Webinar on Volume Estimation using Machine Learning Approaches & Probe Vehicle Data

April 21, 2020

Question and Answer Summary

Questions – NREL Work Effort:

Q1: Josh Roll (Oregon DOT): How do you think latitude/longitude is being used by the machine learning algorithm and would it work as a covariate for application?

A: Yi Hou (NREL): In Harrisburg, the longitude has an effect on the model because during model training, it uses that geographic information to estimate the downtown vs. suburban areas.

Q2: Sanhita Lahiri (Virginia DOT): Please would you further explain the variance during peak hours? It seemed from the slide that it is not even?

A: Yi Hou (NREL): It depends on the real traffic. Sometimes there are special events like weather where peak hour might be shifted. The model can still capture that variance by probe count, weather information, and speed data.

A: Stan Young (NREL): The patterns of traffic greatly differ on days with major holidays, in this case, Christmas, and the model will estimate something in a more predictable pattern, which we're looking at fixing.

Q3: Keith Miller (NJTPA): Do you think the model would need to be recalibrated with COVID-19 conditions?

A: Stan Young (NREL): The above question also plays into this one – our current model reflected a large change in volume but we'd likely have to train it on more data.

A: Yi Hou (NREL): In the COVID-19 era, we're using a model trained on 2018 data applied to the current state of events. It captured some of the drop in volume, but if we calibrated it with 2020 continuous count station data, we could see what the error might look like. With 2018 data and that two-year lag, there may be significant changes in the surrounding area like population or economic growth, which we can't capture.

Q4: Keith Miller (NJTPA): Might it be possible that the probe penetration rate differs? How are the probe penetration rates calculated?

A: Yi Hou (NREL): Yes, the probe penetration rate differs by region (i.e. downtown, outskirt area) and road class. Penetration rates are only computed at continuous count stations where ground truth volume is observed.

A: Chris Hoehne (NREL): Probe penetration rates are calculated as the ratio of vehicle probe counts to the observed station counts for the same location and time period. Example: in one hour, 10 probe counts and 100 vehicles observed equals 10% penetration rate. Penetration rates are often lowest on local roads such as in subdivisions or low traffic residential areas. This is likely because privacy concerns with data near home locations.

Q5: Taruna Tayal (VHB): Is this model scalable and transferable to other geographies/states?

A: Yi Hou (NREL): We are still testing the transferability. It should give decent volume estimates, but the best way is to calibrate the model is with data from the region where volume needs to be estimated.

Questions – UMD CATT Work Effort:

Q6: Raj Hassija (Infosense Global): Is this model being retrained based on the inference or live results and predictions?

A: Kaveh Sadabadi (UMD CATT): At this point, the work we are doing is based on archive data. Since the real-time application of this method requires live APIs and different data layers in real-time (number of probe counts, weather, etc.), at this point that is not available. Our approach to using machine learning is a good one and the model is truly learning how to make meaningful predictions based on the input data. Once those real-time inputs are ready, the model can be used in real-time.

A: Stan Young (NREL): To sum up – we're limited by getting real-time data rather than the modeling framework.

Q7: Vaishali Shah (AEM): What predictive models were used and what platform for model calibration? Had you tried fitting the model only for peak periods? What type of neural network model?

Josh Roll (Oregon DOT): Why did you settle on the RNN while NREL used XGB? Were your results with XGB much different than RNN?

Vaishali Shah (AEM): What platform was used for modeling and how many months were used in testing?

A: Justin Ferri (KMJ Consulting): In previous VTM webinars there was more in-depth discussion about different model performance. You can find the VTM presentations toward the bottom of this page on the I-95CC website: https://i95coalition.org/projects/vpp-marketplace/

A: Kaveh Sadabadi (UMD CATT): We are using artificial neural networks – neural nets, different learning algorithms. The tools we are using are cutting edge (tensor flow and other python libraries). For all three questions - if you need more details or information please email me at kfarokhi@umd.edu.

A: Stan Young (NREL): We both tried several things and each gravitated to what we thought best. We've yet to get to a point where we've found one modeling technique works better in certain circumstances and they're markedly better than old statistical regression.

A: Chris Hoehne (NREL): One advantage to XGBoost is training speed and not needing as large of training data sets to achieve acceptable predictions. Neural networks

typically require more training data and training time but have a higher ceiling for prediction accuracy.

Questions – Off-Freeway Results:

Q8: Tom Edinger (DVRPC): Why are there higher penetration rates for TomTom versus INRIX, about 12% to 6%, respectively? Are the new penetration rates going to be included in the study?

A: Kaveh Sadabadi (UMD CATT): Mainly it has to do with where they are getting their data from. In new datasets INRIX penetration rates are much higher. We expect to see more about those increased penetration rates in the next six months.

Q9: Mike Bruff (CAMPO): How does this work relate to what big data providers (e.g. Streetlight) are working on regarding providing AADT data. In SL's case, they are using continuous count stations in association with their models.

A: Yi Hou (NREL): This work estimates hourly traffic volume, while other big data providers only estimate AADT. The estimates of this work have higher temporal granularity.