technische universität dortmund

RTG 1855

Optimization-based Support and Training of Clinical Decision Making

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Abstract:

Physicians need to make many important decisions per day. One clinical example is the scheduling and dosage of chemotherapy treatments. A second example is the discrimination of atrial fibrillation from atypical atrial flutter, based on ECG data. Such important and complex decisions are usually based on expert knowledge, accumulated throughout the life of a physician and shaped by subjective (and sometimes unconscious) experience. It is not readily transferable and may be unavailable in rural areas. At the same time, the available imaging, laboratory, and basic clinical data is abundant and waits to be used. This data is not yet systematically integrated and often single data-points are used to make therapy decisions.

I propose a systematic approach that supports and trains individual decision making. The developed ideas, mathematical models, and optimization algorithms will be generic and widely applicable in medicine and beyond, but also exploit specific structures, resulting in a patient- and circumstance-specific personalized medicine. This allows, e.g., a physician to first simulate the impact of his decisions on a computer and to consider optimized solutions.

I will present results and future plans covering different aspects of the ERC Consolidator Grant project MODEST (starting in July 2015), including medical applications, mathematical optimization, and training issues, in particular results from a study on the impact of optimization results on training. These show that knowledge about optimal solutions can significantly enhance future performance compared to a control group.