

Thesis Project Portfolio

Speculative SuperOptimization: Boosting Performance via Speculation-Driven Dynamic Binary Optimization

(Technical Report)

Vetting Social Media: Has social media contributed to anti-liberalism and anti-democracy in the US and India?

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

Technology has been evolving at an unprecedented rate since the twentieth century. The modern processor and social media giants of today are both the result of that sharp advancement, and in some ways have encouraged each other's growth. The ability of processors to handle mass computation made the creation of social media possible while the need of social media for better and more focused processors encouraged specific research into modern processors. For my project, I worked on both of these technologies, with a more technical approach toward the processors and a social approach toward the social media platforms, specifically WhatsApp, Twitter, and Facebook.

I was inspired to lead research into processors after taking CS3330, Computer Architecture at UVA. During the class, we went over different techniques that researchers had come up with, each incrementally making the processor faster and more secure. Captivated by the content, I reached out to my Professor and requested an opportunity to work with him for my Capstone project which he granted. My project involved finding vectorizable loops encountered in a program for them to be vectorized so a speedup could be achieved. The analysis I intended to do was done post-deployment and post-compilation as more information is available at runtime than at compile-time, which allows for more loops to be vectorizable, leading to a potential higher speed-up. The project required multiple steps beginning with writing an algorithm to detect a loop and then writing an analysis script to determine if a loop is vectorizable. The loop detection algorithm successfully found the loops in a stream of instructions given to it and the analysis script narrowed down the loops leading to a vectorizable loops list. This provided the information needed for the next researcher to speculatively vectorize the output loops and garner a speed-up.

For my social project, I was inspired by the recent reckoning that social media companies are facing in Congress and elsewhere. After claims were made that social media companies had damaged liberal and democratic values, and promoted radicalism, I hoped to study more into the phenomenon. I focused my attention on two major democracies in the world, the US and India. I also limited my social media platforms to Facebook, Twitter, and WhatsApp. The evidence researched was analyzed through Winner's *Do Artifacts Have Politics?* framework. After my research, it was revealed that these companies had indeed hurt the democratic tenant of free and fair elections and increased people's distrust in the system. It was also revealed that they hurt the tolerance of society by promoting radical and fringe ideas. These findings could now be used to create better policies regarding social media platforms and their role in society.

In this portfolio, you can expect to learn about a technique that could be implemented in future processors in order to get a speed-up. You can also expect to read about the criticism social media companies are facing and in what ways that criticism is accurate. These findings could potentially have a practical impact on many people's lives.