**Thesis Project Portfolio**


**Occam's Razor in CS: Creating Value for Clients in the Simplest Way Possible**

(Technical Report)


**The Technological Momentum of Data Centers in Northern Virginia**

(STS Research Paper)


An Undergraduate Thesis


Presented to the Faculty of the School of Engineering and Applied Science

University of Virginia • Charlottesville, Virginia


In Fulfillment of the Requirements for the Degree

Bachelor of Science, School of Engineering


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Spring, 2025

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**Executive Summary**

What is the cost of using artificial intelligence (AI) for developers, software companies and their clients, and the inhabitants of the regions where AI infrastructure resides? The recent exponential rise in the use of AI has turned the software world upside down. Software companies and their developers are rushing to incorporate this flashy new technology into their deliverables, but a further examination of the social, economic, political, and environmental cost of this technology is necessary and often neglected. Throughout the history of software development, new technologies have risen and fallen with the promises of transforming the industry. Therefore, it is worth considering that the best approach to providing high quality software deliverables is to create the simplest piece of software possible, perhaps neglecting any new fads in the industry. When these new technologies emerge, they require infrastructure to function. Data centers power AI, cloud computing operations, and blockchain technologies. Northern Virginia is the global hub for data centers, and local lawmakers have been quick to facilitate the rapid expansion of the data center industry. However, the industry has changed the social, political, economic, and environmental landscape of Northern Virginia. It has been increasingly difficult to regulate the industry due to the amount of technological momentum it has gained due to its economic benefits. A deep analysis as to how this momentum has affected Northern Virginia and how data center companies and local lawmakers are sustaining or slowing this momentum will illuminate the benefits and dangers of allowing such a technology to consume the social, economic, and political identity of Northern Virginia.

What is the cost of introducing complex technologies, specifically AI, into codebases for software developers? In the current landscape of the software world, companies are tripping over themselves trying to incorporate AI into their products. Its inclusion has the risk of being a silver

bullet solution that only serves to satisfy shareholders while providing a worse quality product. Often times, its presence is nothing but a buzzword to stimulate profits. The time developers spend incorporating AI into their products could be better spent generally refining the product, especially if developers have to spend time learning how to implement it. Therefore, I posit that software made in the simplest way possible is higher quality than software bloated with complex technologies like AI. In order to test this, I suggest having two teams of software engineers be prompted with creating the same product. One of the teams will adopt a simple approach and not incorporate AI, while the other team will include it. The quality of both products can be judged on how many deliverables they hit.

How has the snowballing technological momentum of data centers affected Northern Virginia, and how are data center companies and local lawmakers acting in response to the industry's increasing presence? Northern Virginia has tethered its social, economic, and political identity to the data center industry, but there is little literature on how the industry has been affecting it. Therefore, I have done a deep dive into the existing literature on the topic using both computer science and political science scholarly literature databases. Furthermore, I examined town hall meetings where data centers were proposed, statements from data center companies, and interviewed former Virginia State Senator Chap Petersen to learn about how and why he has been pushing back on the data center industry. Because of the Pentagon and CIA Headquarters being located in Northern Virginia, and because of their outsourcing of technical work to government contractors in the region, Northern Virginia has accrued prestige for being a technology hub ever since the Cold War. When data centers started popping up to support cloud computing operations, Northern Virginia was a perfect candidate to house a large amount of centers. Since then, data centers have provided hundreds of billions of dollars in tax revenue and

tens of thousands of jobs for Northern Virginia. However, data centers account for a whopping 2% of global electricity demand. They jeopardize Virginia's carbon-neutral efforts and carry a massive environmental footprint. Despite this, data center companies sustain their momentum by citing economic benefits. Pro-data centers lawmakers shrug off any regulation efforts by claiming they would hurt the region's technological prestige. Opposing lawmakers cite environmental concerns and claim there is not enough known about data centers' impact to continue to allow the region to be dominated by the industry. The state and its counties have allowed the exponential growth of the industry while only commissioning studies about its effects. This is not enough to curb any negative socio-economic effects–only actual regulation will do that.

I have provided a deep analysis into how AI and its infrastructure have affected stakeholders. In an age where software companies are "moving fast and breaking things," my portfolio serves an important reminder to consider the social, political, economic, and environmental effects of adopting flashy new technologies like AI. To anyone looking to further research this issue, I suggest a more comprehensive look into impacts data centers have had on specific communities in Northern Virginia. These voices are often bulldozed over by companies' fancy buzzwords and economic promises, but it is these voices that can further illuminate the impact of data centers and AI.