Optimized EV Charging Station Locations in Washington State

Anqi Lin, Clarissa Tai, Mengchen Xu, Yue Zhang, Yu-Chieh Chen
Industry Mentors: Alexander Voet, Arvind Sathi, Chengwei Wang, Jeffrey Lee, John Heath, Michelle Zee, Sydney Son

Optimization Model

Our optimization model chooses candidates from existing gas station locations to put new EV charging stations, with the objective to minimize the total station and charger number while satisfying the following constraints:
1. The driving distance from highway exits to each locations should not exceed 10 miles
2. Newly added EV stations can support all EV traffics passing by
3. Charger count at each location should not exceed 15

For each location $i$, our variables are $x$ (# of new chargers), $d$ (driving distance from highway exits), $y$ (existing EV charger # within 5 miles), $e$ (maximum EV traffic within 5 miles). The model is:

$$\text{minimize } \sum x_i$$

subject to $d < 10$

$$(x_i + y_i + e_i) \times \text{ratio} \geq e_i$$
$x_i \in \mathbb{Z}, x_i \leq 15, x_i \geq 0$

Model Result

With different EV% of total registered vehicles scenario on example I-5 south area, model result is shown in Figure 3. The result on whole I-5, I-90 and I-82 are shown in Figure 4.

Conclusion & Looking Forward

Model-suggested new locations are evenly scattered around areas where higher traffic is presented. They not only fulfill the anticipated increasing demand in city area, but also fill the gap around comparatively rural areas. However, current optimization model doesn’t incorporate crime rate, NRI, attractions informations. For future steps, we can incorporate those factors to create a score on each optimized locations suggesting whether we recommend to build an EV station there.

References