**CONCLUSIONS**

This paper presented a machine learning model that can be conveniently developed for each heavy vehicle in a fleet. The model relies on seven predictors: number of stops, stop time, average moving speed, characteristic acceleration, aerodynamic speed squared, change in kinetic energy and change in potential energy. The last two predictors are introduced in this paper to help capture the average dynamic behavior of the vehicle. All of the predictors of the model are derived from vehicle speed and road grade. These variables are readily available from telematics

devices that are becoming an integral part of connected vehicles. Moreover, the predictors can be easily computed on-board from these two variables.

The model predictors are aggregated over a fixed distance traveled (i.e., window) instead of a fixed time interval. This mapping of the input space to the distance domain aligns with the domain of the target output, and produced a machine learning model for fuel consumption with an RMSE < 0.015 l/100 km.

Different model configurations with 1, 2, and 5 km window sizes were evaluated. The results show that the 1 km window has the highest accuracy. This model is able to predict the actual fuel consumption on a per 1 km-basis with a CD of 0.91. This performance is closer to that of physics-based models and the proposed model improves upon previous machine learning models that show comparable results only for entire long-distance trips.

Selecting an adequate window size should take into consideration the cost of the model in terms of data collection and onboard computation. Moreover, the window size is likely to be application-dependent. For fleets with short trips (e.g., construction vehicles within a site) or urban traffic routes, a 1 km window size is recommended. For long-haul fleets, a 5 km window size may be sufficient. In this study, the duty cycles consisted of both highway and city traffic and therefore, the 1 km window was more adequate than the 5 km window. Future work includes understanding these differentiating factors and the selection of the appropriate window size. Expanding the model to other vehicles with different characteristics such as varying masses and aging vehicles is being studied. Predictors for these characteristics will be added in order to allow for the same model to capture the impact on fuel consumption due to changes in vehicle mass and wear.