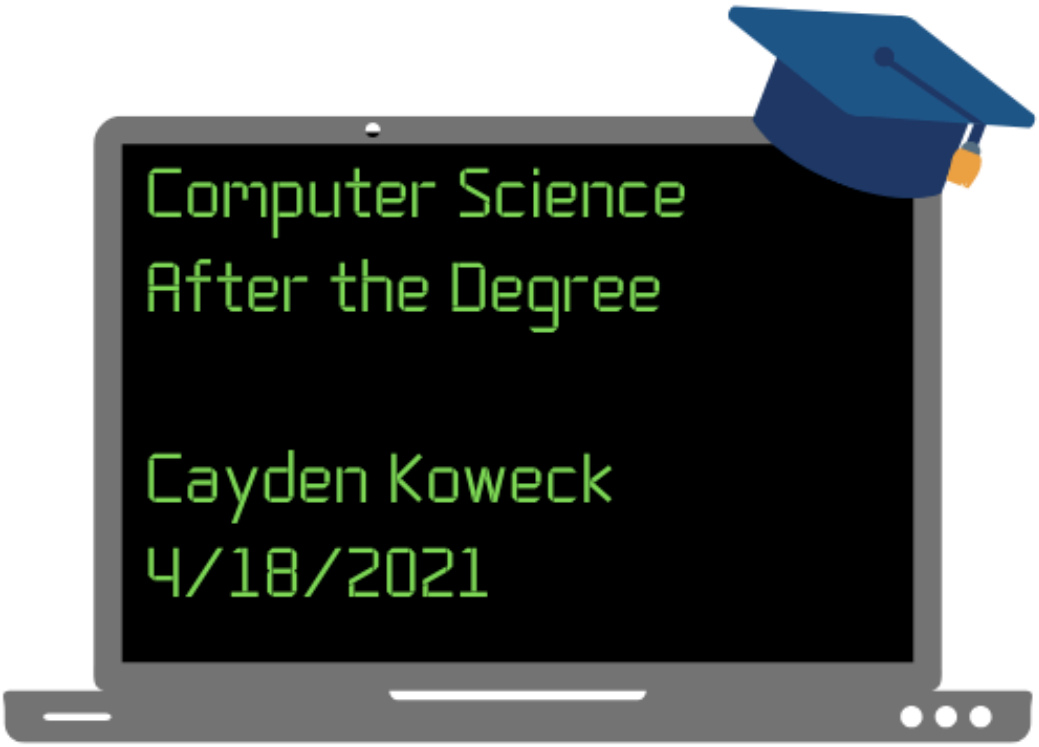
Computer Science
After the Degree
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Table of Contents

List of Figures

List of Tables

Introduction

In this recommendation report I will analyze data gathered from reputable sources to empirically determine the best courses of action in response to some common dilemmas that may come up. Whether or not to pursue a Postgraduate Degree, the best cities and locations for new Computer Science majors, what occupational titles are all subjects that will be addressed in this report.

As the number of college graduates steadily increases, the question of what to do after getting a degree becomes a more pressing matter. According to a study done by the Federal Bank of New York, the underemployment rate for recent graduates was just over 40% in 2020 (New York Fed). Pairing this with the ever-increasing price of higher education paints a precarious position for the graduating class of 2021. While Computer Science was once about computational theory, most colleges have pivoted it into a degree that prepares students for software development.

Being limited in time, and manpower means this study will be restricted to a few questions backed by outside study, with qualitative data gained via an interview with a professor here at Wayne state, as well as some relevant news articles. Although this report recommends some optimal strategies, many readers may have unique attributes and circumstances that invalidate or alter the conclusions made here.

I am well acquainted with research and information compiling. The final project of my senior year was an 8-page research paper on the Moral Application of Artificial Intelligence, incorporating dozens of academic articles, databases, and other sources. Additionally, I have gained experience working with large data pools as the Lead Scout of the Southgate robotics team. During my freshman year, I took charge of managing data collection (With the help of a dozen scouts under me), Automating analysis (Programming and developing a spreadsheet), and informing our drive team on the strengths and weaknesses of our allies and opponents during the competition. Finding patterns in large pools of data, and using those trends to make informed decisions is something I’m very familiar with. As a Wayne State student, I have access to a large collection of works and studies available in the university libraries in addition to the various connections that come with enrollment.

Methods

The primary method of analysis for most studies was comparative analysis, which allows the ranking of several properties of choices, and an allocation of points based on those rankings. Additionally, going with a weighted decision matrix allows me to attribute higher values to an options property, the weights are reported on the bottom of a table and rationalized in this section if they are used.

Most data came from other studies, mainly by the BLS. And while the analyses here are primarily supported by those studies, additional qualitative sources were used to grant context to the findings. These sources are mainly referenced in the discussion section. To grant further context to this report, I conducted an interview with Dan Oulette, a Computer Science professor at Wayne State who has 25 years of experience working as a Software Developer.

The first analysis reported in the findings section, the ideal location for CS majors, is a decision matrix of 10 cities noted for being strong candidates. Average Wage and Location Quotient were taken from the Bureau of Labor statistics, while job growth was taken from a study done by Glassdoor using software development job postings on their platform. The cost of living indexes were taken from BestPlaces, a research organization which uses the American Chamber of Commerce Research Association's 100-as-national-average model to determine the Cost of Living (COL) index of cities and states. They pull from multiple reputable sources (Available on their data page) to determine the average cost of housing, utility, health care, entertainment, transportation, food, child care, as well as tax rates of the locations it investigates.

While the Location Quotient for the Software publishing industry was included, its relatively loose association with job availability makes it only marginally useful when compared to other data points. Additionally, the cost of living for the state and city are both weighted lower, essentially taking the average score a city earned in both categories instead of the full amount of both. For example: Dallas earned 7 points for State cost of living, and 9 for City cost of living, earning it 8 points between the two categories.

The second analysis reported, which sought to determine the best university to pursue a graduate degree, uses data from USNews, and the National Center for Education Statistics (NCES). The acceptance rate is weighted lower to account for it being not representative of a decision's cost or benefit but of its realism.

The third analysis focuses on occupational goals, and which job titles are the most beneficial. Using data from the BLS's Occupational Outlook Handbook to compart average wage, availability, job growth.

The final product is a combination of these studies which lists several good options, lists their strengths and weaknesses (The importance of which varies from person-to-person) and determining the optimal strategy from those options.

Findings

Location Comparative Analysis

Location is an important consideration when building a career. For new graduates, moving out of their home state may provide unique opportunities. This study aims to find the optimal cities for computer science occupations using data on average wages, location quotient (ratio of an area's industry concentration when compared to a reference area, in this case, the US as a whole), industry growth, and cost of living. I determined these were valuable statistics in determining not just the overall job market for Computer Science, but also the difficulty of making a living in that area (COL index).

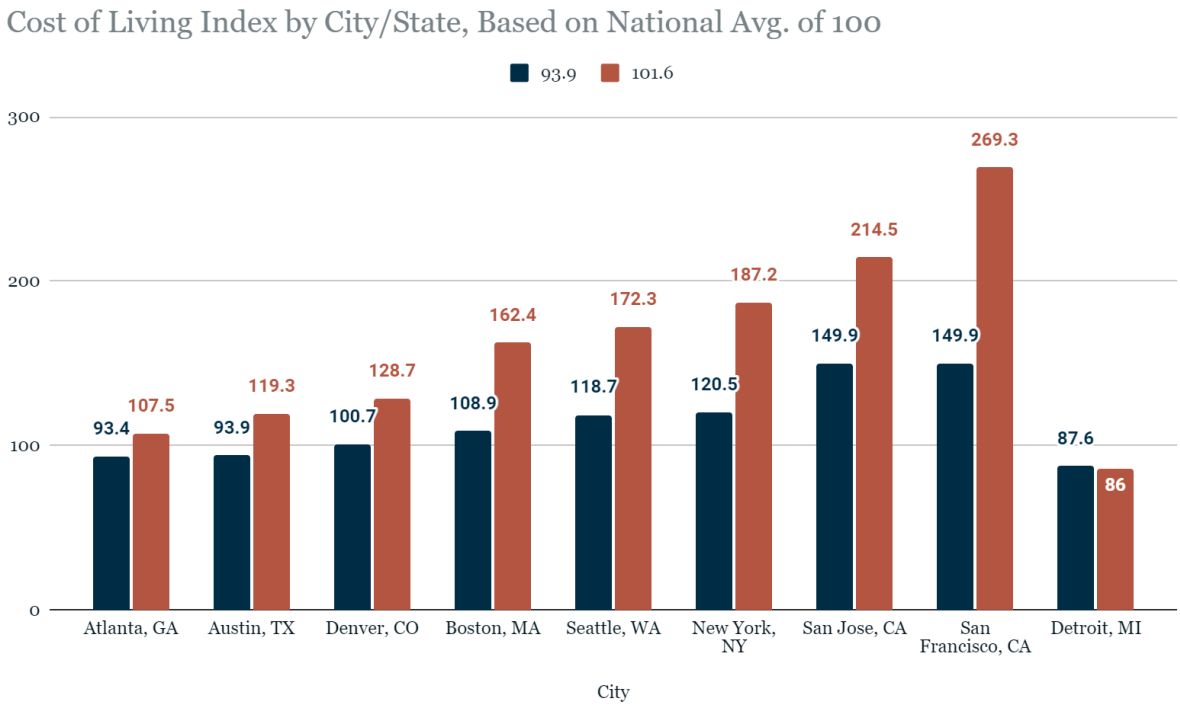
Based on the data, Seattle, Washington is the best choice, while Denver, Colorado and Austin Texas are also good options. More information about these findings is available in the Discussion section.

Table 1: Location Comparative Analysis

City	Wage Ranking	Location Quotient	Growth	Cost of Living (State)	Cost of Living (City)	Points
Dallas, TX	6	3	4	7	9	19.5
Atlanta, GA	4	7	3	9	8	19
Austin, TX	5	5	7	7	7	21.5
Denver, CO	7	4	7	6	6	22
Boston, MA	3	6	2	5	5	13
Seattle, WA	8	10	10	4	4	27
New York, NY	2	2	4	3	3	10
San Jose, CA	10	9	1	1	2	17
San Francisco, CA	9	8	6	1	1	20
Detroit, MI	1	1	9	10	10	20.5
Weights	1	0.5	1	0.5	0.5	

This graph illustrates the cost of living index for the cities based on a national average of 100 to give a more proportional view of the data.

Graph 1. COL Index By City and State



Graph 1 Shows the difference in cost of living for the 9 cities analyzed.

Graduation School Comparative Analysis

According to a study done by researchers at Georgetown University, 30.9% of CS majors attain a graduate degree, and for this specific field, it raises your median potential salary by about $17,000, making it highly likely to pay for itself within the first decade of employment. While the decision of whether or not to go to graduate school is an important question in it's own right, it depends on a variety of case-specific factors, which graduate school to go to can be determined much more concretely.

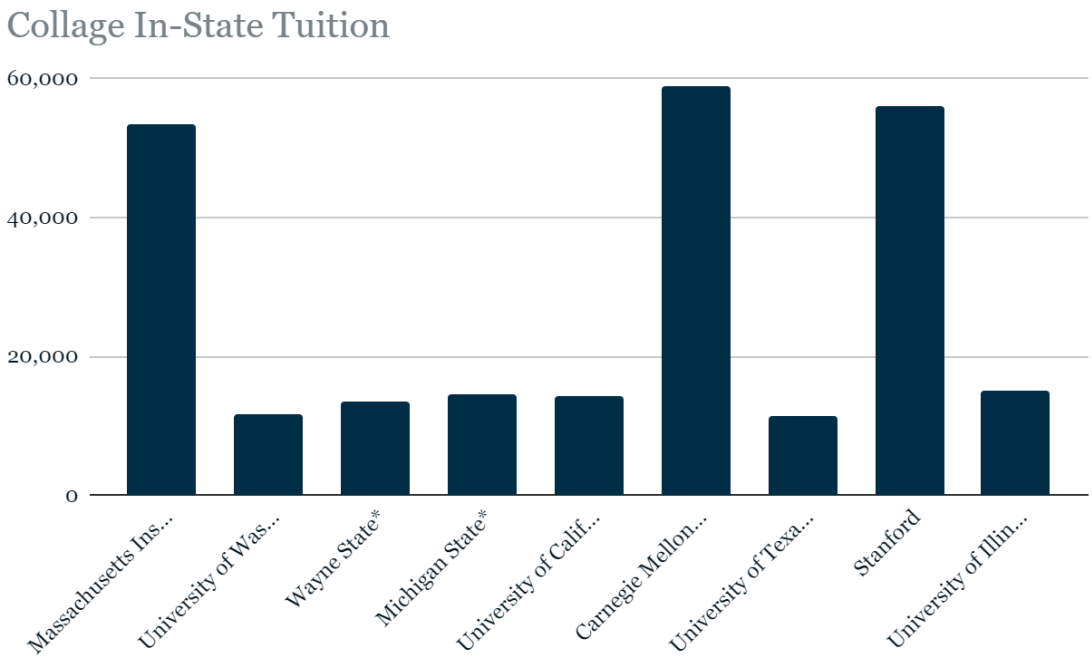
The following analysis determines the best college to attend graduate school based on program ranking (USNews), in-state tuition cost, the amount of students currently enrolled in the graduate CS program (representative of its overall appeal, and peer support). Colleges marked with an asterisk offer Computer/Information Science degrees instead of a specialized Computer Science Degree.

Based on the results of the comparative analysis, the University of Illinois is the best option. Second is the University of Texas (Austin Campus), and a three way tie between The University of California (Berkeley Campus), the University of Washington, and MIT.

Table 2. Graduate School Decision Matrix

School	CS Ranking	Avg. In State Tuition	Enrolled	Acceptance Rate	Points
Massachusetts Institute of Technology	6	3	7	2	34
University of Washington	4	8	2	6	34
Wayne State*	1	7	4	9	33
Michigan State*	2	5	1	8	24
University of California - Berkeley	6	6	3	4	34
Carnegie Mellon University	6	1	6	3	29
University of Texas - Austin*	3	9	5	5	39
Stanford^dMA	6	2	8	1	33
University of Illinois Urbana-Champaign	5	4	9	7	43
Weight	2	2	2	1	

Graph 2. College In-State Tuition



Graph 2 shows the difference in tuition between the university, establishing two distinct price points.

Occupational Comparative Analysis

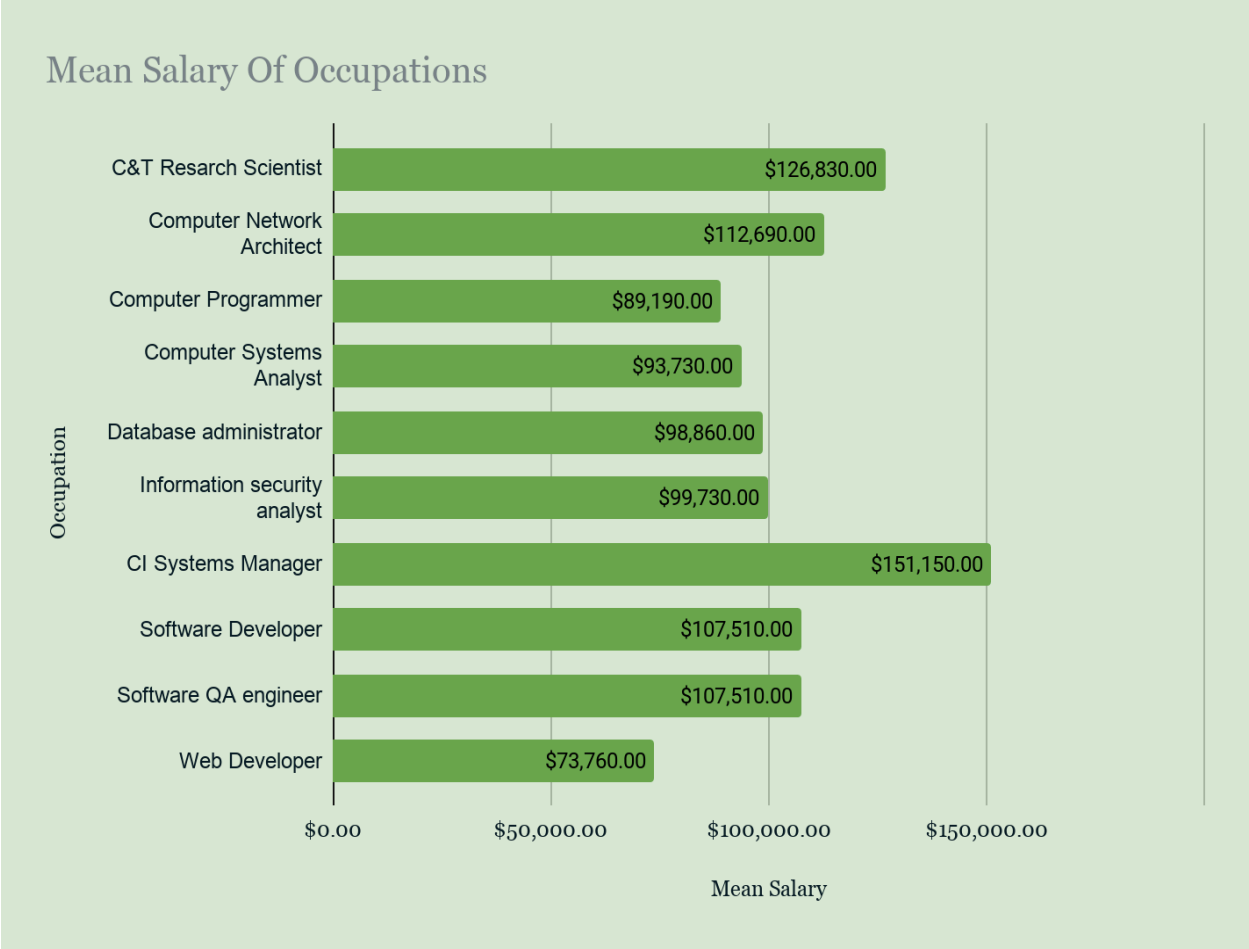
Determining the career path you want to take with your degree is the most important thing to consider when dealing with your future as a graduate. This comparative analysis is intended to direct you towards the most viable Occupations available. Taking into account the mean earnings, the amount of openings, and the overall job outlook.

Based on these factors, Software Development is the optimal choice for its large amount of job openings and continued growth. Two different titles that are also great options are CI Systems Manager and CIT Research Scientist.

Table 3. Occupational Comparative Analysis

Occupation	Mean Salary	Jobs (2019)	Outlook (2019-2029)	Total
C&T Research Scientist	9	1	8	18
Computer Network Architect	8	5	2	15
Computer Programmer	2	7	1	10
Computer Systems Analyst	3	9	3	15
Database administrator	4	4	6	14
Information security analyst	5	2	10	17
CI Systems Manager	10	8	6	24
Software Developer	6	10	9	25
Software QA engineer	6	3	4	13
Web Developer	1	6	4	11

Graph 3. Mean Occupational Salary



Graph 3 gives a clearer picture of the difference in salary for these careers.

Discussion

Location Comparative Analysis

Seattle is the obvious winner here with a high ranking in earnings and job growth. However, the high statistics are due to the presence of Microsoft and Google, which are both very lucrative and very selective. Paring that with competition from the University of Washington, which has a great CSE program. Seattle has a difficult job market to break into. Your decision to go here should depend on a particularly strong resume and excellent interview skills, be prepared for questions on data structures and algorithms. This is a great choice if you are interested in research and development work.

For a more general-purpose career, Dallas and Austin are great choices for their relatively low cost of living and the recent boom in tech companies, with the former being regarded as a business hub, and the later earning the nickname “Silicon Hills” due to its involvement in the tech world. Colorado also boasts a low cost of living, an array of housing costs, and a large number of Information Technology firms, providing an array of opportunities for CS majors (Chamberlain).

Silicon Valley still offers a great opportunity due to the massive amount of tech companies that are hosted there, hence the nickname “Silicon Valley”. The extremely high cost of living, when compared to other options, makes this a hard area to recommend unless you have separate reasons for wanting to move there. With many companies spreading out of the tech hub it’s not as lucrative as it once was.

Detroit is a great option for its low cost of living, while the average wage in the software publishing industry is not great, the unmatched growth of computer Science jobs makes this a good future-proof decision.

Graduate School Comparative Analysis

The University of Illinois is the best choice on account of a large base of peer support, as well as a reasonable tuition ($15,015) and low selectivity. It should be your pick if a graduate degree is your top priority.

While a Phd is a degree that focuses primarily on research and development, and as such is a highly specialized program, a masters degree is technical in nature, and an expansion on the topics you’ve already studied. One will narrow you in on a high-level career while the other will expand your options and accelerate the growth of your career.

Occupational Analysis

A software developer is the general-purpose job of a programmer, you'll be designing applications and programs to fit your client's needs. This job has by far the most openings out of the six because it's not a specific title, as such, the languages and tools you need to be familiar with vary greatly with the company you want to work for. Strong proficiency and interest in object-based programming is almost always a requirement, and focusing on the major languages like Java, C, and Python as well as a few niche programs will help build your repertoire and make you viable for a lot more job openings. At 22% projected growth in the next decade, Software Development will only increase in demand making it a very safe bet for building a career.

As a CIT Research Scientist, you'll be working in a lba environment developing new computing technologies, as well as finding new applications for existing technologies. While a Masters degree is usually a requirement, a Phd will give you a more comparable experience for your career. This Career has a high salary and growth potential.

Pathway Suggestions

Since in-state tuition is a valuable boon when going to grad school, working in the state you plan to get your graduate degree for about a year is important to both finance your education, as well as paying a lot less for it.The three recommendations presented in this section follow that rule.

Table 4. Seattle Pro/Con Chart

Seattle >> University of Washington >> Phd >> CIT Research Scientist	
Pros	Cons
Very High Potential Salary	Higher Cost of Living
Working for High profile Companies	Competitive job market
	Ph.D. is restrictive to Career
	Highest cost of Education
	Requires the most Time Investment

Table 5. Austin Pro/Con Chart

Texas >> University of Texas >> Masters >> Software Developer	
Pros	Cons
Good potential Salary	No Specialized CS degree offered
Graduate degree not a necessity	Lowest Acceptance Rate
Wide job choice	
Low Time Investment	
Low Monetary Investment	

Table 6. Detroit Pro/Con Chart

Detroit >> Wayne State >> Masters >> Software Developer	
Pros	Cons
Low Cost of Living	Low mean Wage
Graduate degree not a necessity	Not a High-profile CS University
Decent Job Choice	No Specialized CS degree offered
Low Time Investment	
Low Monetary Investment	
Very Realistic Acceptance Rate	

The most advisable pathway is to pursue a career as a software developer in Austin, Texas. Which has a great Computer Science Program if you decide to pursue a graduate degree. Although one is not required to build a career here. Software development is the optimal choice for a career, and it may lead into one of the more financially lucrative positions.

If pursuing a Phd is a decision you make, the Seattle route is the best option, as most of the cons listed are intrinsic to the acquisition of a Phd. (restrictiveness, high cost/time investment, and a competitive program).

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