

Operations Research and Engineering Management
Seminar Series

Research Seminar

Stochastic Algorithms for Solving Constrained Continuous
Optimization Problems



Dr. Frank Curtis

**Professor, Director of Graduate Studies for the Department of Industrial
and Systems Engineering at Lehigh University**

**Friday, April 12th
11:00am - 12:15pm
Caruth 383**

Abstract: I will discuss the recent work by my research group on the design and analysis of stochastic algorithms for solving constrained continuous optimization problems that arise in areas such as machine learning. As opposed to the typical approach to enforce structure and/or incorporate knowledge into a learning problem through regularization, the use of constrained optimization allows one to avoid expensive hyperparameter tuning and leads to knowledge being respected more accurately. This latter feature is important in areas such as physics-informed machine learning and fair learning. Our proposed algorithms are of the sequential quadratic optimization and interior-point varieties and we have shown that they enjoy strong convergence and complexity guarantees when solving problems that may be nonconvex, as is the case in settings such as deep learning. I will discuss various extensions of our methods that we have explored as well as multiple open questions.

Biography: Frank E. Curtis is a Professor in the Department of Industrial and Systems Engineering at Lehigh University, where he has been employed since 2009. He received a bachelor's degree from the College of William and Mary in 2003 with a double major in Mathematics and Computer Science, received a master's degree in 2004 and Ph.D. degree in 2007 from the Department of Industrial Engineering and Management Science at Northwestern University, and spent two years as a Postdoctoral Researcher in the Courant Institute of Mathematical Sciences at New York University from 2007 until 2009. His research focuses on the design, analysis, and implementation of numerical methods for solving large-scale nonlinear optimization problems. He received an Early Career Award from the Advanced Scientific Computing Research program of the U.S. Department of Energy, and has received funding from various programs of the U.S. National Science Foundation, including through a TRIPODS Institute grant awarded to him and his collaborators at Lehigh, Northwestern, and Boston University. He received, along with Leon Bottou (Facebook AI Research) and Jorge Nocedal (Northwestern), the 2021 SIAM/MOS Lagrange Prize in Continuous Optimization. He was awarded, with James V. Burke (U. of Washington), Adrian Lewis (Cornell), and Michael Overton (NYU), the 2018 INFORMS Computing Society Prize. He and team members Daniel Molzahn (Georgia Tech), Andreas Waechter (Northwestern), Ermin Wei (Northwestern), and Elizabeth Wong (UC San Diego) were awarded second place in the ARPA-E Grid Optimization Competition in 2020. He currently serves as Area Editor for Continuous Optimization for Mathematics of Operations Research and serves as an Associate Editor for Mathematical Programming, SIAM Journal on Optimization, IMA Journal of Numerical Analysis, and Mathematical Programming Computation. He served as the Vice Chair for Nonlinear Programming for the INFORMS Optimization Society from 2010 until 2012, and is currently very active in professional societies and groups related to mathematical optimization, including INFORMS, the Mathematics Optimization Society, and the SIAM Activity Group on Optimization.

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