NDnano Undergraduate Research Fellowship (NURF)
2015 Project Summary

1. Student name: Justin Stamets

2. Faculty mentor name: Dr. Kathleen Eggleson

3. Project title: Analyzing Fictional Participatory Governance Scenarios with Automated Text Analysis

4. Briefly describe any new skills you acquired during your summer research: This summer I have cultivated my programming skills in Python, I have learned how to handle machine learning algorithms, collect and prepare data for text analysis, use statistical packages in R, and how to present my work at poster competitions.

5. Briefly share a practical application/end use of your research: One application of this research is the future use of the machine learning tools that were applied to the fictional participatory governance scenarios. Unique methods were used in this research that could be used in other settings.

Begin two-paragraph project summary here (~ one type-written page) to describe problem and project goal and your activities / results:

The aim of this project is to objectively analyze, via automated text methods, data derived from dialogue-based interactions in realistic role-play scenarios developed for science and engineering ethics learning. This research pursues methodological innovation with respect to two distinct purposes (1) objective evaluation of a novel pedagogical intervention through its verbal content (2) identification and analysis of ethics-specific content through machine learning. In addition to these advances, we consider the hypothesis that distinct adopted stakeholder perspectives in a contentious emerging technology scenario will be associated with differentially applied ethical frameworks.

Through this NSF-sponsored project, Notre Dame science and engineering graduate students participated in a realistic scenario in which a nanosilver food packaging company may become established in a fictional Midwestern town. Each participant played one of seven citizen stakeholders.Workshops were digitally recorded, then converted to text files. Text files were run through machine-learning algorithms, resulting in a model of the topical content of each role-play cohort. Similar machine-learning algorithms were applied to the Stanford Encyclopedia of Philosophy to extract content related to ethical frameworks. The extracted content was used as training set to classify the text files generated in the role-play exercises.

The machine learning algorithms indicated that the dominant ethical framework was consequentialism. However, individuals who supported the company's local establishment, associated with relative risk tolerance, were more likely to advance arguments with deontological frameworks. In contrast, the arguments of risk averse characters were more closely associated with a consequentialist framework. This project contributes to the development of

automated tools toward the investigation of ethical content and pedagogical evaluation, and has also provided evidence of the complexity of moral reasoning in fictional participatory governance scenarios related to a specific nanotechnology applications. Interestingly, students applying predominantly one framework for their arguments countered others through application of the opposite framework.

Publications (papers/posters/presentations): Poster presented July 31st: Analyzing Fictional Participatory Governance Scenarios with Automated Text Analysis