Thesis Portfolio

Developing a Reliable and Economical Web Portal for Meals on Wheels

(Technical Report)

Language Models and Online Bot Revolution

(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, 2020

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Sociotechnical Synthesis

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Online services are an essential component of our society. We use online communication channels to stay connected, online tools to store and share information, and online platforms to monetize our efforts. This thesis investigates online services from two major angles. First, our UVA Capstone team did technical work to improve the tools that are used by a local nonprofit organization, Meals on Wheels. Second, I investigate the problem on online bots in world-scale, text-based communication channels. While the domain and scope of these two endeavors are very different, they are both in the pursuit of a better understanding of how to use the internet to make the world a better place.

Meals on Wheels Charlottesville/Albemarle is a local nonprofit organization that uses the internet for action. They provide "nutritious meals to the ill, aging, and convalescing residents of the Charlottesville/Albemarle," leveraging donations and volunteers to maintain a flexible cost structure. Meals on Wheels staff use software to organize the customers, volunteers, routes, and food, and the software is hosted on the online cloud. In order to allow the organization to grow while keeping costs low, the Meals on Wheels Charlottesville/Albemarle organization needs a new online portal. Our UVA capstone team has worked with the Meals on Wheels staff to satisfy the staff needs and to unroll the technical debt accrued by the previous two capstone teams that worked on the application.

The STS research paper explores the problem of online bots on social media and analyzes potential solutions from research scientist's perspective. How can the software engineers and research scientists that support online forums adapt to the proliferation of bots that are

indistinguishable from humans without infringing on free speech and privacy? Documentary research provides a foundation for analyzing options for tackling both technical and social problems. Actor-Network analysis is an effective way to synthesize the literature and gain new insight into the intricacies of the problem space. Actor-Network analysis also provides a unique perspective on bots, since it treats both human and non-human actors as identical. Wicked problem framing is effective at extrapolating the analysis to the future of bot development and providing insights on how to adapt int the paradigm shift towards ubiquitous bots that are indistinguishable from humans. It is expected that no solution will satisfy all constraints and objectives. Therefore, a holistic approach is necessary, combining a social shift towards increased awareness from users, transparency from online platforms, regulation of those platforms, and a spectrum of choices available to users that offer a variety of freedom, privacy, and authenticity. This research will provide a groundwork for future technical, social, and regulatory work in solving the problem of online bots. The analysis of the engineering process itself will also contribute to other engineering disciplines since all engineers face similar contradictions between users' values and the health of society in general.

Working on the implementation of the new Meals on Wheels Portal while working on the research into online bots afforded two unique insights. First, while working on the Meals on Wheels portal, it was imperative to get feedback from our users, the Meals on Wheels staff. At several points, we discovered that initial framing of the problem was insufficient and we had to reevaluate. This is relevant for world-scale online services. The needs of the users are the driving force behind the progression of the service. Users want freedom of speech, privacy, etc. Both projects benefitted from the exposure to this reality from the other. Second, the issue of online bots was relevant to both projects. For the STS research, bots were the focus; however, for the

capstone project, we needed to address security and to implement safeguards against attacks. The STS research benefitted from the tangible experience of implementing security measures, and the capstone project benefitted from the awareness fostered by the STS. Ultimately, these two projects, while very different, complemented each other.