

Capstone Project Ideas

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1. Coastline Tracker

I have a large 4x4 foot homemade LED display that would be good for displaying map images. It's easy to download stylized maps from Google Maps and display them but to make it more interesting I would like to write a script that slowly scrolls the map and follows a coastline.

This algorithm would have to understand the difference between ocean and land and find the next point along the coastline. It sounds easy but could be tricky – e.g. understanding the difference between an island and the mainland and deciding when a river is a river and not an inlet.

2. Analyse Smart Meter Data

So-called 'smart meters' are power meters that record energy consumption in real time and transmit the data to the utility or to the property owner to better understand their consumption patterns. Smart meters are increasingly being installed in homes and businesses to help utilities improve the reliability of power supply and to increase efficiency in the distribution system. The goal is also to provide useful information to property owners/tenants so they can reduce their energy consumption.

One issue with making use of smart meter data is the lack of explanatory information about the end uses of the energy and the activities that drive consumption patterns. There are privacy issues with utilities monitoring data on customers.

If I can find a suitable data set I would be interested in seeing if it is possible to build predictive models of the data and if certain phenomenon (occupancy, heating/cooling, specific loads turning on/off) are discernable from the data alone.

If it works, this type of data might be useful for utilities and households in better understanding their energy use and potentially reducing their energy consumption and costs.

3. Machine Learning Control

I am interested in algorithms that can learn to achieve goals in a physical environment in real-time. This is the domain of control systems and has applications to robotics and autonomous vehicles etc. There is probably a lot of existing literature and methods to absorb first but I would be interested in simulating one or more classic systems (e.g. an inverted pendulum or a car on race track) and then testing various algorithms in a real-time simulation of the combined real-world system and the machine learning algorithm. It would be cool to set one of these simulations up as a competition and open it to multiple people/teams and have the algorithms compete against each other.

The goals of this project would be to learn about different intelligent control systems and methods and potentially to identify solutions that could be applied to real-world problems in robotics or industrial process control.