UNC CHARLOTTE
School of Data Science

Seed Grants For Data Science Spring 2020 Recipients

(1) A contactless non-intrusive data collection approach for the creation of healthy energy saving built-environment

Dr. Hamed Tabkhi (PI) - College of Engineering/Dept of Electrical and Computer Engineering
Dr. Mona Azarbayjani (PI) - College of Arts and Architecture/Dept of Architecture
Dr. Steven Lockley (External Collaborator) - Harvard University School of Medicine
Dr. Stefano Schiavon (External Collaborator) - University of California, Berkeley, College of Environmental Design

This project will investigate collecting thermal condition data directly from the occupants in a completely non-intrusive approach through the integration of thermal and RGB cameras. Lighting condition data also influencing occupants' health conditions is to be collected by the cameras and light sensors. The physiological and environmental collected data will then be used for predicting and controlling occupants' health conditions in the work environment and healthcare facilities through employment of deep learning and deep reinforcement learning approaches. Indoor environmental qualities have a great influence on health conditions. Despite significant expenditures in resources to provide comfortable conditions for occupants, there is a significant level of dissatisfaction with regards to environmental comfort. Phenomena such as Sick Building Syndrome (SBS) is one result. Recent research seeks to leverage occupants' demand in the control loop of the buildings. The intent is to consider the well-being of humans as well as the buildings' energy savings. To that end, a real-time feedback system is needed to provide data about occupants' comfort conditions that can be used for controlling the building heating, cooling and air conditioning (HVAC) and lighting systems.

The main funding agency for the future proposals will be the National Science Foundation.

(2) Investigating User Engagement in Mobile Health Applications

Dr. Albert Park (PI) - College of Computing and Informatics/Dept of Software and Information Systems
Dr. Virginia Gil-Rivas (PI) - College of Liberal Arts and Sciences/Dept of Psychological Science
Dr. Mohamed Shehab (PI) - College of Computing and Informatics/Dept of Software and Information Systems

This project will investigate the effectiveness of different user engagement strategies and employ analytic approaches to design the delivery of the interventions of Mobile health (mHealth) apps. Mobile health (mHealth) has become mainstream in the growing field of intervention delivery in the health

technology domain. The main focus of mHealth research has been the evaluation of efficacy of the delivery of interventions with limited regard to user engagement. However, mobile apps usage statistics show that users tend to quickly stop using apps, partially due to apps failing to sustain the user's attention and to provide limited engagement features.

Targets for future funding include: National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK), National Cancer Institute (NCI), National Institute on Alcohol Abuse and Alcoholism (NIAAA), National Institute on Minority Health and Disease (NIMHD), or National Institute on Nursing Research (NINR)

(3) Curating Heterogenous, Unstructured Health Data to build Personalized Health Infrastructures and Digital Assistants

Dr. Samira Shaikh (PI) - College of Computing and Informatics/Dept of Computer Science
Dr. Shi Chen - College of Health and Human Services/Dept of Public Health Sciences
Dr. Douglas Markant - College of Liberal Arts and Sciences/Dept of Psychological Science
Dr. Sara Levens - College of Liberal Arts and Sciences/Dept of Psychological Science
Dr. Jennifer Langhinrichsen-Rohling - College of Liberal Arts and Sciences/Dept of Psychological Science
Dr. Victoria Scott - College of Liberal Arts and Sciences/Dept of Psychological Science

Efforts during this seed grant will focus on: (a) collecting and analyzing pilot data for future grants, (b) collecting and analyzing scientific literature in the field of digital health libraries and digital health assistants, and (c) collecting and analyzing scientific literature on health communication via novel channels, including social media. We propose to undertake three distinct yet complementary efforts towards building capacity for bringing artificial intelligence to health information. We will leverage the resources of the SOPHI platform for data storage and analysis. The outcome will yield pilot data, analytical methods, and digital library and health communication approaches that will be included in prospective grant proposals to strengthen our external review prospects.

Targets for future funding include: National Institute of Health/National Library of Medicine Data Science Research: Personal Health Libraries for Consumers and Patients; National Science Foundation Smart and Connected Health, National Science Foundation Core Programs/Information and Intelligent Systems.

(4) Synthetic Aperture Radar data for imaging of dielectric constants of objects using the inverse convexification method

Dr. Loc Nguyen (PI) - College of Liberal Arts and Sciences/Dept of Mathematics and Statistics
Dr. Mikhail Klibanov (Co-PI) - College of Liberal Arts and Sciences/Dept of Mathematics and Statistics
Dr. Vasily N. Astratov (Co-PI) - College of Liberal Arts and Sciences/Dept of Physics and Optical Science
Dr. Erik Saule (Co-PI) - College of Computing and Informatics/Dept of Computer Science

The aim of this project is to compute the spatially distributed dielectric constants of objects using the measurements of the back scattered wave generated by Synthetic Aperture Radars (SARs). Using currently available SAR data, we will provide values of dielectric constants of objects of interest. Since dielectric constants of various materials are different, the knowledge of dielectric constants will provide a very important tool of the identification of targets of interest. We have promising preliminary results for experimental data. This problem is interdisciplinary among Mathematics, Physics, and Data Science.

The proposed globally convergent inverse numerical method is constructed based on our recently developed convexification approach.

Targets for future funding include:NASA, Air Force Office of Scientific Research and National Geospatial Intelligence Agency.