CSDS 500 and ECSE 500
Fall 2020 Colloquium

11:30AM to 12:30PM
Thursday, November 19, 2020

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"GNSS ONLY SPARSE DATA BASED ROUTE PROCESSING MODEL FOR TIRE WEAR PREDICTION"

Tire wear prediction models rely on accelerometer-based measurements to predict tread wear. Accelerometer measurements are often used to generate the drive-features that are required for the driver-to-vehicle component of wear prediction models. The accuracy of this component significantly impacts the estimation of forces and wear energy experienced by the tires in tread wear computations. Significant presence of errors in this approach skews tread wear prediction performance. The underlying physics-based wear computation algorithms in the tire wear prediction model requires accurate and high frequency measurements. Practical challenges arise with this requirement since the quality of data can be affected by the instrument quality, accelerometer and related factors. Second, low frequency data is often more available than high frequency data and exert far less strain on computational and transmission resources. Studies show that the wear prediction model performance exhibits an inverse relationship with data frequency. The implication is that model predictions are less reliable with increasing sparseness of data. Added to this challenge are inherent errors with accelerometer-based measurements deriving from signal loss or 'dead spots' (route segments with failed accelerometer readings) and errors associated with accelerometer orientation and accuracy. These challenges introduce significant degradation in wear prediction model performance and model generalizability. Developing an alternative approach that relies less on accelerometer and high frequency data would improve the utility and robustness of wear prediction models. This paper presents findings from a study of an alternative data science/machine learning- based approach to estimating the contribution of route to wear energy using very sparse GNSS data especially in cases where accelerometer measurements are unavailable or unreliable. The findings further provide insight into the contribution of driving style to wear, by computing a baseline wear prediction which is dependent only on the underlying route.

Stanley Omeike is the Lead Data Scientist/Machine Learning Engineer at the Advanced Digital Solutions Innovation Center of Bridgestone Americas. He received his Ph.D. degree in Management (Designing Sustainable Systems) from Case Western Reserve University, his M.Sc. degree in Data Science from Kent State University, Ohio and his B.Sc. degree in Chemistry from the University of Jos, Nigeria. His research is on the development of data science and machine learning-based approaches for enabling active vehicle safety, smart tires and for tire wear prediction. His research mainly focuses on the automotive industry as the application area, where he develops algorithms for driver behavior and active safety modeling, active vehicle route processing and vehicle/tire load estimation models for fleet operations.

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