

**A Shield of Many Pieces: Utilizing Localized Crime Data to Improve Public Safety  
Dealing With Data Dissimulation: Combatting Data Misinformation through Better  
Presentation**

A Thesis Prospectus

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By

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On my honor as a University student, I have neither given nor received unauthorized aid on this assignment as defined by the Honor Guidelines for Thesis-Related Assignments.

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## **General Problem: The Responsible Use of Data Armament**

Armament is defined by the Oxford English Dictionary as weapons and other equipment of war, encompassing mechanisms for both attack and defense (*The Compact Edition of the Oxford English Dictionary*, 1988). Data armament, in line with this definition, is here considered to be any technology that uses data to either protect or harm another party. While most harmful uses of data may be unintentional, they can still be considered problematic, such as when Amazon created a hiring algorithm that preferred men over women (Lavanchy, n.d.). Although it would be easy enough to just condemn Machine Learning and big data algorithms entirely, they can also be used for great good as well, such as in their applications in medical imaging and other medical fields (Haleem et al., 2019), so this would be premature. Instead, it is important to try and optimize the use of these technologies to maximize protection and helpfulness and minimize harm. The research proposed in this document intends to both give an example of well-used data armament, that provides a shield against the designs of criminals, and to also seek to understand more deeply the connections between presentation and perception of technical information to attempt to help address this particularly harmful aspect of the problem domain.

## **Technical Topic: A Shield for the People of Charlottesville**

*How to utilize local crime statistics to provide accessible and equitable information to improve the safety of the community while avoiding discrimination.*

The research proposed by this document seeks to advance the safety of the residents of Charlottesville VA by utilizing the data provided by the city to give the public a tool for evaluating the safety of a proposed walking route. Such a tool would be useful for increasing public awareness and circumspection, which could result in lower crime rates. This can be thought of as reducing the naivety of the general populace. Furthermore, a system like this that utilizes local data for a local cause for the purpose of protecting those who use the system would be an excellent way to showcase the use of data as a shield against malignant activity, and should it prove successful, similar systems could likely be implemented in other cities with only minor adjustments.

To construct such a data-driven system, there must first be data. In this instance, the City of Charlottesville conveniently provides a data set containing records of all the reported crimes over the past five years up until the present (2022). While this is certainly useful on its face, much of the data (such as traffic law violations) is not particularly relevant to the issue of making walking safer. Additionally, the geographic information is encoded by street name and block number, which will need to be translated to more specific latitude and longitude coordinates. Furthermore, while the type of crime is provided, no indication of the severity or dangerousness of each kind of crime is present in the data, and thus, to make it useable, it will need to undergo feature engineering to add these labels in by hand. Thus, a nontrivial amount of preprocessing will need to take place. However, once this is completed, it should be simple to train and tune a regression model to predict the danger level of a given route, using various factors such as the age of historical crime reports, the dangerousness of nearby historical crimes, and the actual proximity to the route of interest to weight the prediction.

## **STS Topic: The Destructive Influence of Data Dissimulation**

*Combating algorithmic bias through proper contextualization and conscientious presentation of information.*

Dissimulation is a word here used to mean the act of presenting true information with the intention to deceive. Within the field of data science and other such disciplines that are regularly tasked with translating scientific results that are typically numeric into some form of representation understandable to the public, while the intentionality of dissimulation may often not be present, it nonetheless is often the case that the information presented is lacking important context the absence of which substantially alters the meaning of the information. In a thorough exposition of the deception in data science and machine learning practices within marketing and sales, Willis shows that while deceptive practices are commonplace, they often do not involve intent (2020). She also demonstrates that the current legal system therefore has no way to deal with these kinds of deceptions, and gives many concrete examples of such deceptive practices, explaining that many of them are generated by machines learning algorithms that ruthlessly optimize profit unchecked by any sort of boundaries. This is only one field in which machine learning and data science have been utilized deceptively to the detriment of the public, and thus it is no small wonder that the topic of deceptive machine learning and data science practices is often called into the forefront of techno-ethical discussions.

### **Current Practical Solutions**

The question that naturally arises is what to do about the problem of data dissimulation. Willis claims that placing boundaries on algorithmic control of marketing and/or limiting the algorithms themselves to stay within equitable boundaries is an ideal solution for the marketing domain, citing autonomous car algorithms as a highly successful example of making an algorithm stay within the boundaries of the law. Others suggest that by viewing research, researchers, and data as each having some context that must be taken into account, much of the injustice present in data science and machine learning fields can be reduced (Corple & Linabary, 2020).

In exploring the different concepts and ideas surrounding this problem of data dissimulation, it is important to consider all the relevant factors. It would be wrong to emphasize only the scientists and programmers and their role in this problem domain because the public and the education they have received, their habits of media consumption, and the like are equally important to the problem domain. Vitale et. al. describe the communication of scientific information to the public using a model that they refer to as Public Engagement with Science and Technology, or PEST (Vitale et al., 2021). This model emphasizes the public's role in determining their own understanding of science, pointing out that, with the support that public opinion gives to scientific funding (via government grants and other means), the public can shape the direction of scientific research in a meaningful way. It will also be important to realize that, while in an idealized setting, the scientists could just "do a better job", they are faced with many external pressures that may be responsible for at least some degree of shoddily done presentation. It is also important to note that presentation of the results of a scientific nature may be done by those in marketing departments, and it may not accurately represent the intentions of the scientists who produced those results. All these factors must be considered if the problem is going to be understood in its fullness.

## **STS and Philosophical Frameworks**

A framework that is often useful in analyzing the many different social and technical factors in a system is Actor Network Theory, or ANT, which treats the entire sociotechnical system in question (dissemination of technical and scientific knowledge in this case) as a network of various human and non-human actors that work with or against one another to influence the system and its behaviors. ANT provides a ready-made method of conceptualizing this system in question that is designed to emphasize the role that each aspect of the problem domain plays in constructing the system as it currently stands. This is useful for revealing hidden negative influences contributing to data dissimulation, and for identifying actors that could potentially be harnessed to combat those negative forces. In this way, it is likely that a clear image of the system will emerge, allowing for practical and ethical analysis to direct and inform future solutions.

However, fundamental to being able to understand the ethics of any socio-technical context is an understanding of the underlying philosophical context. Therefore, whenever necessary to be able to evaluate the ethics of a given aspect of the problem domain, virtue ethics will be used in conjunction with scholastic metaphysical definitions of the subject matter. This is an ideal choice of frameworks primarily because it dates to the days of Aristotle, and remains in use today, implying that it is well suited to handle innovations in technology. Because of its adaptability, it is ideal for analyzing problem domains that have only recently come into existence.

## **Methods**

This research proposes to study the socio-technical scope of the domain of data science and machine learning particularly with respect to its deceptive abuses. The end goal of this topic of study will be to draw a clear image of the ways in which deception in data science and machine learning can be reduced by proper contextualization. Within this scope, an examination of examples of solutions to this problem and analyses of their success will likely be useful, with a particular focus being placed on the way they were able to draw upon the presentation of their material to impede or improve the clarity and truthfulness of their results. Analysis of scholarly works on theories of information communication may also prove useful. By drawing upon these resources and considering them in the light of ANT and virtue ethics, a clear picture of the effect of presentation on the dissemination of knowledge gleaned from data-driven processes should emerge.

## **Conclusion**

The socio-technical research described above, should yield a deeper understanding of the concepts surrounding the problem of data dissimulation and should shed some light on the role of presentation in this system. Thereby, data scientists and those involved in the field can potentially glean a new perspective on the issue that can improve the truthfulness of their work by highlighting an aspect of the problem that they may not have previously emphasized. The technical research project aimed at improving the safety of the City of Charlottesville will also serve as an example of how to use data that could be potentially very biased depending on the way it is used, in a way that is neither harmful nor deceptive, but rather, contributes to public well-being. Thus, these two research projects shall both contribute to the use of data armaments for the shielding of humanity from those who would do it harm.

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