University of Miami

Scope of Research: Proposal to request access to IMEDS Laboratory from Ramin Moghaddass, University of Miami

Research Objectives and Aims:

We focus on using longitudinal observational data available in IMEDS Lab to make inference about the dynamic effects of various drugs/treatments with respect to various health outcomes/adverse events simultaneously. It is very clear that many drugs are closely related to each other (there are dozens of antibiotics for instance), and many health outcomes are closely related to each other (e.g., strokes, heart attacks, and other vascular diseases). Although, observational data often contain information on more than one drug and one health outcome, they are rarely used for analyzing multiple drugs and outcomes simultaneously.

Unlike most conventional models, we aim to consider multiple-drug, multiple-outcome interactions while considering **I) time-dependent treatment effects, II) treatments interaction, and III) health outcomes interaction**. The interaction analysis would include not only the interactions within treatments and within outcomes, but also the history of treatments and outcomes. The primary objective of this research project is to provide a new statistical tool, which can help us leverage the dependencies within drugs/treatments and health outcomes to better understand causal effects. Our ultimate goal is to develop new statistical methods, which be used as a drug surveillance and control tool over the course of a treatment(s) period.

Scope/Proposed Approach:

We proposed to develop new statistical methods for I) causal inference and II) drug surveillance and control.

The first domain focuses on providing supervised and unsupervised models to map drugs and outcomes to several classes and building a hierarchical framework using longitudinal observational data. The second domain focuses on building a predictive model to monitor the likelihood of a health condition over the course of a treatment, given the history and current exposure of multiple drugs/treatments and other related health outcomes as well as patient-specific features.

The main criteria to be considered in our models are to I) provide a high level of interpretability, II) use fewer variables and parameters, and III) develop a computationally efficient framework for model training, in order to benefit from big data. The computational benefit is to be provided through hierarchical modeling, identifying latent factors among similar treatments, and similar health outcomes/adverse events, and Bayesian framework.

Impact:

The proposed methods will potentially provide better insights into the real effect of multiple drugs/treatments (which are often used together) on certain correlated health outcomes/adverse events. They will also provide predictive models that can help healthcare decision-makers design and develop more efficient drug safety and drug surveillance programs using observational data.

Experience:

We request access to the IMEDS Research Laboratory platform and datasets for the following individuals:

1. Ramin Moghaddass, PhD, Assistant Professor of Industrial Engineering, University of Miami, Coral Gables, Florida

2. Skordilis Erotokritos, PhD Student, Industrial Engineering, University of Miami, Coral Gables, Florida

Timeline:

Anticipated start and end dates are Sept 2015 and August 2017, respectively, for a total of 24 months.