10/18/2019

Estimating Parking Capacity in Somerville

Scope of Work

AC297r Fall 2019

Background

In order to appropriately plan transportation, the City of Somerville is currently conducting a comprehensive audit of its parking resources. The Massachusetts Bay Transit Authority's Green Line Extension presents a motivating example. With the addition of new T stops in Somerville, many non-residents will likely change their commuting behavior by driving to Somerville, parking their cars, and taking the T into Boston. If this influx of non-residents looking to park their cars forces the city to designate street parking spaces formerly reserved for residents, they would like to be able to assess in which parts of the city residents would be able to relocate their cars in on-street residential parking spaces into off-street residential parking, such as driveways.

Broadly, we can split parking in Somerville into two categories: residential and non-residential parking. The former includes driveways and private garages located on people's properties while the latter includes street parking, parking garages, and parking lots. The city has already handled the audit of the non-residential parking and on-street residential parking. We are now working to estimate the location and capacity of off-street residential parking.

Problem Statement

Currently, the City of Somerville does not have an inventory of the off-street residential parking locations in the city. To obtain this inventory, we plan to use satellite images to predict whether or not each parcel in the city has a driveway or not. As such, we are framing this problem as a binary classification problem using computer vision. Since this is a supervised learning problem, we need labeled data, so we plan to create a pipeline to hand-label a small subset of the data ourselves to train our model.

Available Resources

The City of Somerville provided us with satellite imagery from Mass Orthoimagery Consortium (Spring 2015) with assessment information. This raster data was converted to over 14,000 individual files in tagged image file format (TIFF), each representing one parcel. We also have access to data regarding parking permits (2018), registered vehicles (2017-18), and parcel-level assessment data (FY 2019).

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Planned Deliverables

The main deliverable we aim to provide is a list of where off-street residential parking spaces (i.e., driveways and garages) are located in the City of Somerville. A nice-to-have would be to provide the estimated capacity of those spaces (i.e., how many cars could fit in each driveway). We also aim to provide a clear, reproducible process for the City of Somerville to follow if they wish to refresh this project in the future.

Rough Timeline

October 30	Extract recent data sample from LandSat and manually label in ArcGIS
November 6	Implement transfer learning (VGG16, Resnet-34) + Single Shot MultiBox Detector into model
November 15	Milestone 3: Preliminary results for location of driveways to be shared
November 20	Capacity estimation models
December 9-12	IACS Showcase; final report

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