Cleveland State University
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COLLOQUIUM

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Deep learning for real-time probabilistic traffic congestion prediction

Friday March 24th at 2:30pm in RT 1516

Bio: Dr. Pedro Gerum is an Assistant Professor of Supply Chain at Cleveland State University with a diverse background in both academia and industry. During his time at NASA Ames, Dr. Gerum contributed to the development of Exominer, a deep learning model that discovered over 300 new exoplanets. Prior to joining CSU, Dr. Gerum gained valuable industry experience at Amex, where he applied his expertise in machine learning to projects in fraud detection and probability of default forecasting. In his academic research, Dr. Gerum has made important contributions in the areas of highways congestion and travel time forecasting, railway track defect predictions and the optimal allocation of inspection crews. With several published articles, Dr. Gerum's research focuses in data science, machine learning, stochastic modeling and optimization, and game theory.

Abstract: Transportation systems depend on timely and accurate traffic congestion predictions to provide travelers with a reliable and satisfactory experience. However, most current models fail to account for unexpected situations and produce forecasts with limited information. Moreover, these models usually rely on extensive preprocessing to achieve relative accuracy. This research provides new probabilistic deep learning architectures geared specifically for traffic density forecasting that extend state-of-the-art methods. We address the quantile-crossing issue to ensure correct forecasts and perform an extensive experimental study using two distinct data sets. We verify that the proposed models are significantly more general, reliable, and accurate than traditional time-series models. The results suggest that the proposed models are (1) general across data sets without the need for preprocessing; (2) capable of capturing non-recurrent events that impact congestion; and thus (3) produce dynamic, accurate, and correct distributions of traffic density. The proposed deep learning regressors are the clear winners against

traditional methods. They produce valid non-parametric distributions that can be directly used for congestion mitigation practices, unlike the other standard regressors.

Refreshments will be served in RT 1517 at 2:10pm