Estimating Off-Street Infrastructure for Delivery and Pick-Up Operations

Jose Luis Machado Leon  Dr. Anne Goodchild
PhD Student  Director of the UW Supply Chain
Urban Freight Lab  Transportation and Logistics Center
The lack of truck load/unload spaces in cities:

• Causes illegal parking and congestion (Alho & de Abreu e Silva, 2014)

• Has been studied with a focus on on-street parking (Alho et al., 2017; Dezi et al., 2010; Lubinsky & Dave, 2017)
In 2016 the City of Seattle Department of Transportation’s geospatial databases included city curb parking spaces, but truck load/unload spaces out of the public right-of-way were missing.
Types of private truck load/unload spaces:

Outside of building walls
- EXTERIOR LOADING DOCK
- EXTERIOR LOADING AREA

Interior of exterior wall
- INTERNAL LOADING BAY
Objective

Predict what parcels have loading bays or loading docks in dense urban areas as a function of characteristics of:

- Parcel
- Commercial buildings in the parcel
Data - Predictors

Size of parcel (sqft.)

Average story number of commercial buildings

Legend
Lot Area (Sqft)
- 477 - 10,584
- 10,584 - 23,700
- 23,700 - 50,880
- 50,880 - 138,780
- 138,780 - 381,917

Legend
Number of stories
- 0
- 1
- 1 - 3
- 3 - 6
- 6 - 76
Data – Additional predictors

• Count of changes in the history of the parcel

• Best use of parcel
  • Commercial service (reference)
  • Retail or wholesale
  • Manufacturing
  • Temporary lodging

• The parcel has an accessory parcel

• There is a covered parking accessory

• There is a open parking accessory
Method – Classification analysis

• Random forests
• Support vector machines
• Penalized binomial logistic regression
Method – Classification analysis

• Random forests
• Support vector machines
• Penalized binomial logistic regression
Method – Measure of model performance

Cross-validated estimates of:

- Area under the ROC curve (AUC)
- Optimum cutoff threshold
- At optimum cutoff threshold:
  - True positive rate
  - True negative rate

Gareth et al. (2013)
Results – Random forests model performance

• AUC = 83.5%
• Optimum cutoff threshold = 10.3%
• True positive rate = 78.3%
• True negative rate = 77.8%
• Misclassification rate = 21.95%
Results – Importance of predictors

- Accessory Open Parking
- Manufacturing
- Accessory Covered Parking
- Accessory parcel
- Temporary lodging
- Retail/Wholesale
- Count of changes
- Average No. stories
- Lot area

Ave. Decrease in Gini Index
Next research steps:

• Evaluate the transferability of the method:
  • Capitol Hill and First Hill, Seattle
  • Other cities

• Create a smarter method to collect data of private truck load/unload spaces in dense urban areas

• Elaborate policy recommendations
Thank you,

Questions?

Contact information:

Jose Machado
Research Assistant
Supply Chain Transportation and Logistics Center
University of Washington
jlmaleon@uw.edu

Dr. Anne Goodchild
Director of the
Supply Chain Transportation and Logistics Center
University of Washington
annegood@uw.edu