

Prospectus

Skills Needed by Software Engineering Interns
(Technical Topic)

The Inequality between Women and Men in the Tech Industry
(STS Topic)

By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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Introduction

With the tech industry being 75% male (Western Governance University, 2020), women commonly feel intimidated in the technology space. The Amazon hiring tool built in 2014 that aimed to retrieve top talent reinforced that intimidation by incorporating gender bias that downgraded women's resumes for software engineering positions (Goodman, R. 2018). Amazon engineers were feeding male dominated resume data from the past 10 years into the algorithm which incorporated bias that further highlighted the current demographic within tech (Dastin, J, 2018).

As a woman in STEM, I have experienced many barriers prior to studying Computer Science (CS) at school. The gender gap between women and men in CS related opportunities was apparent to me since a very young age – for example, when I was taking AP Computer Science in high school. Statistically, the percentage of women students who take AP Computer Science A is 34% (College Board. 2020) and the percentage of women who hold CS degrees is 18% (U.S. Department of Education, National Center for Education Statistics. 2016), which is a decrease since its peak in the 1980s at 34% (Vu, S. 2017).

The disproportionate representation of women in tech affected me subconsciously and altered my viewpoint on whether I could succeed in the tech field. I felt intimidated by men in my major who had been coding since they were 13 years old and had the skills to be a part of exciting new projects that they were interested in and that also sharpened their technical skills to become more marketable to tech companies. This is not an uncommon feeling amongst women in tech since the representation of women in tech is so little. In fact, '72% of women in tech are regularly outnumbered by men in business meetings by at least a 2:1 ratio. 26% of women

report being outnumbered by 5:1 or more' (Sullivan-Hasson, E. 2021). Not surprisingly, this unbalanced ratio has led women to overcompensate and try to 'prove' their worth to men – that percentage being 78% (Sullivan-Hasson, E. 2021).

To gain confidence in my technical skills, I interned at Fortitude Technologies, a small government contracting company that works in the intelligence branch, this past summer. Through my internship at Fortitude, I was able to gain the confidence and skills to affirm my choice to pursue CS and become more marketable in the tech industry. However, the onboarding process to become adept in the workplace was shocking and time consuming. I propose to create a course that simulates life as a software engineer where students can learn real-life industry skills and practices.

While incorporating my proposed course into the school curriculum that aims to teach real industry skills and practices, it is important to keep in mind the science, technology, and society (STS) aspect of the problem that I faced when fearing my career in technology, which is the social construction of technology (SCOT). In the tech industry, women are the minority, and as a minority, they are bound to feel imposter syndrome more than men. I will use the STS framework of SCOT to analyze why women feel more intimidated in the tech industry and how changing the bias against women in tech to be more inclusive and encouraging early on will shape technology to also be more inclusive.

Technical Problem

Fortitude Technologies LLC, a small government contracting company that works in the intelligence branch, needed an improved internal platform to match open positions to current employees or applicants based on wanted skill sets. The other interns and I were assigned to develop this internal platform since we did not have security clearance. Fortitude's goal with this

project was to automate the email process in a serverless application. The platform utilized React, AWS services, MySQL, and Unit testing (testing the smallest piece of code that can be logically isolated in a system) and was developed in an Agile cycle – a type of software development that emphasizes small iterative deployments to achieve a larger product goal. It was a struggle getting familiar with all the technologies, frameworks, and software development practices utilized in this project, that is, learning how to efficiently work as a software engineer in the industry.

Currently, many curriculums teach the basic CS topics such as Data Structures and Algorithms and Computer Organization and Architecture. While those are necessary in a CS curriculum and provide a great foundation to students, oftentimes those students are shocked to see how little they use those concepts in their future careers. If curriculums continue to only teach the basic CS topics, students will fail to gain insight into how the tech industry is currently operating and will be shocked to see that much of their knowledge that they learned in school cannot be applied to their work.

I believe that students would benefit from real life industry practices and knowledge about trending new technologies. To strengthen students' confidence in their ability to thrive in the industry, I am proposing a course that simulates life as a software engineer. Future software development interns should be equipped and ready to understand the whole tech stack (even if they are not working on a full stack project) and should be knowledgeable of the best kinds of software development practices such as Unit testing and Agile development. Students would benefit from being taught real life knowledge and practices of the tech industry so that the onboarding process of their first software development internship will go much smoother; by

doing this, companies will also save more time and can put new software engineers on company work much quicker.

To analyze this issue, I will draw upon “Beyond the Computer Science Curriculum: Empowering Students for Success” which delves into many other topics that students would benefit from in order to become successful in CS that doesn’t only include course material. I will also refer to my entire CS curriculum and compare it to my skills that I learned at Fortitude to show what students would benefit from in addition to the current CS courses being offered provide. The curriculum provides a solid foundation for students but could be so much more if it also incorporated more software engineering ‘simulation’ so that the transition from school to industry work isn’t as shocking.

STS Problem

In 2014, Amazon engineers set out to develop a hiring artificial intelligence tool that would automate its recruitment. Its goal was to be handed 100 resumes and pick out the top 5 to hire. ‘The company created 500 computer models to trawl through past candidates' résumés and pick up on about 50,000 key terms. The system would crawl the web to recommend candidates.’ (Hamilton, I. A. 2018). However, this included massive amounts of gender bias against women because the AI was combing through mostly male resumes submitted to Amazon over the past 10 years. This isn’t just a problem at Amazon, in fact, 48% of women in STEM jobs reported discrimination in the recruitment and hiring process (Daley, S. 2021). In an interview with Ziff, Inc (a company that creates unstructured databases powered by AI) Cofounder Ben Taylor, he said:

Every human on the planet is biased. We all carry an incurable virus called our unconscious bias. I firmly believe that AI is the only way we can reduce human bias with

recruiting. Unfortunately, naively using AI for recruiting is a guaranteed recipe for disaster. Racist/Sexist AI isn't a risk, it is a guarantee if used by inexperienced teams. AI will naturally learn our bias and amplify it. (Papadopoulos, L. 2018).

Currently, the failure of the Amazon AI hiring tool is often described as a gender bias against women and is solved with extensive research and impact facing (Papadopoulos, L. 2018). This viewpoint fails to shed light up on why this bias occurs. If we continue to view biased technology as just a gender bias and don't delve deeper into why this bias even exists, we will continue to see companies create gender-biased technology because of the lack of representation of women in tech historically.

I argue that the Amazon AI hiring tool gender bias is a result of society discouraging STEM careers for women from a young age. By acknowledging and understanding that negative bias against women in tech is a societal issue that has been occurring for centuries, we can start to include women in the development of new technologies like the Amazon AI Hiring Tool. This will start to generate technology that will include and benefit everyone in tech. SCOT aims to challenge the process of tech design, and that the technologies that result, are socially constructed (Microsoft. n.d.). Applying this concept, I will analyze the process of how the Amazon hiring tool had failed due to social constructs against women in STEM. I will reference exclusive interviews with women who work at Amazon and reports regarding the hiring tool issue.

Conclusion

The deliverable for the technical problem discussed in this paper will be an in-depth report of my experience at Fortitude Technologies, what prepared me for this experience, and what I think other students going into the tech industry would benefit from through a revised

course that aims to teach and simulate real life software engineering skills and practices. The STS research paper will strive to highlight why the struggles that I felt as a woman in the tech space have been experienced by many women in STEM because of the social construct against women pursuing STEM careers. This will be accomplished by applying the Social Construction of Technology to emphasize how this cycle of discouraging women going into STEM careers will create gender gaps within the tech industry, which will then result in biased technology. The combined result of the technical problem and the STS research paper will serve to solve the issue regarding the overwhelming feeling of imposter syndrome amongst women in STEM from a sociotechnical viewpoint with a new proposed school course that will boost confidence for students going into the tech industry and an in-depth look into why discrimination against women going into STEM creates gender biased technology.

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