



Rocky Mountain INFORMS Chapter Meeting – October 2022

When: Thursday, October 6, 2022, 5:30-7:00pm (the technical talk will begin at 6:00pm)

Where: OptTek Systems, Inc. located at 2241 17th Street, Boulder, CO 80302 (the office parking lot is available off 17th Street, which is accessed through the alleyway between Pine St and Mapleton Ave).

Background on OptTek Systems, Inc: We exist to make the world a better and safer place by eliminating waste and inefficiency. We do this by providing state-of-the-art analytical technology, software engineering, and advanced services to eliminate waste of natural resources, energy, labor, materials, time, and potential. We believe that our people are our most valuable resource and treat them as colleagues with kindness, dignity, and respect while supporting them to maximize their potential.

We are the world's leader in complex systems optimization, serving a wide range of clients and partners in the public and private sectors including Fortune 500 companies, government agencies and branches of the U.S. military. Our core government solution is the OptDef simulation optimization and analytics software that integrates with existing constructive Department of Defense (DoD) simulation tools, providing an intuitive user interface to set up, execute, and analyze the results of a simulation study. OptDef enables an analyst with an effective tool to perform complex simulation optimization and analysis leading to more effective military systems and greater capability for the warfighter.

Speaker Biography: **Dr. Michael P. Deskevich** is a Principal Algorithms Engineer at OptTek Systems, Inc. He has twenty years of experience developing high-performance numerical algorithms for scientific computing and modelling of complex systems, data analytics, language development, computer vision, deep learning, and large-scale architecture of geospatial and healthcare computer systems, as well as leading highly technical teams in those fields. He obtained a B.S in Chemistry, Physics, and Computer Science from Juniata College and a Ph.D. in Theoretical Chemical Physics from the University of Colorado where he was a fellow of the Optical Sciences and Engineering Program (OSEP) through NSF with an emphasis on lasers.

While working for OptTek, Michael has developed and implemented several novel algorithms for fast network optimization and response surface estimation for both commercial and U.S. DoD customers. He has been instrumental in developing a new scenario generation algorithm for OptTek's OptDef software tool under a Phase 2 small business innovation research (SBIR) project for the Missile Defense Agency (MDA) to increase the efficiency of studies for that department. Before joining OptTek, he worked for what is now part of the L3Harris Corporation where he developed algorithms for U.S. government clients. Some highlights include: real-time detection and mapping of gaseous contaminants in the atmosphere primarily used by the National Geospatial-Intelligence Agency (NGA); deep-learning based object based feature extraction from multi-spectral and hyper-spectral imagery, including some early research applying computer vision and artificial intelligence techniques to large volumes of data; advanced fast image compression for use in U.S. Army digital moving map systems; and many other

high-performance algorithms to gather intelligence from geospatial data. Michael has extensive experience in high-performance computing, developing state-of-the-art algorithms to distribute large quantum chemistry problems on dedicated computational clusters. His research in chemistry and physics centered around efficiently solving large numerical problems quickly and accurately.

Talk: Kriging-based Adaptive Sampling for Efficient Response Surface Estimation of Complex Simulation Models

Abstract: The U.S. Missile Defense Agency is developing a new high-fidelity digital simulation to model the nation's Missile Defense System (MDS). Computational costs for this new system are necessarily high to achieve the required accuracy. One use of this simulation is to generate heat maps to model the response of MDS configurations to various threat scenarios. The heat maps are traditionally generated with Monte Carlo replications of design points over a large sample space with the number of replications and points chosen *a priori*. OptTek is researching machine learning approaches that adaptively sample the study space and vastly reduce the number of simulation runs needed while still achieving the required accuracy. The algorithms created for this research dynamically learn geospatial correlations and adjust the number of Monte Carlo replications based on local responses while the study is running. The methodology enables reduced global uncertainty while exploring the minimal number of design points and executing the minimal number of replications. While designed for geospatial data, these algorithms naturally extend to higher dimensions and in general can be used to estimate response surfaces for any problem. In this talk, Dr. Deskevich will present research relating to efficient adaptive sampling, dynamic Monte Carlo replication management, and other novel information theoretic techniques to reduce wasted computational effort when sampling a large design space.



OptTek Systems, Inc.
2241 17th Street
Boulder, Colorado 80302
United States of America
Phone: 303-447-3255
www.OptTek.com