



2017-18 Fellows Seminar

Operations Research and Statistics: Toward Integrated Analytics

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Based on the definition developed by the Institute for Operations Research and the Management Sciences (INFORMS, 2017, www.informs.org), *Analytics is the scientific process of transforming **data** into insight for making **better decisions***. There are three major pillars of analytics – Descriptive, Predictive and Prescriptive analytics (Davenport and Harris, 2007):

- Descriptive analytics encompasses the set of statistical techniques that describe **what has happened**.
- Predictive analytics consists of analytical techniques that use prediction models and past data to predict the future to answer **what will happen**.
- Prescriptive analytics is the set of analytical techniques for decision-making including mathematical modeling, optimization, decision analysis, and simulation to determine the best course of action in terms of a multitude of objectives to answer **what should we do**.

In this Fellows Seminar, we aim to bring statisticians, operations research analysts and other interdisciplinary experts together to achieve better teaching and research towards integrated analytics for the art and science of decision-making in the presence of big data available through modern information technology. We will establish a strong presence in both research and teaching in integrated analytics at SMU. Through the expansion of the existing programs, the interdisciplinary research effort will carry into the future of SMU.

Focus and goals

I. Research Collaborations

The fellows seminar will first select some prominent research topics which are best fit to the expertise of the participants and their interests. Some potential topics that operations research and statistics intersect are

1. Stochastic processes (Queueing systems, stochastic networks, and stochastic control)
2. Statistical methodologies for analytics (Big data modeling, data mining and clustering methods, and continuous real-time prediction models)
3. Optimization methods for statistical methodologies
4. Optimization under uncertainty (Robust optimization, optimization via simulation, stochastic programming, and machine learning)

Then, the fellows seminar will select some example readings of the selected topics that interest the group. The seminar participants will identify research questions related to those example readings and discuss the possible research directions.

II. Workshop

We plan to bring a group of scholars, researchers and practitioners in statistics and operations research to SMU in the Spring 2018 semester for a workshop. The main objective of the workshop is to develop and discuss topical issues in especially the predictive and prescriptive analytics context. We will also discuss some recent developments and suggest future research directions. We will identify the means of disseminating our generated experience to other well-known research and educational institutions as well as businesses and industries that utilize analytics for decision making.

III. Course on Integrated Analytics

We plan to develop a course that includes some important analytical techniques which are interesting to both students in operations research and statistics, but not currently covered in the courses offered by neither the Department of Engineering Management, Information and Systems nor the Department of Statistical Science. The course would provide students with the tools to solve real-world problems and make better decisions via integrated analytics by spanning its all three pillars.

Format of the Fellows Seminar

We expect to have five or six participants from the engineering school, the statistics department, and other departments at SMU. We will meet 8-10 times each semester. During the fall semester, our meetings will focus on the first part of our proposal—promoting research collaboration among scholars from operations research, statistics, and potentially other departments at SMU, and organization of the workshop on “Operations Research and Statistics Towards Integrated Analytics”. During the spring semester, we will focus on the second half of our proposal – organizing a workshop and creating a course on integrated analytics.