Personalized medicine: the adjustment of medical treatment to patient’s demographics, genetic makeup, and lifestyle is challenging and relies on medical practitioners exploring multiple treatments with a patient until finding an appropriate one. Meanwhile, patients are on their own: They have to remember the specifics of treatment, and need to identify when and what treatment to put into practice. To overcome these challenges, I envision equipping mobile phones with the means to personalize and provide health interventions. At the core of this proposal, I investigate methods for the personalization of mobile health interventions using artificial intelligence (AI), smartphones and wearables. In my work so far, I have explored two fundamental challenges: when to intervene (identifying intervention points) and what treatment to use (treatment selection). I approached these challenges by integrating human-computer interaction work in interruptibility (i.e., receptivity) and contextual bandits; an AI method for solving sequential decision-making problems. Using this approach, I implemented SleepU: an app for the delivery of a sleep intervention. SleepU was compared to standard clinical treatment. The results show that my integrated approach is as good or better than clinical treatment, and for a stratum of the study’s sample, the results are clinically meaningful. For my remaining thesis work, I propose to investigate methods for how to predict the short-term effect of a treatment (models of effects), and how to predict patient adherence to treatment (models of behavior). I then plan to use these models to augment the treatment selection previously used in my SleepU system, which will then be deployed to college students in a sleep intervention. The overall results from this work will inform the development and deployment of effective and efficient personalized mobile health interventions in the real world.

Committee members: