**Simulation of Electric Transit System**

**Sponsor: Professors Alberto Lamadrid, Shalinee Kishore, Shamim Pakzad, Larry Snyder**

| **Sponsor Type: Lehigh Interdisciplinary Research Team, Valley Transit Authority (VTA)** | **Recommended Technologies: Python, R, Matlab** |
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| **Application Type: Simulation, Data Analysis** |

**Overview**

The project team will collaborate with Lehigh faculty and students to develop a simulation test bed of an electric transit bus fleet. The Lehigh team is collaborating with Santa Clara Valley Transit Authority (VTA) to develop a simulation testbed that captures the transportation and energy needs of VTA’s bus fleet as it moves to a fully electric fleet. As a transit agency in California, VTA is under a state mandate to be zero emissions by 2040. This will require significant investments, ranging from 400+ electric buses and charging infrastructure to solar installations and energy storage deployments, to ensure that the buses meet the serving population’s transit needs while being powered using zero emissions resources.

Currently, VTA has 5 electric buses in operation and will be getting high resolution operational and energy usage data from the buses. The objective of this project is to develop an automated process for data-driven modeling of transit systems that does the following:

1. Processes the collected VTA data, augments it with external measurements, and uses machine learning approaches to identify features and patterns in energy usage of the electric buses. This would yield a data-driven model of electric buses.
2. Uses the above data-driven model of electric buses to simulate the VTA transit fleet using the open-source Simulation of Urban Mobility (SUMO) platform.
3. Enhances the SUMO simulation to interface with a Matlab simulation of the energy system infrastructure for the transit fleet (to be developed by other members of the research team). This energy system simulation would incorporate the effects of charging infrastructure, solar power, and energy storage into the transportation simulation provided by SUMO.
4. Visualizes the joint transportation and energy operations of the electric transit fleet via a dashboard.

The capstone student team will be expected to work with Lehigh faculty and students from a variety of disciplinary backgrounds and VTA engineers, as well as other industry partners.

**Student Requirements:** This project would be ideally suited for a team of students with some experience in Python, R, or Matlab. Beyond that, the students should have an interest in machine learning and optimization and will have to learn the SUMO platform.