Dr. Boris Kovatchev

Professor, University of Virginia School of Medicine & Founding Director of the UVA Center for Diabetes Technology

Biography

Dr. Boris P. Kovatchev received his Ph.D. in Mathematics from Sofia University “St. Kliment Ohridski,” Bulgaria in 1989. Kovatchev has a 25-year track record in mathematical modeling and computing, with primary focus on diabetes technology since 1996. Currently, he is Principal Investigator of several projects dedicated to the development and clinical testing of closed-loop control and advisory systems for diabetes, including the large-scale NIH/NIDDK International Diabetes Closed-Loop Trial (grant UC4 DK 108483), the Diabetes Impact project DP3 DK 101055 “Network Control of Diabetes: Aligning Artificial Pancreas Design with Physiology,” and NIH Project “Nightlight” (grant RO1 DK 085623). His JDRF projects resulted in the [only] computer simulator of the human metabolic system accepted by FDA as a substitute to animal trials for the pre-clinical testing of insulin treatments for diabetes and in the design of the first mobile artificial pancreas system. Kovatchev is author of over 180 peer-reviewed publications, holds 42 U.S. and international patents, and has numerous pending patent applications. In 2008 he received the U.S. Diabetes Technology Leadership Award; in 2011 he was named the UVA’s Edlich-Henderson Inventor of the Year, and in 2013 he was the recipient of JDRF’s Gerold and Kayla Grodsky Award presented for outstanding scientific contributions to diabetes research. Expertise: Mathematical Modeling, Diabetes Technology, Continuous Glucose Monitoring, Closed-Loop Control and Artificial Pancreas.

November 2, 2017
12:00 - 1:00p.m.
Research Hall, 163
Lunch is provided.

“Diabetes: Models, Signals, and Control”

ABSTRACT:

Diabetes is a prime example of an enormous health care problem, the only current solution of which is advanced technology aiming precise treatment optimization. Classic studies have shown that diabetes complications are predicted by average glycemia (measured by HbA1c) and can be reduced by intensive therapy; however, the risk for hypoglycemia remains the primary barrier to optimal glycemic control. Thus, people with diabetes face a life-long optimization problem: reduce HbA1c while simultaneously avoiding hypoglycemia. Until a cure is found, closed-loop control, known as the “artificial pancreas” (AP), presents the best solution for this optimization problem, particularly in type 1 diabetes. The AP idea can be traced several decades back to studies demonstrating the possibility for external blood glucose (BG) regulation using intravenous BG measurement and infusion of insulin and glucose. With the arrival of continuous subcutaneous insulin infusion (CSII) pumps and minimally-invasive continuous glucose monitoring (CGM), building an AP system suitable for everyday use became a realistic objective.

In this presentation, we will discuss briefly the history of quantifying diabetes, the models of the human metabolic system that made possible the acceptance of in silico experiments as substitute to animal trials, the signals available to the technological treatment of diabetes, and the analytics aiming to optimize diabetes control. We will highlight recent closed-loop control developments and AP studies, which defined the AP as a tool for diabetes optimization and as a platform for technology deployment.