

Thesis Project Portfolio

Data Clustering and Representation: Displaying High Volumes of Geodata Efficiently and Meaningfully

(Technical Report)

The Struggle over the Future of Data Centers in Northern Virginia

(STS Research Paper)

An Undergraduate Thesis

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Sociotechnical Synthesis

With the rise of AI and Big Data, data collection and storage have become a core part of modern computing. As a result, the need for efficient and accurate methods of representing data has increased and so has growth in the data center industry. My technical project describes the challenges faced and solutions developed in displaying high volumes of data on the map of a web application in a clear, efficient, and meaningful manner. By clustering data points hierarchically, I developed software that displayed point clusters reducing the load on a user's browser and allowing more data to be represented. The solution considered factors such as speed, accuracy, and visual clarity to allow the rendering of over 75,000 data points at once while not obfuscating too many details from the end user. Furthermore, the use of open-source libraries and other optimizations helped improve browser compatibility and performance. The result of the project was an overall increase in the working capacity of a pre-existing web application, enabling the software to play a key role in assisting business leaders in analyzing and viewing high volumes of geodata with speed and accuracy.

My STS research paper investigates the influences of social groups over the rapid expansion of data centers in Northern Virginia using the social construction of technology (SCOT) framework. Northern Virginia has become home to many of the world's data centers due to its cheap land, reliable energy, and low risk from natural disasters. However, there are debates over where data centers should be located and their effects on local communities and the environment. Motives like financial opportunity and technological advancement have led companies, associated trade associations, and other organized social groups to also try to influence policy. In contrast, factors like noise, energy consumption, and environmental and historical conservation have mobilized many advocacy groups to ask state and local governments for limits and greater regulation on the data center industry, with some questioning the necessity

of data centers overall. Either way, the rapid expansion of data centers in the region serves as a case study in understanding how the actions and agendas of social groups influence public policy.