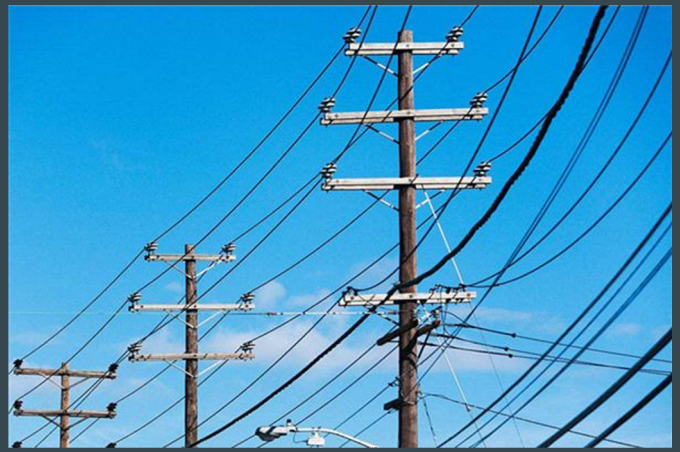
5G Utility Pole Planner Using Google Street View and Mask R-CNN

Yanyu Zhang*, Osama Alshaykh

*Departments of ECE, Boston University
May be reached at zhangya@bu.edu

Overview

With the advances of fifth-generation cellular networks technology, Many cities are planning and investing to build a 5G network. In order to help them to install 5G equipment on utility poles, we trained a model to identify the already existing poles within an image and give a plan to set the 5G equipment.



Poles are the best choice to set the 5G equipment.

System Architecture

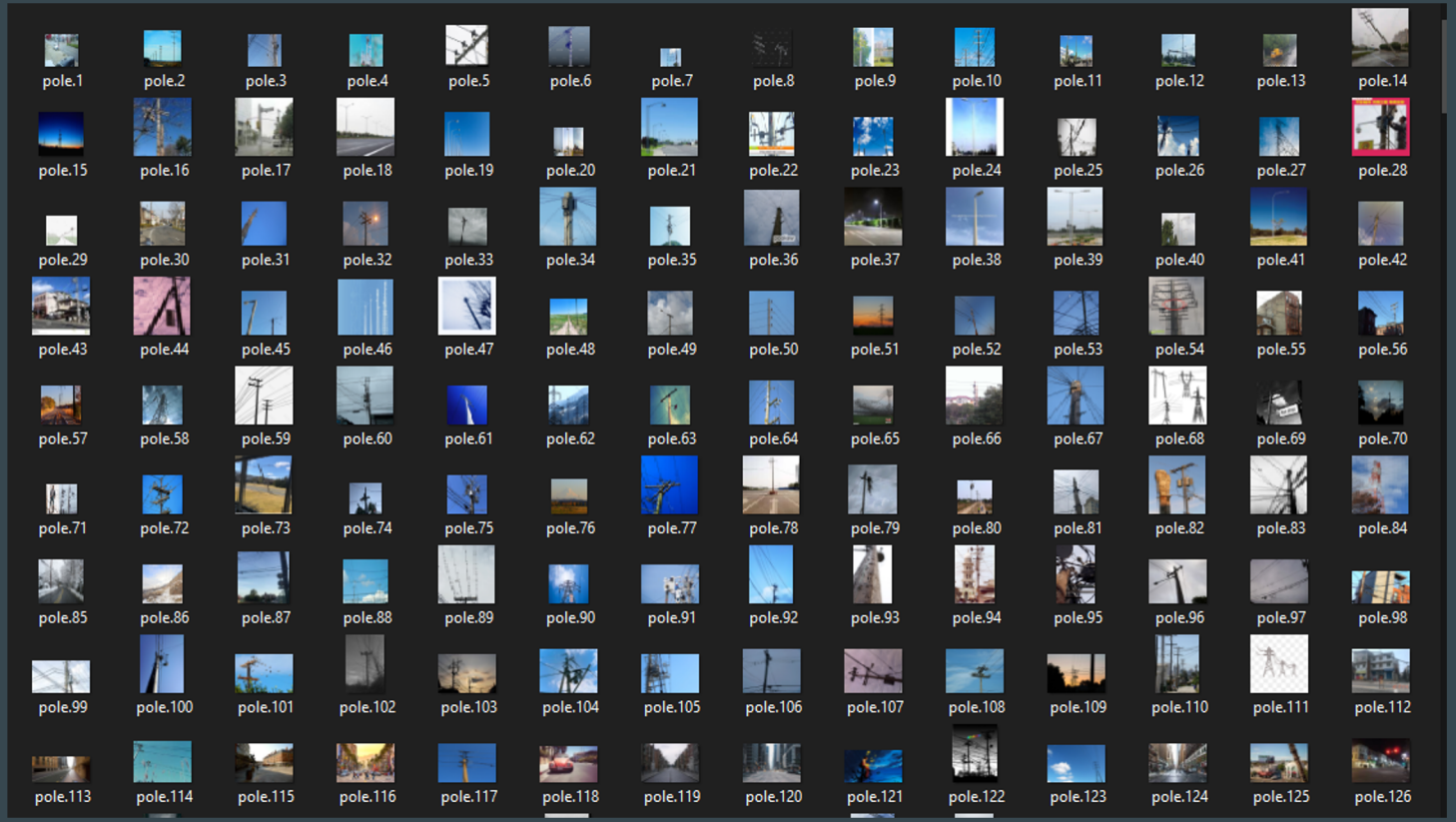
- Map Generator
- Poles Classifier
- Poles Planner
- Django

Dataset

We downloaded 3,000 high resolution images contains poles and labeled them via VGG tools.

*The datasets are provided by Google Images.

Map Generator

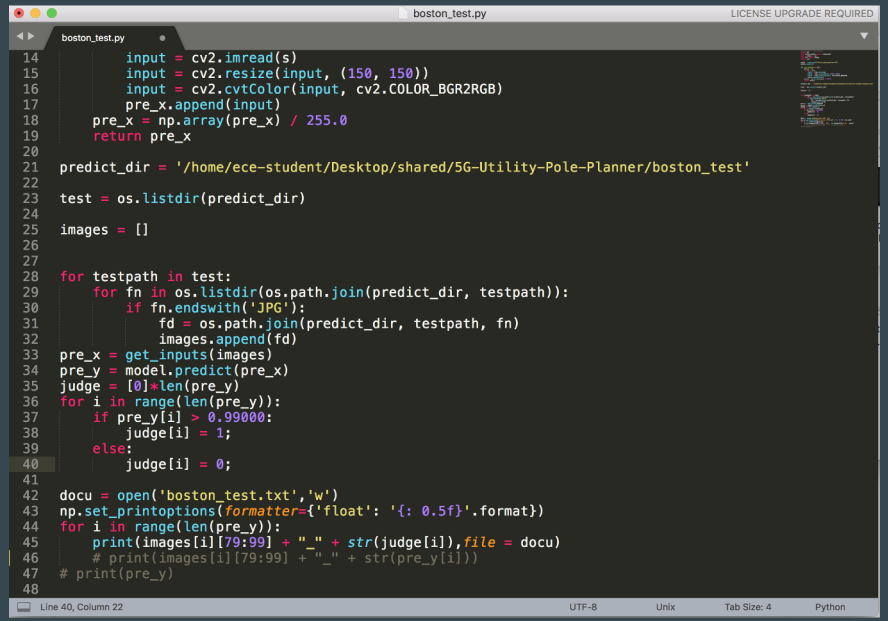


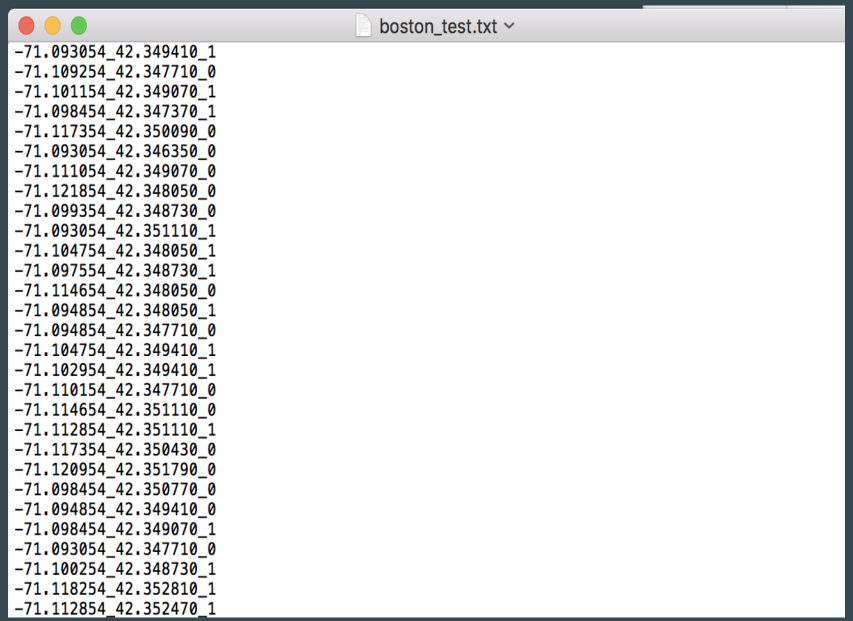
Map Generator

Map images are generated within Boston areas and named by their latitude and longitude, which used to pole planners later.

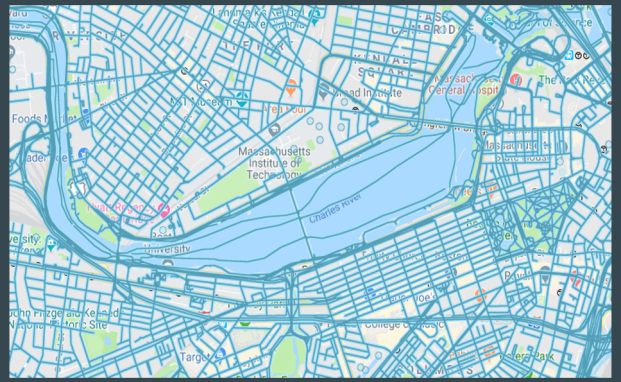
*The datasets are provided by Google Static Street View API.

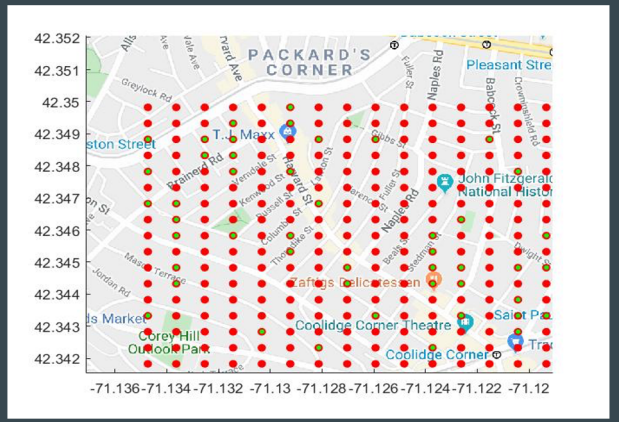
Map Generator

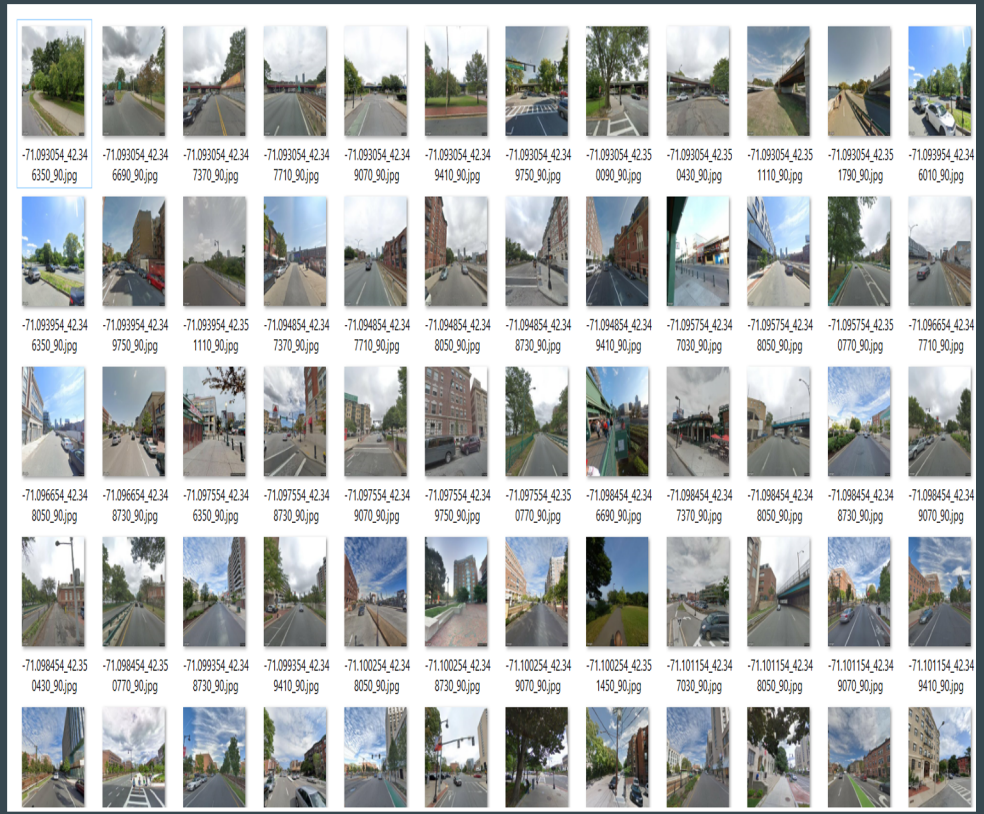




Map Generator

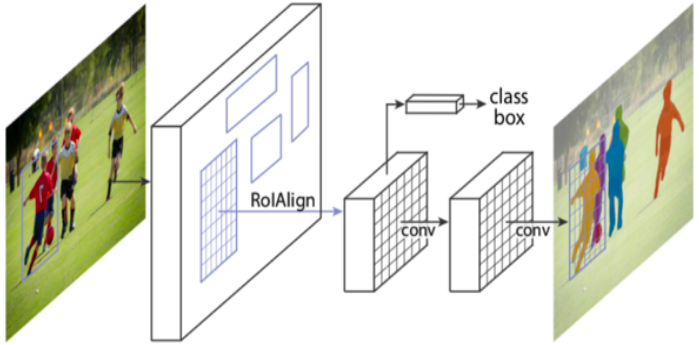




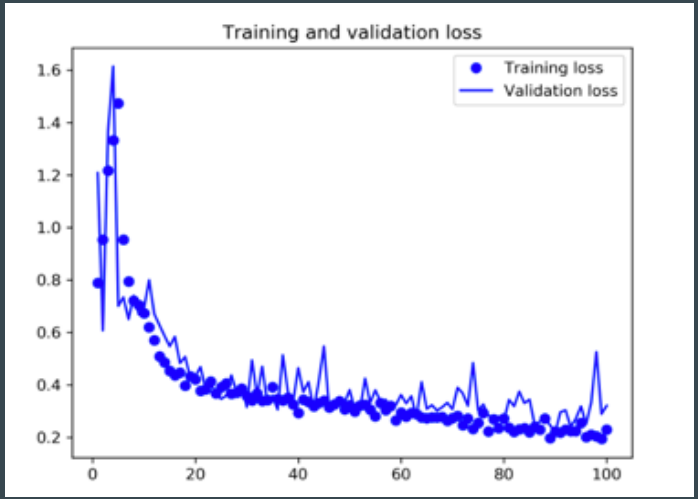


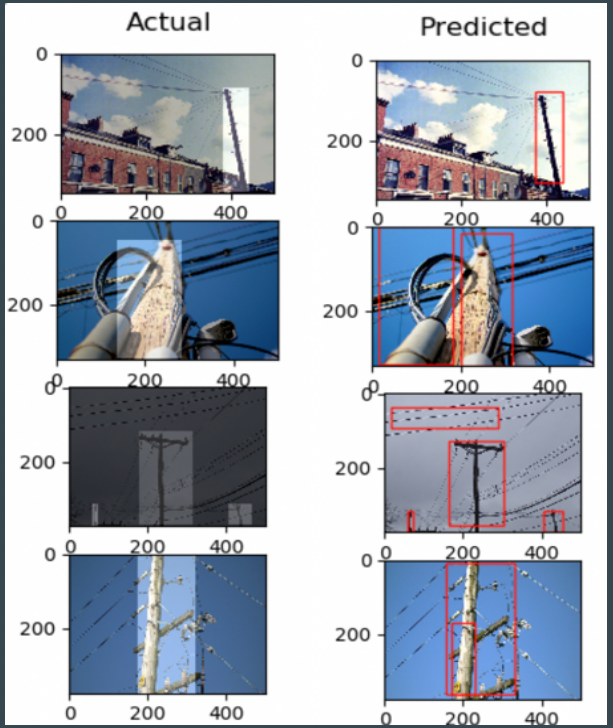
Poles Classifier

We retrained the mask R-CNN models based on the pretrained coco weight file using TensorFlow.



Poles Classifier



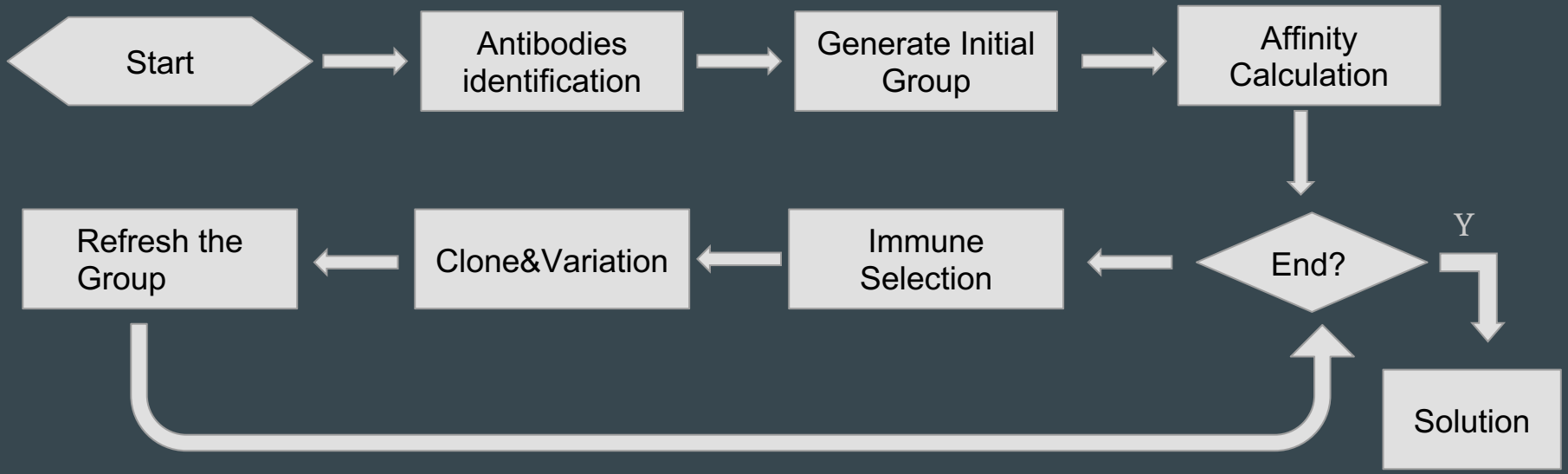


We achieved a train error rate of 7.86% and a test error rate of 32.03%.

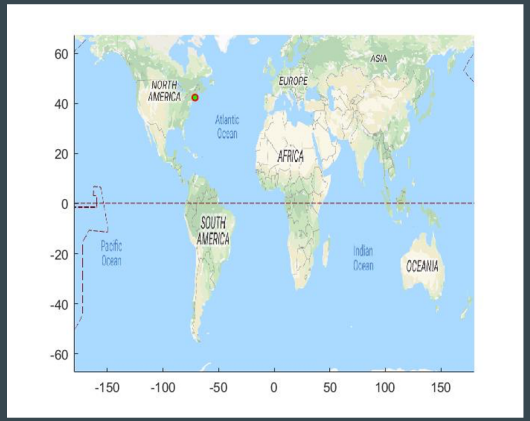
Poles Planner

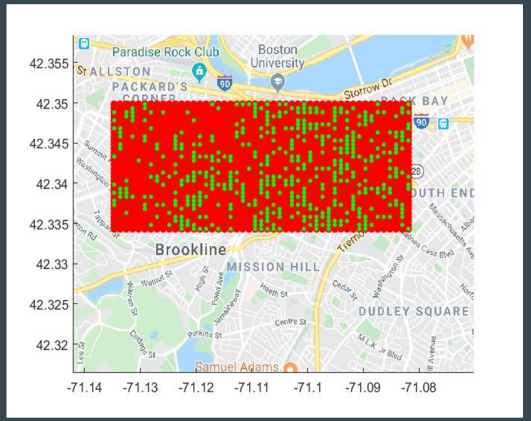
Artificial immune systems (AIS) are a class of computationally intelligent, rule-based machine learning systems inspired by the principles and processes of the vertebrate immune system. AIS are adaptive systems, inspired by theoretical immunology and observed immune functions, principles and models. Our aim is to use AIS to set the least number of poles and cover most areas at the same time.

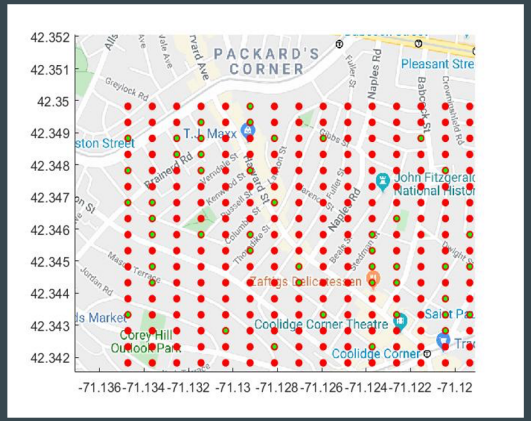
Immune Algorithms



Poles Planner



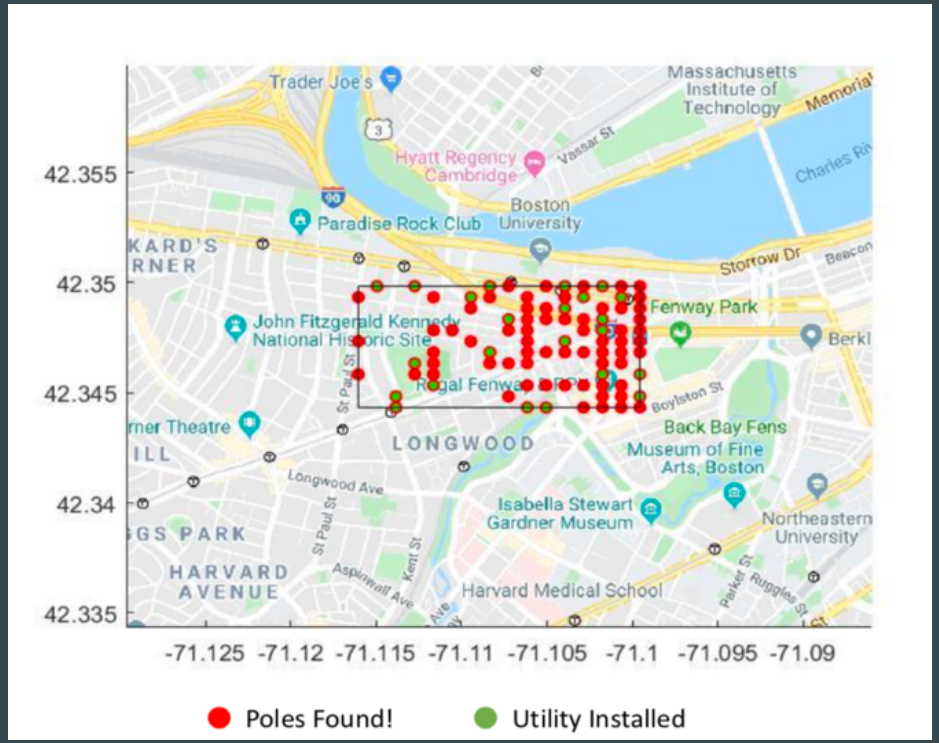




Red points are discrete sampling points.

Green points indicate that the pole needs to be set here.

The Best Result



34% of poles used

99% of areas covered

Thank you

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