SAFE AND SUSTAINABLE FLEET MANAGEMENT WITH DATA ANALYTICS AND REINFORCEMENT TRAINING

EVALUATION OF ENGINEERING ETHICS PROGRAMS IN HIGHER EDUCATION FOR BETTER EQUIPPING STUDENTS IN A DATA-DRIVEN WORLD

An Undergraduate Thesis Portfolio
Presented to the Faculty of the
School of Engineering and Applied Science
In Partial Fulfillment of the Requirements for the Degree
Bachelor of Science in Systems Engineering

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May 9, 2022

SOCIOTECHNICAL SYNTHESIS

Data is seeping into every aspect of our lives, but can it be used to improve driver performance and can it be trusted to dictate how society operates? Part of this question is examined in the technical portion of the research paper where vehicle performance was closely monitored with the goal of performing overall fleet safety and ecological impact. Two different training programs were given to drivers within the fleet, after which their performance data was collected and studied for any positive improvements. As the use of data brings into question ethical dilemmas, the STS research paper in this report attempts to answer whether US public university engineering schools are equipped at instructing ethics correctly. The technical and STS papers both deal with the implications of data; the former works closely with interpreting and applying results while the later uncovers whether engineers as a whole are equipped at doing so at all.

The technical report focuses on improving vehicle fleet performance for the University of Virginia's Facilities Management fleet. The vehicles had special trackers installed on them that recorded six key metrics for both safety and environmental impact: speeding, idling, harsh braking, harsh cornering, hard acceleration, and seat belt usage. These metrics were used to evaluate how well a vehicle, and its drivers, were performing on the road. With the goal of improving their performance, two different training programs were given to the drivers. One training program was based on low performance, reactive, while the other was given on a consistent 12-week basis, proactive. The vehicles were monitored after each training was given for any improvements in performance.

The reactive training showed the most statistically significant improvements in driver performance. Specifically, speeding was improved when the reactive training was given to

drivers. Reactive training showed graphically promising results for the other metrics as there were improvements in all the categories. Proactive training did not show any statistically significant improvements; however, given the limited amount of time for research, with more trials and proactive trainings given there is optimism that significant improvements will show.

The STS research paper explores best practices for engineering ethics education among public engineering schools in the US. The STS paper analyzes an ongoing controversy and relies on expert opinion: accreditors, professional organizations, and STS scholars to reach a conclusion. Given expert suggestions, the STS research then uses the Social Construction of Technology framework, originally developed in 1984 by Trevor Pinch and Wiebe Bijker, for further evaluation. Their framework helps to understand what each suggestion for ethics education entails.

The STS research showed that the ideal format that engineering ethics education should take is a system of embedded ethics programs into the curricula in which students have the opportunity to be exposed to those in other fields as well as realistic ethics scenarios. Furthermore, such a system would be fueled by consistent student feedback and input. This suggestion adheres most to the newly implemented ABET requirements and follows what expert STS scholars have demonstrated is effective through pilot programs.

The technical and STS research in this thesis both deal with data and how engineers should best apply the use of data in their respective fields. The technical report demonstrates how data can be used in a small and very specific case on vehicle fleet management. The STS research question then analyzes how the ethics of data usage on a large scale should be taught to engineers across the country.

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