# Optimal Location Framework for Electric Vehicle Charging Stations——A case study of Seattle, Washington

**Haode Sun**

UNIVERSITY OF LEEDS

## Introduction

As a result of transportation inequities caused by high transit costs, Se attle has proposed Electric Vehicle Charging with Right-of-Way (EVC ROW) (Seattle Department of Transportation, 2023), which allows elec tric vehicle (EV) charging stations to be installed at curbside locations where public right-of-way is adequate to meet the requirements of the pilot program.

This study aims to use the location model of the Maximum Coverage L ocation Problem (MCLP) to set the bus station as a potential facility for electric vehicle charging and construct a demand model consisting of t he centroid of the census, the centroid of the annual average working day traffic flow, and poi. Optimize site selection. Because the bus stati on has a good transportation infrastructure, its transformation can pro mote the construction of a shared mobility hub and promote a compreh ensive solution to the last mile problem.

## Data

**1.EVCS data**
Including the latitude and longitude, address, zip code, type of charging pile, and number of ports of the charging station
**2.POIs**
Including residential areas, commercial areas, schools, and hospitals
**3.Traffic flow data**
Using the median of 9,500 as the threshold to capture the road sections with higher than average traffic flow.
**4.Bus stops data**
**5.Neighborhood boundaries**
**6.Census boundaries**

## Method

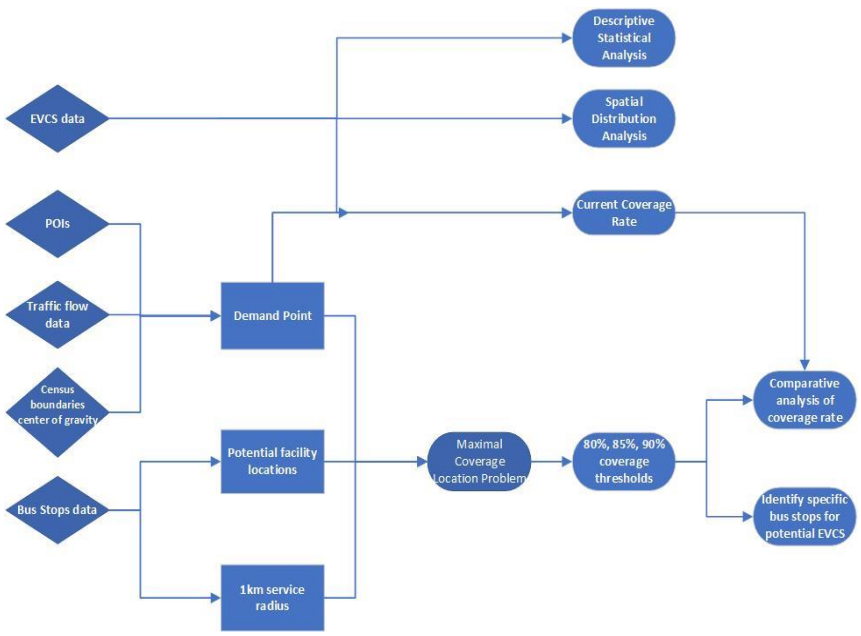


Fig 1. Workflow

## Result and discussion

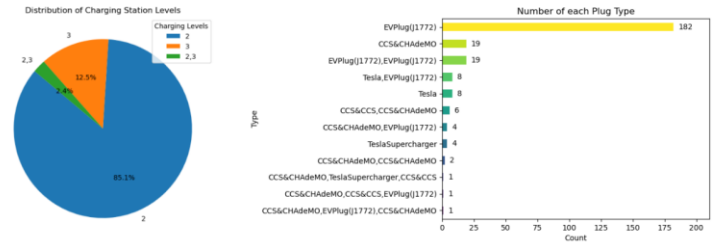


Fig 2. (A) Distribution of Charging Station Levels, (B) Number of each Plug Type

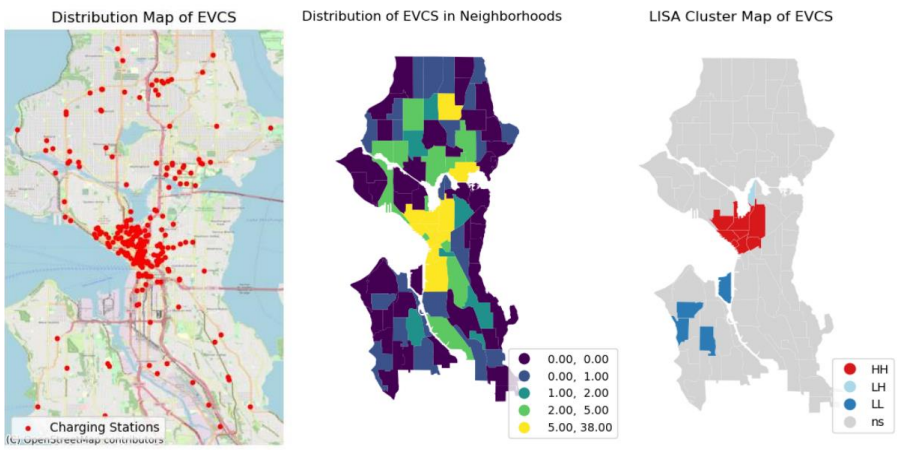


Fig 3. Spatial Analysis: (A) EVCS distribution, (B) EVCS distribution in neighborhoods and (C) LISA Cluster Map

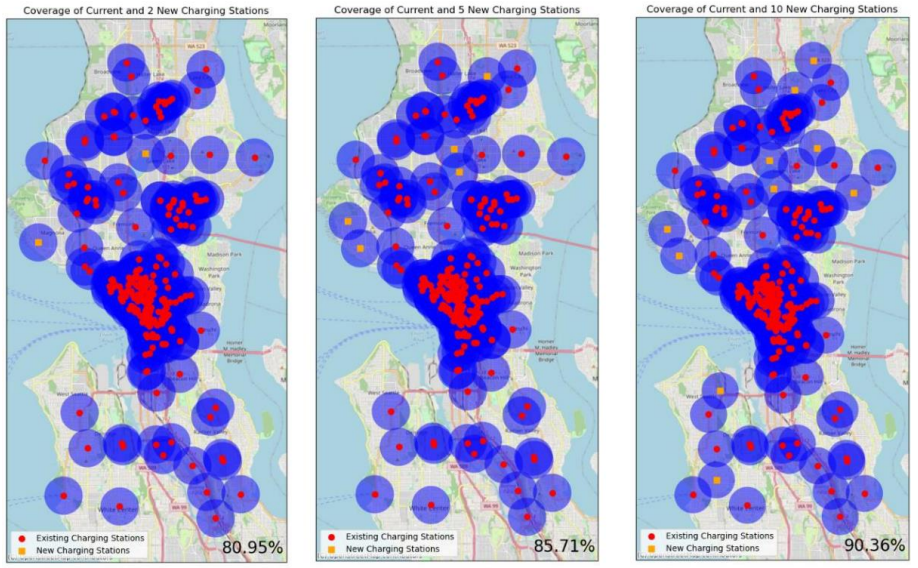


Fig 4. Electric Vehicle Charging Posts with Different Coverage Rates

By applying the maximum coverage problem for optimization, the coverage can be increased to 78.31% when we convert a bus stop into an EV charging post. If two additional charging piles are installed, the coverage rate will be over 80%. Further, when five additional charging piles are installed, the coverage rate can exceed 85%, while 10 additional charging piles can make the coverage rate exceed 90%.

## Conclusion

- When the coverage rate exceeds 80%, the names of the two new charging stations are: East Green Lake Dr N & Orin Ct N and West Viewmont Way W & Westmont Way W.
- When the coverage rate exceeds 85%, the names of the five new charging stations are: East Green Lake Dr N & Wallingford Ave N, NE 125th St & 15th Ave NE, Viewmont Way W & 35th Ave W, West Viewmont Way W & W Ruffner St and Woodlawn Ave N & N 63rd St.
- When the coverage rate exceeds 90%, the names of the ten new charging stations are: 35th Ave SW & SW Elmgrove St, East Green Lake Dr N & Wallingford Ave N, Harbor Ave SW & SW Harbor Ln, Kirkwood Pl N & N 59th St, NE 125th St & Roosevelt Way NE, NE 145th St & 23rd Pl NE, NE 55th St & Princeton Ave NE, Ravenna Ave NE & NE 86th St, Viewmont Way W & 35th Ave W and West Viewmont Way W & W Ruffner St

MSc Urban Data Science and Analytics
University of Leeds

## References

1. Seattle Department of Transportation, 2023. Electric Vehicle Charging in the Public Right-of-Way. Available at: https://www.seattle.gov/transportation/projectsand-programs/programs/new-mobility-program/electric-vehicle-charging-in-thepublic-right-of-way [Accessed 17 August 2023].