

Project Descriptions for University Course: UNIV 5360

Projects are expected to involve the following steps:

- Establishing social context with stakeholder interviews and background research.
- Understanding the existing data, its format and analysis methods that are currently used.
- Converting the project specification into an analytics and optimization problem with the help of project mentors.
- Developing a document describing the effects and concerns of the new project for the community.
- Developing a proposal for new sensors if they are required and describing a plan to integrate the sensors into the community.
- Developing a simulation model for the project to understand relations among important variables, perform “what-if” analyses, and construct and verify proposed solutions.
- Developing the front end applications, backend analytics, and optimization methods for the project.
- Final demonstration.

Project 1: Innovative Mobility Solutions – In this project student teams will study existing traffic flow data, and develop innovative modes of transportation and better route planning to reduce traffic congestion. Students will get access to the MTA bus data and HERE traffic data. They will also learn the use of MATSIM simulator. Students may innovate and propose and study the use of new ridership models.

Project 2: Efficient Energy Management - In this project student teams will get access to the current building data from Vanderbilt Plant Ops for one or more available buildings. They will develop methods using non-privacy invasive occupancy sensors to improve the energy efficiency of buildings in Vanderbilt University. They may also innovate to develop methods for anomaly and fault detection in primary components of the climate control subsystems of the building.

Project 3: Pedestrian Safety on Campus: In this project student teams will first gather data about accident occurrences and near misses that have occurred in the past in the areas in and around the campus, and will develop methods to characterize and quantify the notion of pedestrian safety around the campus. Then, they will suggest better safety mechanisms and show the effectiveness of their newly designed system in an agent-based simulation environment.

Assessment Criteria:

The assessments for this class will adopt the following framework:

- Analytical problem solving with accompanying reports for which the students will be provided with reading material, data, and related material drawn from the topics listed earlier.
- Systematic progress in project work working in teams, multi-disciplinary collaboration, evaluation mechanisms, and making clear presentations that outline the different stages of the design and development process. Systematic progress will be measured in phases: (i) Qualitative and Quantitative Data collection that addresses social and technical aspects of the projects; (ii) Requirements Analysis; (iii) Initial Prototype and Review; and (iv) Final Prototype and demonstration.
- Classroom participation including classroom presentations
- Project Report and Final Presentation