

UTSA College of Business
Department of Management Science and Statistics
Research Seminar Series

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“Challenges in Modeling the Smart Grid and Deep Learning to Forecast Solar Irradiance”

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Abstract

The North American power grid has been called the “world’s largest and most complex machine.” Edison’s model of generation-transmission-load has been radically transformed in the past decade because of distributed renewables such as wind and solar and the attendant dynamic pricing of electricity.

The first half of the talk will discuss the mathematical and statistical challenges that arise when modeling the Smart Grid. Effective models must use stochastic dynamical systems; nonlinear, nonconvex optimization; control theory; and machine learning for big data. The second half of the talk will present a specific application: the problem of intra-hour solar irradiance forecasting of “ramp events”, critical for the utility.

For this research the input dataset consisted of six months of daily image sequences acquired by the UTSA SkyImager at the National Renewable Energy Laboratory. Several machine learning models were used to predict irradiance, including Deep Learning and Random Forests. Impressive accuracies were achieved when compared to pyrometer-measured irradiances. The talk is open to undergraduates.