Thesis Project Portfolio

Internship at L3Harris: Software Engineering and Signal Processing

(Technical Report)

Department of Defense Funding for Fiscal Year 2023

(STS Research Paper)

An Undergraduate Thesis

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In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering

Natasha Mathew

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Sociotechnical Synthesis

Introduction

My technical capstone focuses on my signal processing work I did for beamforming capabilities at my summer internship. My STS research project focused on federal funding for defense research and development. I chose this STS research project because over the summer I worked at a federally contracted defense company. My STS research paper was about how the defense budget gets allocated for the specific 2023 fiscal year. My technical paper goes into the federal defense work that I did in the summer 2023. I picked my STS research paper because I wanted more information on how my projects at the company get funded because I realized that the funding affected what specific project I worked on.

Technical Report

L3 Harris, an American technology company and defense contractor, found that its sonar testing process was outdated and needed additional capabilities. In order to address this problem during my internship, I worked on beamforming and pre-processing techniques for the passive sonar of the Multi-function Towed Arrays (MFTA). I worked on existing C programs that performed beamforming and added capabilities for half azimuth, an array with hydrophones that cover 180 degrees. The problem our team ran into was the half azimuth beams were not compatible with the functions associated with the active sonar that built off the array I was working on. We created a function that could mirror the beams of the half azimuth before the tap off to the active sonar. I added a new select_mode for the beams in the configuration file called beam_mirror, which loops through the array of half-azimuth beams and copies the beams over to a new side, creating a full-azimuth array. Creating this function allowed for a more efficient, seamless beamformer whose function was validated through testing with MATLAB comparison

tools. There still needs to be more thorough testing of the new beam_mirror function and of the passive and active sonar processes done by observing the total actual output of the array compared to the expected in order to ensure the functionality of the beamformer.

STS Project

My STS project researches how the federal government allocated money to the Department of Defense's Research and Development sector for the fiscal year 2023. I picked that specific year because there were special circumstances such as it being right after an election year and global military conflicts were present. Through my research I explored different aspects of how the federal government allocates defense funding for research and development, such as lobbying from defense contractors and debates that happen within Congress. I analyze my research through the social construction of technology (SCOT) framework and look at how the different relevant social groups affected the funding. I go into the motivations and background of different groups such as Congressmen and federal contractors to paint a clearer picture of defense funding. I research how lobbying, political motivations amidst looming global conflicts, and the desire to modernize military technology all affected defense funding in 2023. I argue that all these topics together help understand how defense funding for the 2023 fiscal year was about reflecting strength and projecting unity in the face of uncertainty.

Conclusion

Working on these projects at the same time has been extremely valuable to me because it allowed me to understand the bigger picture of what I was doing at my internship. Seeing how funding is allocated made me realize why I worked on certain projects and how that affects what work the team did. My STS paper gave me a good foundation to better understand why I did the work that I did at my internship and who it was for. My technical paper allowed me to see the

observable outcomes of the research that I did in my STS paper. Both together can help me with

future research into defense funding and work for federal contractors.