Reverse Engineering: Its Critical Role in Computer-Based Forensic Investigations

(Technical Report)

Bridging Socioeconomic Gaps: An Analysis of Persisting Inequity in the Education System

(Sociotechnical Research Paper)

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by

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Educational inequities persist through our modern education system despite efforts to address them, and the gaps between groups of students are growing. Education is viewed as a critical pillar to society and is often perceived as one of the most efficacious equalizers for those under the poverty line. Despite its potential, it now often serves as a barrier instead due to a lack of equal access for students in minority groups and those of a lower socioeconomic (SES) background. The focus of the STS component of this project was to analyze educational inequity and factors that contribute to it. The technical aspect was unrelated to the general research problem, as it followed a CS Capstone approach, where I discussed my experiences in an internship project I partook in.

The STS component of the project focuses on persistent inequities in the education system. First, it discusses the roots of inequity, in racial segregation of school systems. It goes on to explain how this inequality evolved into inequity, due to improper distribution of resources throughout the educational system. SES is found to be a factor that is strongly linked with education quality and outcome. A large contributor to SES's correlative relationship is how it can influence access levels to technology, which in itself has an impact on a student's education. There are also other struggles lower SES students face that are external stressors. The work goes on to use the Covid 19 Pandemic as a case study of how students of lower SES can be affected disproportionately by those external stressors. Many students lacked access to devices and the internet during the pandemic, which prevented them from completing their schoolwork effectively. Finally, the work examines some case studies of efforts being put forth to address inequity by nonprofit and for-profit companies across the US.

The technical component of my project was less research based and more so describing a critical part of my education outside of school. It focused on a Reverse Engineering problem that I was tasked with at an internship I have been participating in for six years. I discussed how I broke down the problem, analyzed it systematically, and rebuilt the functional program by the end. I was tasked with determining the purpose of an unlabeled file. After finding it to be executable and disassembling it, I worked my way through the assembly code, slowly reverse engineering the program to determine its function and purpose. Eventually, I determined the program, and a set of files I found within it, were a corrupted Docker container. I rebuilt the program to a functional state and completed the project.

The STS portion of my research does a good job contributing to the broad picture view of educational inequity. It lays out where inequity is stemming from and some of its negative effects; however, I think it should only serve as a starting point for further, more pointed research. It would be beneficial to continue with a higher level of specificity for many of the problems discussed in the original work. For example, when case studies are presented for current efforts in combating inequity, it would be beneficial to develop metrics and analyze how effective each of those efforts had been to compare and contrast them. Such research could lead to increasing the efficacy of the efforts seeking to aid in

addressing issues with inequity. The technical component of the project did not embody research; it served more as a project for me to gain experience in my field. With that being said, the project made it clear that there is a need for a program capable of rebuilding Docker containers, something that proved to be painful to do manually. This may serve as grounds for future expansion on the work completed.

I am thankful to Professor Peter Norton, who permanently altered my view of my role as an engineer in society and had a massive impact on my education. Professor Norton fostered a unique classroom environment that promoted positive discussion of ethical and social issues from diverse perspectives. He also aided in the preliminary pieces of research for the STS component of this project. I would also like to thank Professor Caitlyn Wylie who provided extensive feedback through multiple drafts of writing the STS research component of this project. That style of writing has never been something that came easily to me; she was extremely helpful in the organization and production of the STS paper. I would finally like to thank Ms. Rosanne Vrugtman, my technical writing instructor, who provided excellent feedback on the drafts of my technical paper.