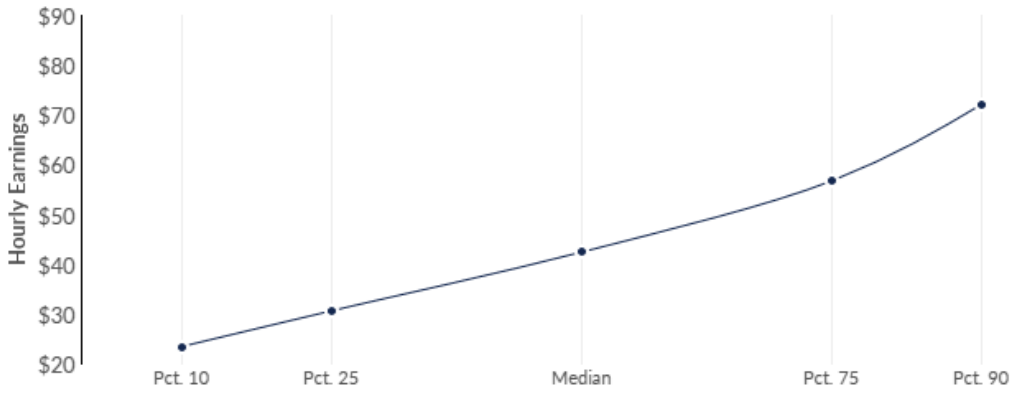


Occupation	2023 Jobs	2033 Jobs	Change	% Change
Computer and Information Systems Managers (11-3021)	12,177	13,576	1,399	11%
Computer Systems Analysts (15-1211)	17,794	18,651	857	5%
Information Security Analysts (15-1212)	3,989	4,909	920	23%
Computer and Information Research Scientists (15-1221)	286	356	70	24%
Computer Network Support Specialists (15-1231)	10,796	11,094	298	3%
Computer User Support Specialists (15-1232)	18,304	19,122	818	4%
Computer Network Architects (15-1241)	4,919	5,005	86	2%
Database Administrators (15-1242)	2,321	2,440	119	5%
Database Architects (15-1243)	1,084	1,144	60	6%
Network and Computer Systems Administrators (15-1244)	8,969	9,220	251	3%
Computer Programmers (15-1251)	3,653	3,408	-245	-7%
Software Developers (15-1252)	46,714	53,462	6,748	14%
Software Quality Assurance Analysts and Testers (15-1253)	3,182	3,732	550	17%
Web Developers (15-1254)	2,872	3,312	440	15%

Web and Digital Interface Designers (15-1255)	2,529	2,926	397	16%
Computer Occupations, All Other (15-1299)	7,768	8,500	732	9%
Statisticians (15-2041)	1,158	1,393	235	20%
Computer Hardware Engineers (17-2061)	1,546	1,638	92	6%

Percentile Earnings

$30.66/hr	$42.47/hr	$56.80/hr
25th Percentile Earnings	Median Earnings	75th Percentile Earnings



Occupation	25th Percentile Earnings	Median Earnings	75th Percentile Earnings
Computer and Information Systems Managers (11-3021)	$55.15	$71.07	$79.84
Computer Systems Analysts (15-1211)	$36.66	$46.88	$56.99
Information Security Analysts (15-1212)	$37.42	$47.22	$57.88
Computer and Information Research Scientists (15-1221)	$57.59	$62.78	$63.51
Computer Network Support Specialists (15-1231)	$23.34	$29.16	$37.37
Computer User Support Specialists (15-1232)	$20.12	$26.39	$30.75
Computer Network Architects (15-1241)	$48.02	$52.51	$64.99
Database Administrators (15-1242)	$32.60	$44.07	$57.93
Database Architects (15-1243)	$48.40	$57.48	$72.77
Network and Computer Systems Administrators (15-1244)	$30.61	$39.05	$47.26
Computer Programmers (15-1251)	$30.34	$38.21	$47.10
Software Developers (15-1252)	$37.55	$48.00	$61.25
Software Quality Assurance Analysts and Testers (15-1253)	$32.15	$43.26	$48.30

Web Developers (15-1254)	$24.25	$35.56	$49.67
Web and Digital Interface Designers (15-1255)	$22.54	$32.42	$45.81
Computer Occupations, All Other (15-1299)	$22.78	$35.81	$52.71
Statisticians (15-2041)	$29.54	$36.37	$47.86
Computer Hardware Engineers (17-2061)	$37.35	$37.53	$51.75

Job Postings Summary

75,604	2 : 1	6,756	27 days
Unique Postings	**Posting Intensity**	**Employers Competing**	**Median Posting Duration**
154,021 Total Postings		36,771 Total Employers	Regional Average: 30 days
	Regional Average: 3 : 1		

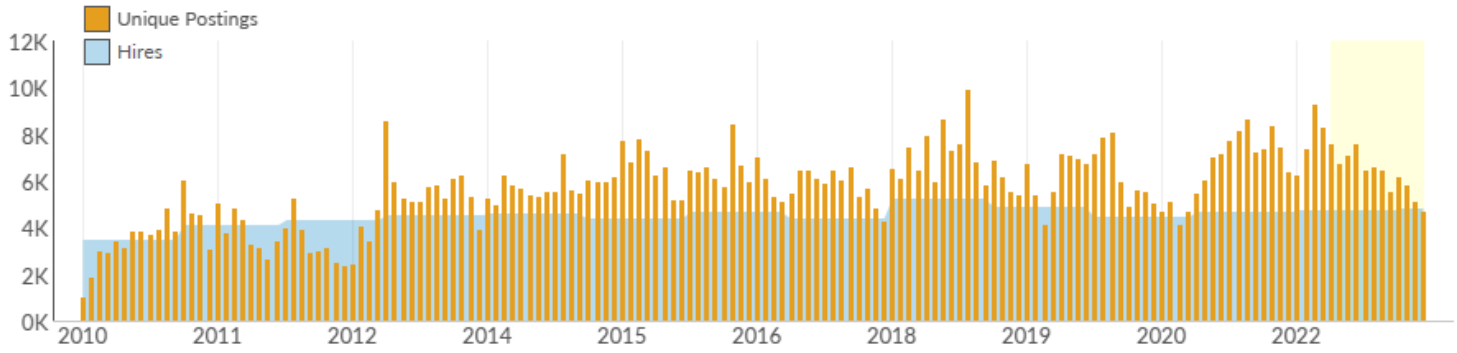
There were **154,021** total job postings for your selection from May 2022 to April 2023, of which **75,604** were unique. These numbers give us a Posting Intensity of **2-to-1**, meaning that for every 2 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

Job Postings vs. Hires

6,300	4,749
Avg. Monthly Postings (May 2022 - Apr 2023)	Avg. Monthly Hires (May 2022 - Apr 2023)

In an average month, there were **6,300** newly posted job postings for *18 Occupations*, and **4,749** actually hired. This means there was approximately 1 hire for every 1 unique job posting for *18 Occupations*.



Occupation	Avg Monthly Postings (May 2022 - Apr 2023)	Avg Monthly Hires (May 2022 - Apr 2023)
Software Developers	1,953	1,460
Computer Occupations, All Other	1,122	261
Computer User Support Specialists	733	659
Computer Systems Analysts	539	514
Information Security Analysts	266	150
Web Developers	259	94
Database Administrators	256	68
Software Quality Assurance Analysts and Testers	227	118
Network and Computer Systems Administrators	200	259
Computer Network Architects	182	136
Database Architects	153	32
Computer Programmers	128	98

Computer and Information Systems Managers	84	374
Computer Network Support Specialists	56	338
Computer and Information Research Scientists	45	12
Statisticians	42	43
Web and Digital Interface Designers	30	87
Computer Hardware Engineers	24	45

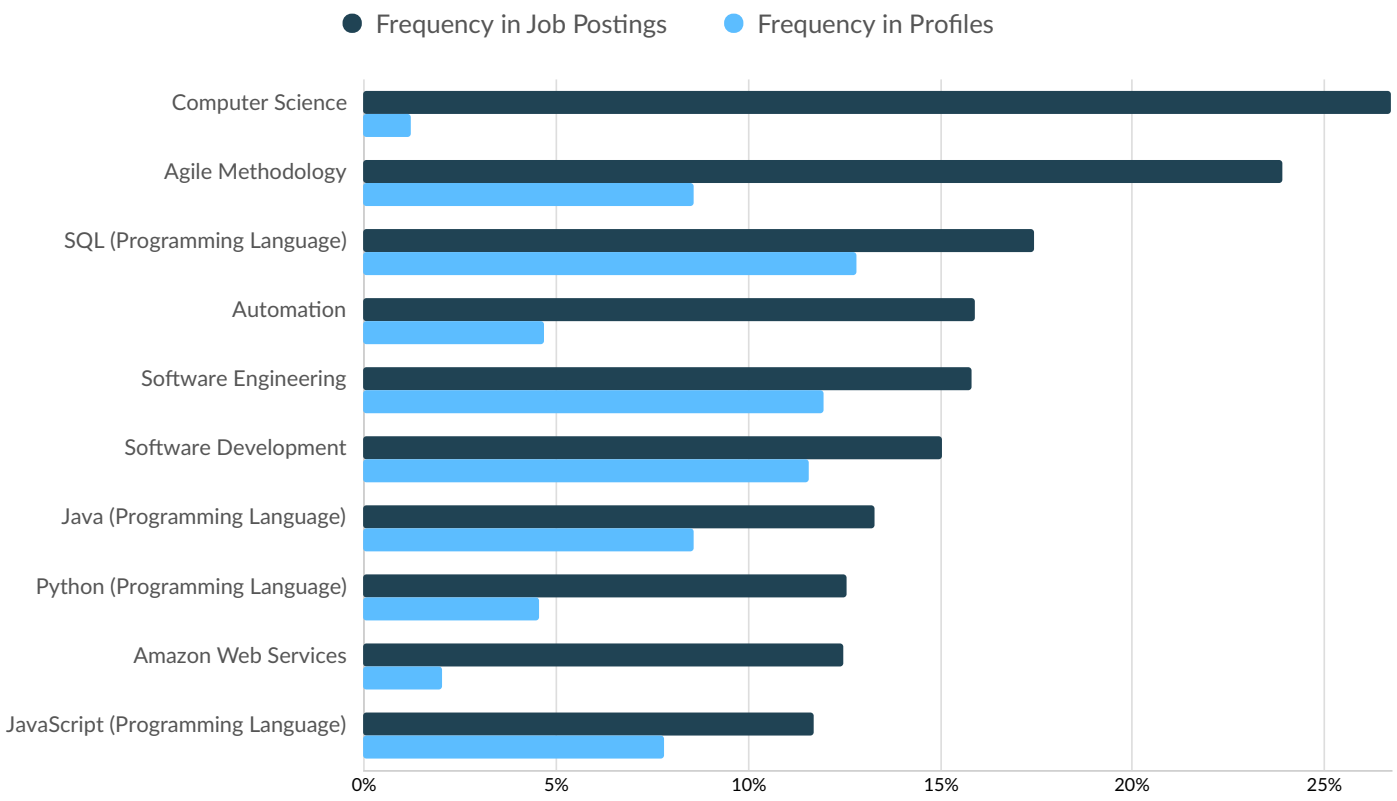
Top Companies Posting

Company	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Randstad	4,146 / 2,422	2 : 1 	20 days
Humana	4,627 / 2,002	2 : 1 	33 days
UnitedHealth Group	4,913 / 1,723	3 : 1 	26 days
Wells Fargo	4,190 / 1,139	4 : 1 	32 days
Robert Half	1,212 / 849	1 : 1 	30 days
US Bank	1,449 / 688	2 : 1 	29 days
General Dynamics	1,104 / 668	2 : 1 	33 days
CTG	742 / 627	1 : 1 	33 days
Optum	2,007 / 612	3 : 1 	36 days
Travelers	746 / 536	1 : 1 	33 days

Top Posted Job Titles

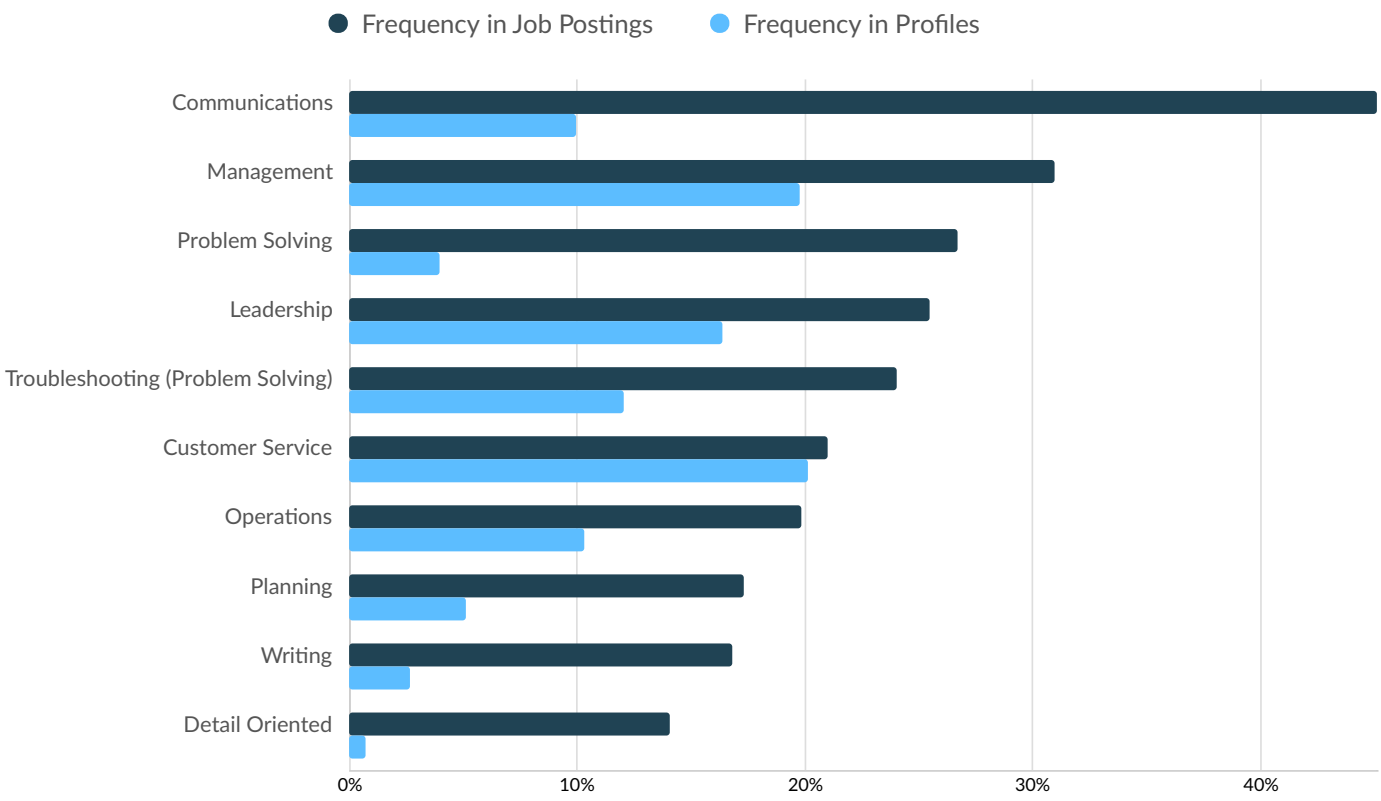
Job Title	Total/Unique (May 2022 - Apr 2023)	Posting Intensity	Median Posting Duration
Software Engineers	6,186 / 2,558	2 : 1 	25 days
Data Engineers	1,521 / 811	2 : 1 	26 days
Systems Engineers	1,170 / 657	2 : 1 	23 days
Software Developers	1,107 / 640	2 : 1 	28 days
Business Systems Analysts	1,313 / 637	2 : 1 	25 days
Full Stack Developers	862 / 501	2 : 1 	23 days
Systems Administrators	860 / 477	2 : 1 	29 days
Solutions Architects	1,022 / 461	2 : 1 	30 days
Java Developers	663 / 439	2 : 1 	20 days
DevOps Engineers	706 / 433	2 : 1 	25 days

Top Specialized Skills



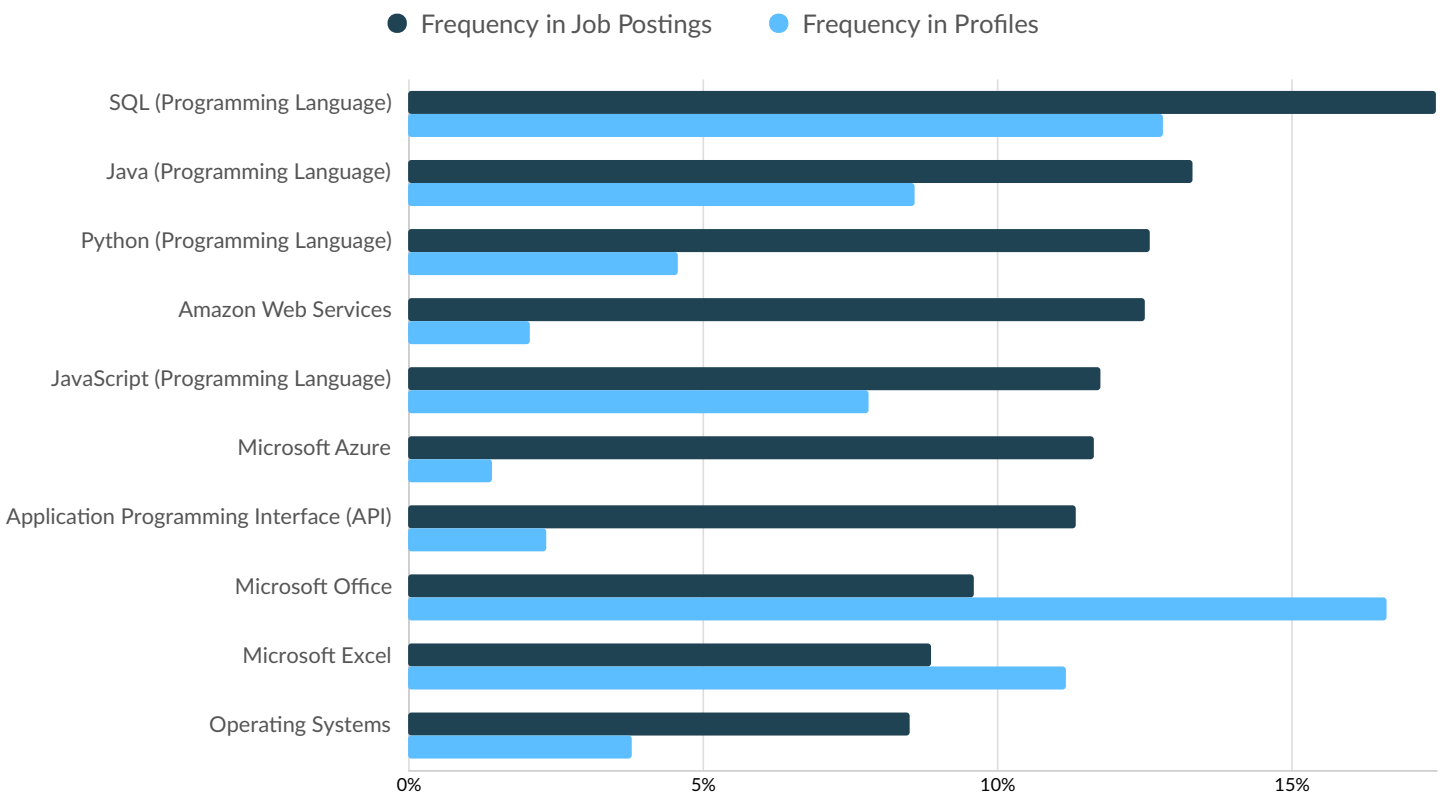
Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Computer Science	20,216	27%	2,405	1%
Agile Methodology	18,077	24%	16,520	9%
SQL (Programming Language)	13,187	17%	24,644	13%
Automation	12,028	16%	9,061	5%
Software Engineering	11,961	16%	23,039	12%
Software Development	11,388	15%	22,256	12%
Java (Programming Language)	10,067	13%	16,537	9%
Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%

Top Common Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Communications	34,137	45%	19,190	10%
Management	23,432	31%	38,058	20%
Problem Solving	20,205	27%	7,628	4%
Leadership	19,288	26%	31,481	16%
Troubleshooting (Problem Solving)	18,201	24%	23,160	12%
Customer Service	15,914	21%	38,687	20%
Operations	15,007	20%	19,906	10%
Planning	13,109	17%	9,810	5%
Writing	12,699	17%	5,142	3%
Detail Oriented	10,676	14%	1,454	1%

Top Software Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
SQL (Programming Language)	13,187	17%	24,644	13%
Java (Programming Language)	10,067	13%	16,537	9%
Python (Programming Language)	9,522	13%	8,811	5%
Amazon Web Services	9,448	12%	3,968	2%
JavaScript (Programming Language)	8,878	12%	15,034	8%
Microsoft Azure	8,807	12%	2,755	1%
Application Programming Interface (API)	8,565	11%	4,486	2%
Microsoft Office	7,265	10%	31,933	17%
Microsoft Excel	6,717	9%	21,476	11%
Operating Systems	6,430	9%	7,318	4%

Top Qualifications

Qualification	Postings with Qualification
Valid Driver's License	3,407
Certified Information Systems Security Professional	1,593
Project Management Professional Certification	1,432
Security Clearance	1,118
CompTIA A+	1,084
Cisco Certified Network Associate	1,005
Master Of Business Administration (MBA)	841
CompTIA Security+	734
Certified Information System Auditor (CISA)	733
Certified Information Security Manager	681

Appendix A

Program Selection Details

CIP Code	Program Name
11.0701	Computer Science

Appendix B - Data Sources and Calculations

Institution Data

The institution data in this report is taken directly from the national IPEDS database published by the U.S. Department of Education's National Center for Education Statistics.

Location Quotient

Location quotient (LQ) is a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. It can reveal what makes a particular region unique in comparison to the national average.

Occupation Data

Emsi occupation employment data are based on final Emsi industry data and final Emsi staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Emsi earnings by industry.

Lightcast Job Postings

Job postings are collected from various sources and processed/enriched to provide information such as standardized company name, occupation, skills, and geography.

State Data Sources

This report uses state data from the following agencies: Minnesota Department of Employment and Economic Development; Montana Department of Labor and Industry; North Dakota Job Service; South Dakota Department of Labor and Regulation

New Academic Program Request

Institution:

North Dakota State University

Program Name:

Cybersecurity

Degree Types:

Bachelor of Science

Undergraduate Certificate

What day did AAC review the Academic Program Exploration Notice for this New Academic Program?

2020-01-08

CIP Code:

11.1003

Academic Program Code:

Will be determined by Registration and Records in consultation with Core Technology Services upon approval.

Academic Department/Division/College:

Department of Computer Science/College of Engineering

Semester of Program:

Fall

Year of Program:

2023

Other Participating Institutions:

Not Applicable

Delivery Method:

On Campus
Hybrid (on campus & distance)
Online Only

Describe the delivery methods and location(s) to which the program will be delivered:

On campus in classrooms and computer labs and online.

Funding Source:

Instructional Re-allocation

Describe the funding source:

The Department of Computer Science has funded some course development and conversion out of its own funds. Other funds will come from the Provost's Office strategic investment fund. We anticipate that the new program will grow enrollment and generate new tuition.

Is the program eligible for Financial Aid?

Yes

Degree Types eligible for Financial Aid:

Bachelor of Science

Does the program require a criminal background check described in NDUS Procedure 511?

No

Describe a brief description of the program:

The proposed bachelor of science in cybersecurity is designed to provide students with the knowledge and skills to allow them to succeed in the rapidly growing field of cybersecurity. It will prepare them to identify security issues with computing systems and networks, prior to attacks, and to detect and respond to ongoing attacks. It will also provide students with the skills that they need to understand and respond to the computing, cybersecurity and relevant scientific challenges of today and tomorrow. It will prepare students for entry-level positions in a number of career areas such as cybersecurity analyst, defensive cybersecurity, penetration testing and computer and network forensics. The certificate draws from the set of courses that are specific to the Cybersecurity track of our B.S. degree. In contrast to the other certificates, this certificate can be of interest even to professionals with computer science degrees who wish to expand their expertise in the area of cybersecurity. It can also be of interest to current students who complete a different track but wish to cover more than one specialization.

Address student demand and employment availability for students completing the program:

There is incredibly strong demand for individuals with cybersecurity skills. In 2022, there were 755,743 open cybersecurity positions, according to cyberseek.org. Given that there are only 1,112,410 current employees in the cybersecurity workforce (again, in 2022, according to cyberseek.org), this means that there is 0.67 of a job opening for every currently filled position, demonstrating the exceptional growth potential of the area. North Dakota had over 1,100 open positions in 2022 and Minnesota had over 10,000 open positions in 2022 (according to cyberseek.org).

Describe how this need was assessed and indicate sources for data used and indicated ancipated enrollment rates for the first five years:

Need assessment is based on the above-mentioned data from cyberseek.org as well as anecdotal information provided by area businesses, students and alumni. Additionally a Hannover Research report identifies the program area as a high-demand, high-growth area. It is also a stated priority for the state. Enrollment of 50 to 75 is expected per year. Given this, an eventual program size of 200 to 300 students is projected.

Describe how the program addresses the institutional strategic plan:

The program will focus on student preparedness for the cybersecurity industry. Cybersecurity positions require a skillset that is a distinctly different mix from the skillsets provided by computer science, information technology, and other programs. Our goal, thus, is to prepare students with the cybersecurity skills and knowledge to prepare them for their future careers. Students will also gain experience with the methods, tools and techniques used in multiple areas of cybersecurity including system and network defense, cybersecurity testing, and computer forensics. They will also learn about job expectations in the field and gain an understanding of the ethical and legal expectations of cybersecurity professionals. The proposed B.S. in cybersecurity degree program will expose students to relevant industry practices and standards and provide them with relevant knowledge about cybersecurity concepts and technologies, while developing skills that will serve to aid them during their first day on the job and throughout their career. The cybersecurity B.S. program aligns with the university's strategic plan in that it will help to increase undergraduate student enrollment and provides another attractive NDSU program for students to enroll in.

Describe how the program addresses the NDUS stategic plan:

This program addresses Goal 2 (Provide programs people want, where and when they need them) of the NDUS strategic plan. In particular, Objective 2.1 is addressed, which ensures programs are relevant, valuable, and timely (key indicator 2.1). The requested B.S. degree program fits the mission of NDSU. Cybersecurity is a program of need in the state.

Are there similar programs that exist within NDUS or state?

Yes

Identify similar programs that exist within NDUS or state:

According to NDUS information, a B.S. program in cybersecurity with online availability exists at UND. Minot State offers an online program in B.S. program in cyber security and operations and Bismarck State College offers a program in cybersecurity & computer information technology. Associates-level programs are offered at Williston State College (in cybersecurity) and Bismarck State College (in cybersecurity & computer networks). Several colleges offer certificate programs in cybersecurity and related areas.

Briefly discuss if and how the program duplicated similar NDUS programs:

The program has some similarities to the cybersecurity program at UND; however, our areas of program focus are different, drawing on our different departmental and institutional strengths. Additionally, due to the extremely high demand for programs and employees in this area, we see the program as augmenting – not duplicating – the existing program at UND and similar program at Bismarck State.

Briefly justify the duplication of existing program(s) in NDUS or state:

The very high demand for and growth in this area justifies a need for our new program.

Discuss whether the potential students will be drawn from the same population as those in existing program in NDUS or state:

Given the high level of demand for students in this area, which exceeds existing capacity, we believe that the majority of students will not be drawn from existing NDUS/ND student populations. In particular, our focus on offering a best-of-breed online program will allow us to draw students from regions of North Dakota that do not have existing offerings in this area and from outside of the state.

Discuss whether a collaborative program has been considered with an institution where the program exists:

Due to the limited number of qualified cybersecurity faculty in North Dakota, other institutions do not have the capacity to support a collaborative program. We have discussed a number of areas of potential collaboration with faculty at other institutions; however, a collaborative program is not logistically feasible, at present.

How will tuition be charged:

Differential rate

Is this the same tuition model method as the existing NDUS program:

Yes

What is the length of the program?

Target completion of four years.

Identify the proposed program-level accreditation organization, if applicable:

NA

B.S. in Cybersecurity

CSCI 105	Principles of Cybersecurity	3
CSCI 160	Computer Science I	4
CSCI 161	Computer Science II	4
CSCI 222	Discrete Mathematics	3
CSCI 277	Introduction to Unix	3
CSCI 366	Database Systems	3
CSCI 371	Web Scripting Languages	3
CSCI 374	Computer Organization and Architecture	3
CSCI 403	Defensive Network Security	3
CSCI 404	Ethical Hacking	3
CSCI 405	Principles of Cybersecurity	3
CSCI 408	Malware Detection, Analysis and Threat Mechanisms	3
CSCI 409	Cybersecurity Law & Policy*	3
CSCI 410	Computer Crime and Forensics	3
CSCI 411	Secure Software Development	3
CSCI 429	Network Applications and Environments	3
CSCI 445C	Capstone*	3
CSCI 474	Operating Systems Concepts	3
CSCI 159	Computer Science Problem Solving.	3
ENGL 321 or 324	Writing in the Technical Professions or Writing in the Sciences	3
MATH 146 or 165	Applied Calculus I or Calculus I	4
STAT 367 or 330	Probability / Introductory Statistics	3
STAT 368 or 331	Statistics / Regression Analysis	3
	Cyber Elective 1	3
	Cyber Elective 2	3
		78

Cyber Electives

MATH 473	Cryptography	3
CSCI 213	Modern Software Development	3
EMGT 150	Dealing with Terrorism, Cybersecurity and Other Emerg	3
EMGT 435	Issues in Homeland Security and Emergency Manageme	3
CSCI 706	Data-Driven Security	3

CSCI 462	Mobile and Wireless Networks	3
CSCI 412	Mobile Software Engineering	3

Program Overview

Computer and Information Systems Security/Auditing/Information Assurance

Lightcast Q1 2023 Data Set

February 2023

1340 Administration Avenue
Fargo, North Dakota 58102
701-231-8011

Parameters

Completions Year: 2021

Jobs Timeframe: 2023 - 2033

Job Postings Timeframe: Feb 2022 - Jan 2023

Programs:

Code	Description
11.1003	Computer and Information Systems Security/Auditing/Information Assurance

Regions:

Code	Description
27	Minnesota
30	Montana

Code	Description
38	North Dakota
46	South Dakota

Education Level: Any

Tuition Type: Tuition & Fees

Graduate Status: Undergraduate

Residency: In-State

29

Institutions

32% Growth (2017-2021)

764

Completions

61% Growth (2017-2021)

Completions Distribution

Average: 26.3

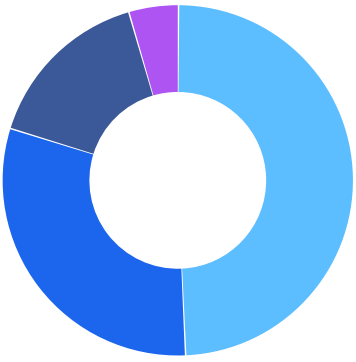
1 — 211

Median: 9

Program Overview

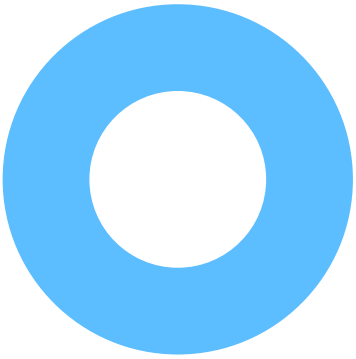
	Completions (2021)	% Completions	Institutions (2021)	% Institutions
All Programs	764	100%	29	100%
Distance Offered Programs	458	60%	14	48%
Non-Distance Offered Programs	306	40%	18	62%

Market Share by Institution Type



Institution Type	Completions (2021)	Market Share
Public, 4-year or above	376	49.2%
Private for-profit, 4-year or above	233	30.5%
Public, 2-year	120	15.7%
Private not-for-profit, 4-year or above	35	4.6%

Market Share by Program

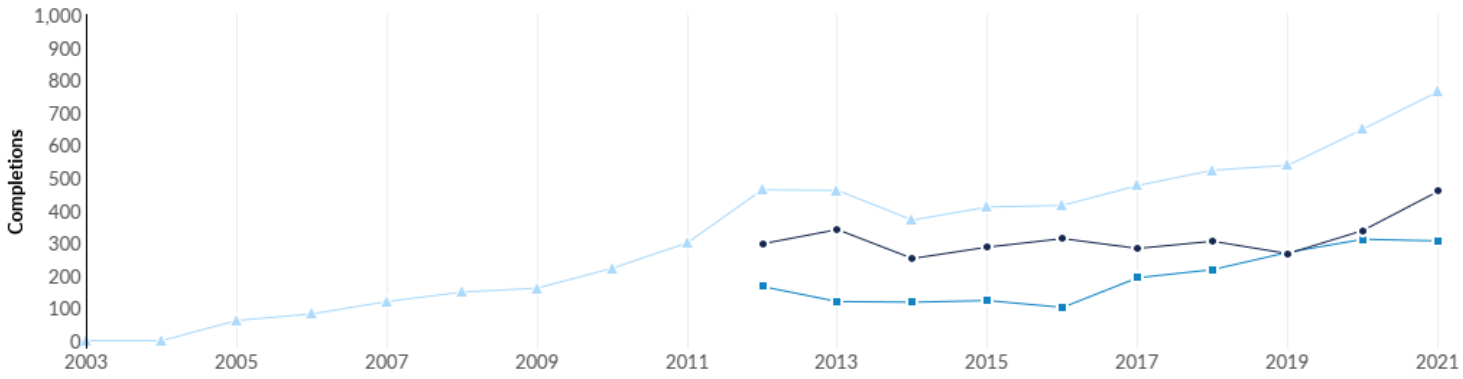


Program	Completions (2021)	Market Share
Computer and Information Systems Security/Auditing/Information Assurance (11.1003)	764	100.0%

Completions by Institution

Institution	Completions (2021)	Growth % YOY (2021)	Market Share (2021)	IPEDS Tuition & Fees (2021)	Completions Trend (2017-2021)
Capella University	211	17.9%	27.6%	$14,148	
Saint Cloud State University	167	13.6%	21.9%	$9,170	
Dakota State University	123	15.0%	16.1%	$9,633	
Metropolitan State University	32	23.1%	4.2%	$9,394	
Saint Mary's University of Minnesota	30	Insf. Data	3.9%	$39,410	
Century College	19	-13.6%	2.5%	$5,907	
University of North Dakota	17	750.0%	2.2%	$10,596	
Minneapolis Community and Technical College	17	54.5%	2.2%	$5,906	
Minnesota State University-Mankato	16	23.1%	2.1%	$9,146	
Anoka-Ramsey Community College	13	160.0%	1.7%	$5,515	

Regional Trends



	2012 Completions	2021 Completions	% Change
Distance Offered Programs	297	458	+54.2%
Non-Distance Offered Programs	166	306	+84.3%
All Programs	463	764	+65.0%

Regional Completions by Award Level

Award Level	Completions (2021)	Percent
Award of less than 1 academic year	40	5.2%
Award of at least 1 but less than 2 academic years	18	2.4%
Associate's Degree	89	11.6%
Bachelor's Degree	343	44.9%
Postbaccalaureate certificate	22	2.9%
Master's Degree	185	24.2%
Doctor's Degree	67	8.8%
Award of at least 2 but less than 4 academic years	0	0.0%
Post-masters certificate	0	0.0%

Similar Programs

133	38,069
Programs (2021)	Completions (2021)

CIP Code	Program	Completions (2021)
52.0201	Business Administration and Management, General	7,464
24.0101	Liberal Arts and Sciences/Liberal Studies	7,167
26.0101	Biology/Biological Sciences, General	2,434
51.0701	Health/Health Care Administration/Management	1,833
11.0701	Computer Science	1,704
52.1401	Marketing/Marketing Management, General	1,485
52.0101	Business/Commerce, General	1,148
43.0104	Criminal Justice/Safety Studies	1,050
24.0102	General Studies	1,043
27.0101	Mathematics, General	826

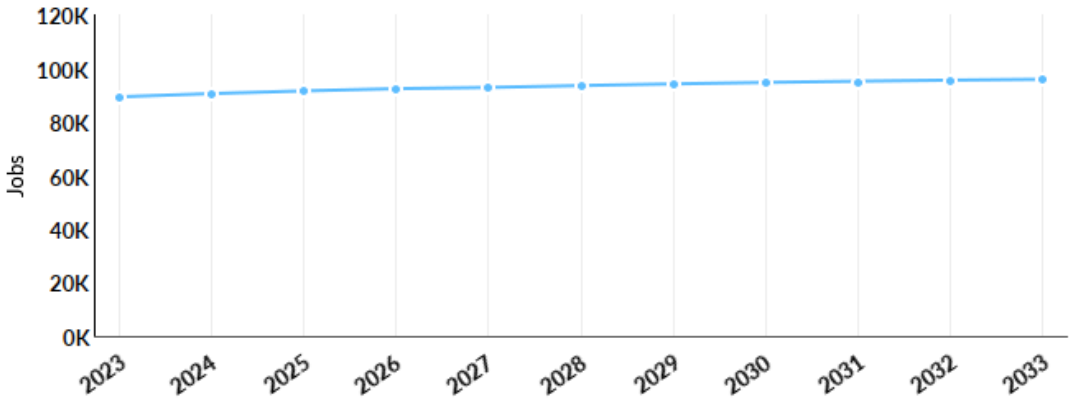
Target Occupations

89,211	+7.3%	$43.49/hr $90.5K/yr	7,519
Jobs (2023)	% Change (2023-2033)	Median Earnings	Annual Openings
9% below National average	Nation: +13.5%	Nation: $48.14/hr; $100.1K/yr	

Occupation	2023 Jobs	Annual Openings	Median Earnings	Growth (2023 - 2033)	Location Quotient (2023)
Project Management Specialists	19,917	1,823	$39.06/hr	+7.45%	0.84
Computer Systems Analysts	17,656	1,385	$46.88/hr	+5.26%	1.10
Computer and Information Systems Managers	12,037	1,079	$71.07/hr	+11.79%	0.77
Computer Network Support Specialists	10,762	894	$29.16/hr	+2.80%	1.95
Network and Computer Systems Administrators	8,881	650	$39.05/hr	+2.96%	0.90
Computer Occupations, All Other	7,675	653	$35.81/hr	+9.64%	0.60
Computer Network Architects	4,870	331	$52.51/hr	+1.85%	0.94
Information Security Analysts	3,954	412	$47.22/hr	+23.47%	0.74
Database Administrators	2,304	178	$44.07/hr	+5.77%	0.87
Statisticians	1,154	115	$36.37/hr	+20.88%	1.08

Growth

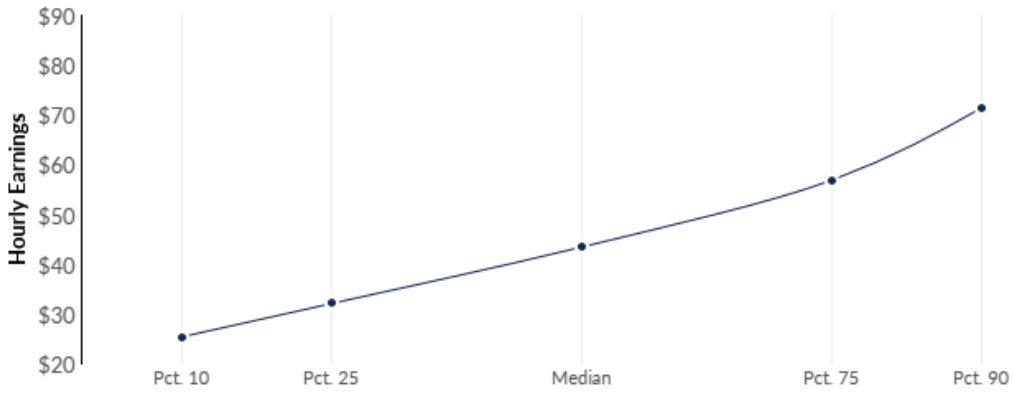
89,211	95,736	6,525	7.3%
2023 Jobs	2033 Jobs	Change (2023-2033)	% Change (2023-2033)



Occupation	2023 Jobs	2033 Jobs	Change	% Change
Computer and Information Systems Managers (11-3021)	12,037	13,456	1,419	12%
Project Management Specialists (13-1082)	19,917	21,401	1,484	7%
Computer Systems Analysts (15-1211)	17,656	18,584	928	5%
Information Security Analysts (15-1212)	3,954	4,882	928	23%
Computer Network Support Specialists (15-1231)	10,762	11,063	301	3%
Computer Network Architects (15-1241)	4,870	4,960	90	2%
Database Administrators (15-1242)	2,304	2,437	133	6%
Network and Computer Systems Administrators (15-1244)	8,881	9,144	263	3%
Computer Occupations, All Other (15-1299)	7,675	8,415	740	10%
Statisticians (15-2041)	1,154	1,395	241	21%

Percentile Earnings

$32.13/hr	$43.49/hr	$56.93/hr
25th Percentile Earnings	Median Earnings	75th Percentile Earnings



Occupation	25th Percentile Earnings	Median Earnings	75th Percentile Earnings
Computer and Information Systems Managers (11-3021)	$55.15	$71.07	$79.84
Project Management Specialists (13-1082)	$31.90	$39.06	$49.18
Computer Systems Analysts (15-1211)	$36.66	$46.88	$56.99
Information Security Analysts (15-1212)	$37.42	$47.22	$57.88
Computer Network Support Specialists (15-1231)	$23.34	$29.16	$37.37
Computer Network Architects (15-1241)	$48.02	$52.51	$64.99
Database Administrators (15-1242)	$32.60	$44.07	$57.93
Network and Computer Systems Administrators (15-1244)	$30.61	$39.05	$47.26
Computer Occupations, All Other (15-1299)	$22.78	$35.81	$52.71
Statisticians (15-2041)	$29.54	$36.37	$47.86

Job Postings Summary

44,155	2 : 1	26 days
Unique Postings	**Posting Intensity**	**Median Posting Duration**
88,967 Total Postings		Regional Average: 29 days
	Regional Average: 3 : 1	

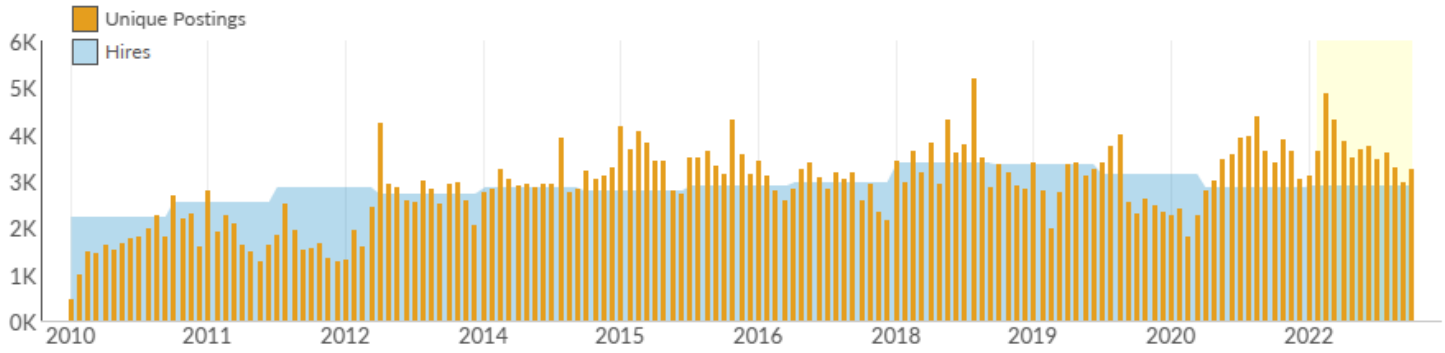
There were **88,967** total job postings for your selection from February 2022 to January 2023, of which **44,155** were unique. These numbers give us a Posting Intensity of **2-to-1**, meaning that for every 2 postings there is 1 unique job posting.

This is close to the Posting Intensity for all other occupations and companies in the region (3-to-1), indicating that they are putting average effort toward hiring for this position.

Job Postings vs. Hires

3,680	2,883
Avg. Monthly Postings (Feb 2022 - Jan 2023)	Avg. Monthly Hires (Feb 2022 - Jan 2023)

In an average month, there were **3,680** newly posted job postings for *10 Occupations*, and **2,883** actually hired. This means there was approximately 1 hire for every 1 unique job posting for *10 Occupations*.



Occupation	Avg Monthly Postings (Feb 2022 - Jan 2023)	Avg Monthly Hires (Feb 2022 - Jan 2023)
Computer Occupations, All Other	1,273	251
Project Management Specialists	625	783
Computer Systems Analysts	604	506
Database Administrators	289	65
Information Security Analysts	286	146
Network and Computer Systems Administrators	213	253
Computer Network Architects	203	135
Computer and Information Systems Managers	89	363
Computer Network Support Specialists	55	338
Statisticians	42	43

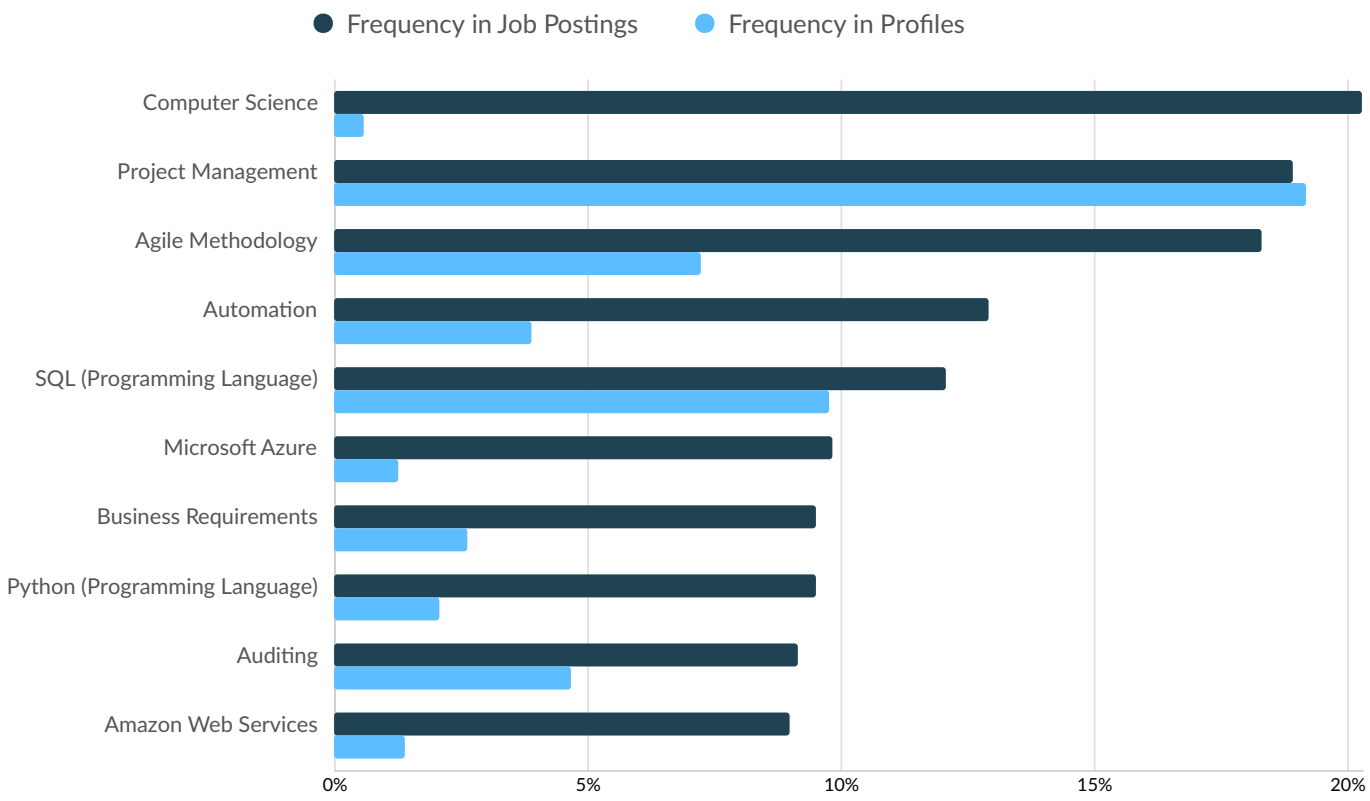
Top Companies Posting

Company	Total/Unique (Feb 2022 - Jan 2023)	Posting Intensity	Median Posting Duration
Randstad	1,843 / 1,143	2 : 1	19 days
Humana	2,420 / 1,139	2 : 1	31 days
UnitedHealth Group	2,853 / 1,087	3 : 1	25 days
Wells Fargo	3,650 / 785	5 : 1	27 days
General Dynamics	782 / 517	2 : 1	33 days
GPAC	974 / 506	2 : 1	39 days
US Bank	861 / 464	2 : 1	21 days
Robert Half	572 / 421	1 : 1	31 days
CTG	462 / 394	1 : 1	35 days
Deloitte	450 / 393	1 : 1	18 days

Top Posted Job Titles

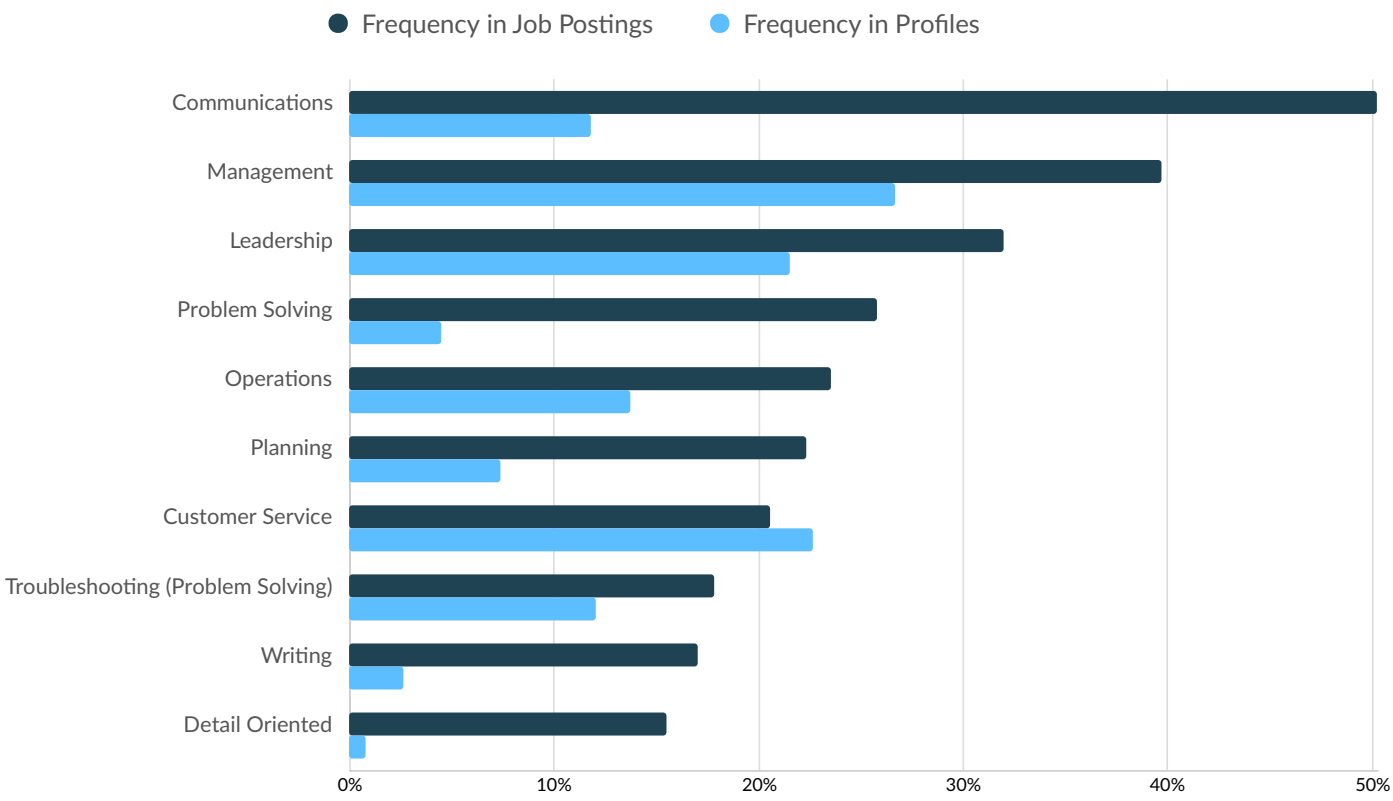
Job Title	Total/Unique (Feb 2022 - Jan 2023)	Posting Intensity	Median Posting Duration
Project Managers	4,667 / 2,531	2 : 1	29 days
Data Engineers	1,524 / 819	2 : 1	22 days
Business Systems Analysts	1,694 / 771	2 : 1	23 days
Systems Engineers	1,362 / 727	2 : 1	23 days
Solutions Architects	1,113 / 541	2 : 1	22 days
Scrum Masters	1,097 / 535	2 : 1	23 days
Systems Administrators	1,038 / 527	2 : 1	25 days
IT Project Managers	825 / 425	2 : 1	25 days
Network Engineers	932 / 407	2 : 1	26 days
Human Resources Project Managers	785 / 394	2 : 1	26 days

Top Specialized Skills



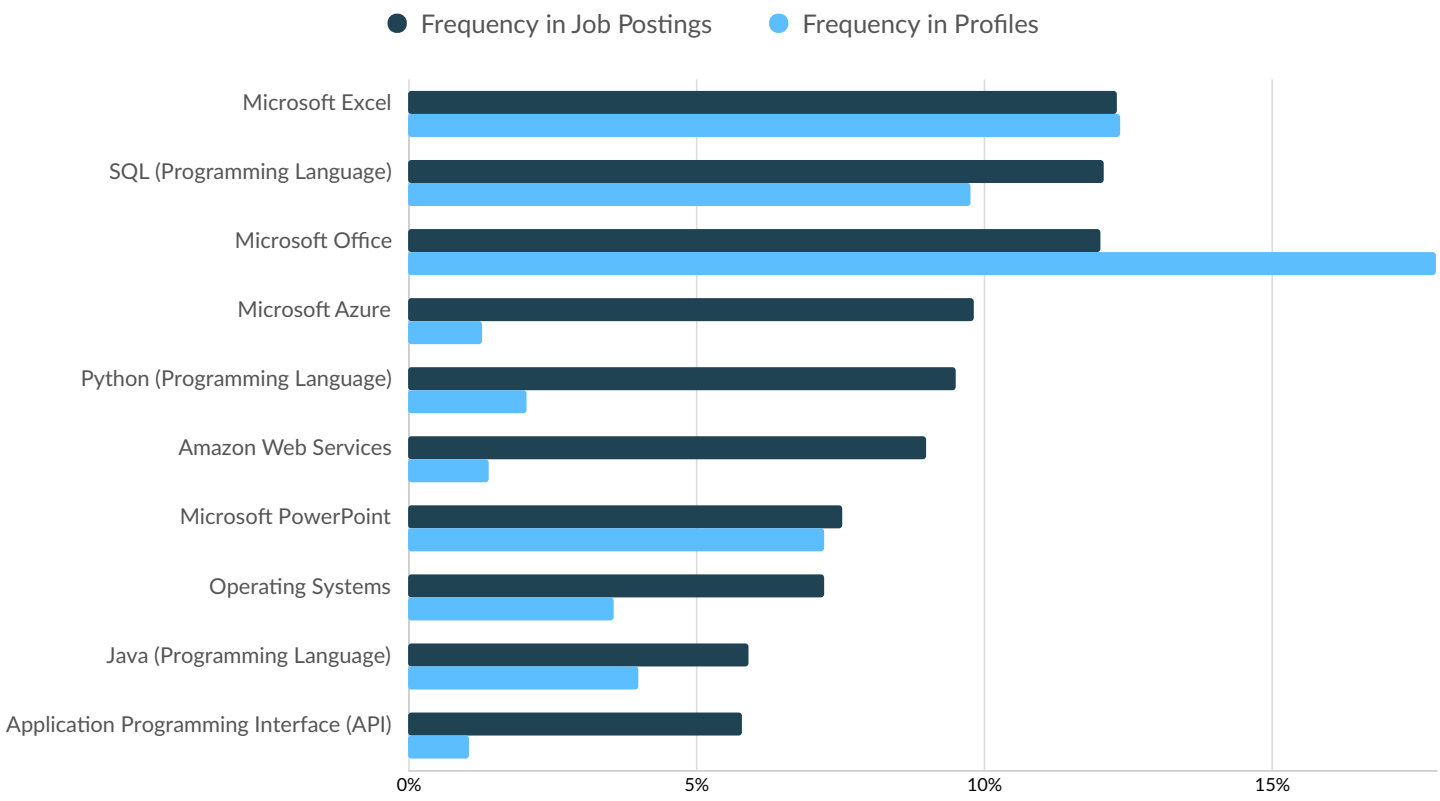
Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Computer Science	8,966	20%	625	1%
Project Management	8,361	19%	20,590	19%
Agile Methodology	8,098	18%	7,754	7%
Automation	5,714	13%	4,190	4%
SQL (Programming Language)	5,331	12%	10,491	10%
Microsoft Azure	4,340	10%	1,365	1%
Business Requirements	4,200	10%	2,834	3%
Python (Programming Language)	4,198	10%	2,214	2%
Auditing	4,042	9%	5,034	5%
Amazon Web Services	3,971	9%	1,512	1%

Top Common Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Communications	22,191	50%	12,639	12%
Management	17,528	40%	28,627	27%
Leadership	14,131	32%	23,097	22%
Problem Solving	11,388	26%	4,790	4%
Operations	10,400	24%	14,703	14%
Planning	9,875	22%	7,947	7%
Customer Service	9,107	21%	24,292	23%
Troubleshooting (Problem Solving)	7,877	18%	12,927	12%
Writing	7,529	17%	2,842	3%
Detail Oriented	6,852	16%	899	1%

Top Software Skills



Skills	Postings	% of Total Postings	Profiles	% of Total Profiles
Microsoft Excel	5,446	12%	13,287	12%
SQL (Programming Language)	5,333	12%	10,491	10%
Microsoft Office	5,317	12%	19,157	18%
Microsoft Azure	4,340	10%	1,365	1%
Python (Programming Language)	4,198	10%	2,214	2%
Amazon Web Services	3,972	9%	1,512	1%
Microsoft PowerPoint	3,333	8%	7,770	7%
Operating Systems	3,187	7%	3,840	4%
Java (Programming Language)	2,611	6%	4,289	4%
Application Programming Interface (API)	2,557	6%	1,139	1%

Top Qualifications

Qualification	Postings with Qualification
Project Management Professional Certification	2,862
Valid Driver's License	2,334
Certified Information Systems Security Professional	1,448
Cisco Certified Network Associate	765
Certified Information System Auditor (CISA)	710
Master Of Business Administration (MBA)	695
Certified Scrum Master	688
Certified Information Security Manager	618
Security Clearance	591
CompTIA Security+	495

Appendix A

Program Selection Details

CIP Code	Program Name
11.1003	Computer and Information Systems Security/Auditing/Information Assurance

Appendix B - Data Sources and Calculations

Institution Data

The institution data in this report is taken directly from the national IPEDS database published by the U.S. Department of Education's National Center for Education Statistics.

Location Quotient

Location quotient (LQ) is a way of quantifying how concentrated a particular industry, cluster, occupation, or demographic group is in a region as compared to the nation. It can reveal what makes a particular region unique in comparison to the national average.

Occupation Data

Emsi occupation employment data are based on final Emsi industry data and final Emsi staffing patterns. Wage estimates are based on Occupational Employment Statistics (QCEW and Non-QCEW Employees classes of worker) and the American Community Survey (Self-Employed and Extended Proprietors). Occupational wage estimates are also affected by county-level Emsi earnings by industry.

Lightcast Job Postings

Job postings are collected from various sources and processed/enriched to provide information such as standardized company name, occupation, skills, and geography.

State Data Sources

This report uses state data from the following agencies: Minnesota Department of Employment and Economic Development; Montana Department of Labor and Industry; North Dakota Job Service; South Dakota Department of Labor and Regulation

Academic Program Termination

Institution:

North Dakota State University

Program Name:

Food Safety

Degree Types:

Master of Science
Doctor of Philosophy

CIP Code:

01.1099

Semester of Program Termination:

Summer

Year of Program Termination:

2023

Other Participating Institutions:

Not Applicable

Has an Academic Program Inactivation form previously been completed?

No

Describe the rationale for making the program termination:

Several faculty participating in the program have left NDSU. The program coordinator stepped down and a replacement could not be found.

Briefly describe how the institution plans to "teach out" any students remaining in the program:

There is one remaining student who will be defending (and plans to graduate) fall semester 2022.

Describe how the program is related to the workforce needs in North Dakota, and how these needs will be met by the state if the program is terminated:

There have been few program graduates in the last 10 years. Lightcast reports that there are 20 jobs in ND for the associated occupation in 2022 with a 10-yr prediction of 15 jobs in ND in 2032, a decrease of -24%.

Academic Program Termination

Institution:

University of North Dakota

Program Name:

BS in Industrial Technology

Degree Types:

Bachelor of Science

CIP Code:

15.0612

Semester of Program Termination:

Fall

Year of Program Termination:

2023

Other Participating Institutions:

Not Applicable

Has an Academic Program Inactivation form previously been completed?

No

Describe the rationale for making the program termination:

This program stopped admitting students over 5 years ago, with the last student recently graduating. There are no students enrolled in the program.

Briefly describe how the institution plans to "teach out" any students remaining in the program:

There are no students in the program.

Describe how the program is related to the workforce needs in North Dakota, and how these needs will be met by the state if the program is terminated:

These programs have been subsumed under other programs on campus, still meeting the workforce needs.

Academic Program Termination

Institution:

University of North Dakota

Program Name:

MS in Technology

Degree Types:

Master of Science

CIP Code:

15.0612

Semester of Program Termination:

Fall

Year of Program Termination:

2023

Other Participating Institutions:

Not Applicable

Has an Academic Program Inactivation form previously been completed?

No

Describe the rationale for making the program termination:

This program is too low enrollment to maintain. It will be modified to serve a broader population associated with the School of Entrepreneurship.

Briefly describe how the institution plans to "teach out" any students remaining in the program:

There are none.

Describe how the program is related to the workforce needs in North Dakota, and how these needs will be met by the state if the program is terminated:

These programs have been subsumed under other programs on campus, still meeting the workforce needs.