

THE DEPARTMENT OF CIVIL ENGINEERING  
AND  
ADVISOR SAULEH SIDDIQUI, ASSISTANT PROFESSOR

ANNOUNCE THE THESIS DEFENSE OF  
Doctoral Candidate

**Wei Jiang**

Thursday, March 22, 2018  
2:00-4:00pm  
Latrobe 106

**“Machine Learning and Optimization for  
Healthcare and Energy Systems”**

**Abstract:**

Healthcare and energy systems provide critical service to our society. Recent advancement in information technology has enabled these systems to keep retrieving and storing data. In this dissertation, we used machine learning, optimization techniques, and data from healthcare and energy systems to build predictive models and discover new knowledge to guide decision-making and improve the efficiency and sustainability of these systems. We also used optimization techniques to improve the efficiency of hyperparameter tuning for machine learning algorithms. Specifically, we built a dynamic daily prediction model for predicting heart failure patients' 30-day readmission risk. We built a prediction model to predict xerostomia (dry mouth) for head and neck cancer patients treated with radiotherapy and identified the influence pattern of radiation dose across head and neck on xerostomia. Using an economic equilibrium model combined with optimization techniques for calibration, we built the first global trade model for wood chip and analyzed how local renewable energy policy in the United States could affect the global wood chip trade and lead to deforestation in other world regions. Finally, we created a new method for tuning the hyper-parameter for support vector machines by solving the problem as a bilevel optimization problem using stochastic gradient descent combined with dual coordinate descent method. We showed that the new method is more efficient than ad hoc empirical approaches. In summary, we demonstrated how machine learning and optimization techniques can improve the efficiency of healthcare and energy systems, and how optimization techniques can advance machine learning algorithms.

**Thesis Committee:** Sauleh Siddiqui, Scott Levin, Todd McNutt