2018-2019

Seminars:

April 19, Tuesday, 3:30pm

Dr Sonny Skaaning
Depository Trust and Clearing Cooperation, Dallas, Texas

Short Bio: Dr Sonney Skaaning finished a Ph.D. in Mathematics from University of Texas at Dallas (2016) under the guidance of Prof Alan Bensoussan. After that, he went to work for Comerica Bank as a Model Development Officer, working on maintaining and suggest potential improvements to the current CCAR models. I is currently working for DTCC (Depository Trust and Clearing Cooperation) as a Senior Quantitative Analyst.

Title: Industrial Challenges with Machine Learning (ML) and Artificial Intelligence (AI)

Abstract: Machine Learning (ML) and Artificial Intelligence (AI) have lately become the “buzzword” in the industrial world. Both AI and ML have made great strides and increased efficiency in the corporate environment, however, many theoretical questions are left unsolved. With its increased usage of AI/ML in every industry, it is essential to have collaboration between academia and industry to facilitate the business application and provide robust theoretical interpretation. Currently, corporation use AI/ML wherever applicable with great success, however, interpretation of the meaning of the results is still an area for which researchers struggle. The interaction between interpretability and results driven procedures is a unique opportunity for both entities to share expertise. Currently, some topics which would benefit and advance the current state of AI/ML entails, but not limited to 1. Construction of Suitable Training Data 2. Interpretability (Black Box) 3. Alternative to Error Backpropagation 4. Adaptability Robustness 5. Security

Dr Dennis Black

Comerica Bank, Dallas, Texas

Short Bio: Dr Dennis Black finished a Ph.D. in Economics from Colorado State University. After that he has been working at U.S. Environmental Protection Agency (Cincinnati, OH) – 4 years, Lodestone Research and Northstar Marketing Engineering (Ft. Collins, CO) – 9 years Comerica Bank (Auburn Hills, MI and Dallas, TX) – 13 years.

Title: Modeling in the Banking Sector

Abstract: Banks employ mathematics, statistics and econometrics to build a proforma balance sheet and income statement to support capital planning, and (for many banks) this exercise was initiated by the aftermath of the Great Recession. Congress Passed the Dodd-Frank act (2010), and any bank above $50B was subject to the Federal Reserve Board (FRB) stress testing requirements, and in addition, a Comprehensive Capital Assessment and Review (CCAR) which was conducted yearly by Federal Reserve econometricians. Models are assessed as adequate by a banks Validation Department, the FRB, and a banks Audit Department (usually contracted out to a consulting firm). Rigorous modeling and documentation is required. For credit modeling, a probability of default (PD) model is produced, a loss given default (LGD) model is produced, and an exposure at default (EAD) model is produced, and expected loss (EL) is the product of PD, LGD, and EAD. For the income statement, time series modeling is used to produce projections of future profit and loss under business-as-usual and stressed conditions. Operational risk, which involves losses due to processes, people and events, employs actuarial science to determine a VAR (Value-at-Risk) model. For example, a lognormal or Weibull Monte Carlo Simulation to model the distribution of External Fraud losses. Market research departments use association rules, logistic regression (purchase – don’t purchase), segmentation analysis, and statistical experimental design to determine what products should be marketed to which group. This talk will center on some of the salient modeling techniques used in the banking sector.

May 1, Wednesday, 3:30pm

Dr Jong-Shi Pang

Epstein Family Chair and Professor, The Daniel J. Epstein Department of Industrial and Systems Engineering, University of Southern California

Short Bio: Dr Jong-Shi Pang joined the University of Southern California as the Epstein Family Professor of Industrial and Systems Engineering in August 2013. Prior to this position, he was the Caterpillar Professor and Head of the Department of Industrial and Enterprise Systems Engineering for six years between 2007 and 2013. He held the position of the Margaret A. Darrin Distinguished Professor in Applied Mathematics in the Department of Mathematical Sciences and was a Professor of Decision Sciences and Engineering Systems at Rensselaer Polytechnic Institute from 2003 to 2007. He was a Professor in the Department of Mathematical Sciences at the Johns Hopkins University from 1987 to 2003, an Associate Professor and then Professor in the School of Management from 1982 to 1987 at the University of Texas at Dallas, and an Assistant and then an Associate Professor in the Graduate School of Industrial Administration at Carnegie-Mellon University from 1977 to 1982. During 1999 and 2001 (full time) and 2002 (part-time), he was a Program Director in the Division of Mathematical Sciences at the National Science Foundation.

Title: Multi-composite optimization for deep learning: basic problem and beyond

Abstract: This talk introduces a novel deterministic algorithmic framework that enables the computation of a directional stationary solution of the empirical deep neural network training problem formulated as a multi-composite optimization problem with coupled nonconvexity and nondifferentiability. This is the first time to our knowledge that such a sharp kind of stationary solutions is provably computable for a nonsmooth deep neural network. Allowing for arbitrary numbers of input samples and training layers, an arbitrary number of neurons within each layer, and arbitrary piecewise activation functions, the proposed approach combines the methods of exact penalization, majorization-minimization, gradient projection with enhancements, and the dual semismooth Newton method, each for a particular purpose in an overall computational scheme. Contrary to existing stochastic approaches which provide at best very weak guarantees on the computed solutions obtained in practical implementation, our rigorous deterministic treatment provides guarantee of the stationarity properties of the computed solutions with reference to the optimization problems being solved. Numerical results from a MATLAB implementation demonstrate the effectiveness of the framework for solving reasonably sized networks with a modest number of training samples. The framework also shows promise to treat extended problems beyond the basic paradigm. This is joint work with postdoc associate Dr. Ying Cui and graduate student Ziyu He.