

# A Circle of Hellenic Academics Event

A talk with an extended Q&A session on

## **Health Care Analytics**

by

**Professor Dimitris Bertsimas  
Operations Research Center, MIT**

Saturday, September 26; 4:00 -5:0 p.m.  
Alumnae Lounge, Tufts University  
40 Talbot Ave, Medford, Massachusetts 02153

### **Abstract**

In this talk we present an analytics approach to a) personalized diabetes management and b) design of clinical trials for cancer as well as some thoughts on the direction of the field of analytics relative to medicine but also more generally.

In the first part of the talk, we present a system to make personalized lifestyle and health decisions for diabetes management, as well as for general health and diet management. In particular, we address the following components of the system: (a) efficiently learning preferences through a dynamic questionnaire that accounts for human behavior; (b) modeling blood glucose behavior and updating these models to match individual measurements; and (c) using the learned preferences and blood glucose models to generate an overall diet and exercise plan using mixed-integer robust optimization. We have implemented our system as an online application, which we demonstrate.

In the second part of the talk, we propose an analytics approach for the analysis and design of clinical trials that provides insights into what is the best currently available drug combination to treat a particular form of cancer and how to design new clinical trials that can discover improved drug combinations. We develop semi-automated extraction techniques to build a comprehensive database of data from clinical trials. We use this database to develop statistical models from earlier trials that are capable of predicting the survival and toxicity of the combination of the drugs used, when the drugs used have been seen in earlier trials, but in different combinations. Then, using these statistical models, we develop optimization models that select novel treatment regimens that could be tested in clinical trials, based on the totality of data available on existing combinations. We also present concrete models for gastric and breast cancer, two of the leading causes of cancer death worldwide. Ultimately, our approach offers promise for improving life expectancy and quality of life for cancer patients at low cost.

**Short Biographical Sketch  
of  
Professor Dimitris Bertsimas**

Dimitris Bertsimas is currently the Boeing Professor of Operations Research and the co-director of the Operations Research Center at the Massachusetts Institute of Technology. He has received a BS in Electrical Engineering and Computer Science at the National Technical University of Athens, Greece in 1985, a MS in Operations Research at MIT in 1987, and a Ph.D. in Applied Mathematics and Operations Research at MIT in 1988. Since 1988, he has been with the MIT faculty. Since 2013, he is the chairman of the council of the University of Athens. Since the 1990s he has started several successful companies in the areas of financial services, asset management, health care, publishing, analytics and aviation.

His research interests include analytics, optimization and their applications in a variety of industries. He has co-authored more than 160 scientific papers and three graduate level textbooks. His fourth most recent book "The Analytics Edge" will appear this fall. He is former area editor in Optimization for Management Science and in Financial Engineering for Operations Research. He has supervised 56 doctoral students and he is currently supervising 17 others.

He is a member of the US National Academy of Engineering since 2005, and an INFORMS fellow since 2007. He has received several research awards including the Philip Morse lectureship award (2013), the William Peirskalla award for best paper in health care (2013) for the cancer work presented in this talk, the best paper award in Transportation Science (2013), the Farkas prize (2008), the Erlang prize (1996), the SIAM prize in optimization (1996), the Bodossaki prize (1998) and the Presidential Young Investigator award (1991-1996).