Seed Grants for Data Science Summer 2020 Recipients

Spring 2020 Projects Selected for Summer Follow-On Funding

(1) Project: Curating Heterogeneous, Unstructured Health Data to build Personalized Health Infrastructure and Digital Assistants

Our efforts 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. The outcome of the work 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. The project involves collaboration with industry.

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

(2) Project: Investigating User Engagement in Mobile Health Applications

Mobile health (mHealth) has become a common and mainstream growing field of intervention delivery in the health technology domain. The focus of mHealth research has been the evaluation of efficacy of the delivery of the provided 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 long-term and to provide limited engagement features. We are investigating the effectiveness of different user engagement strategies and to use analytic approaches to design the delivery of the interventions of mHealth apps.

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

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

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 system. People spend more than 90% of their time indoors and are largely dissatisfied with their environmental comfort despite the fact that a great deal of energy is directed towards providing comfortable conditions for building occupants - particularly in the urban area. The state is coined Sick Building Syndrome (SBS). We are looking into 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 that are also influencing occupants' health conditions are collected by the cameras and light sensors. The physiological and environmental collected data is then used for predicting and controlling occupants' health conditions in the work environment and healthcare facilities through deep learning and deep reinforcement learning.

Dr. Hamed Tabkhi (PI, Department of Electrical and Computer Engineering, Lee College of Engineering)
Dr. Mona Azarbayjani (PI, School of Architecture, College of Arts and Architecture)
Dr. Steven Lockley (External, Harvard Medical School)
Dr. Stefano Schiavon (External University of California, Berkeley)

Summer 2020 Recipients (New Projects)

(1) Project: Understanding and Resolving a Paradox between Privacy Protection and Data Gathering Analytics for an mHealth System in Support of Depression Monitoring, Management, and Intervention

Our proposal proposes a smartphone-based mobile health (mHealth) system for continuous depression monitoring and intervention leveraging data science, mobile computing, and a diverse set of data collected from relevant individuals. Depression is a common mood disorder that causes a persistent feeling of sadness and loss of interest. It can become harmful and result in severe consequences if not monitored and intervened when necessary. Our effort aims to: 1) enable us to have a deeper and better understanding of privacy concerns of users with mHealth in general and with the proposed mobile system specifically; 2) develop a theoretical framework that can guide the development of privacy protection mechanisms; and 3) conduct a user study to evaluate, refine, and extend the developed privacy protection mechanisms in the proposed mHealth system.

Dr. Dongsong Zhang (PI, Belk College of Business)
Dr. Heather Lipford (Co-PI, College of Computing and Informatics)
Dr. Alicia Dahl (Co-PI, College of Health and Human Services)
Dr. Lina Zhou (Co-PI, Belk College of Business)

(2) Project: Personalized Machine Learning Models for Lung Cancer Early Detection: Overuse and Underuse of Preventive Lung Cancer Screening

The overuse and underuse of preventive Low Dose CT scans (LDCT) for lung cancer is widely prevalent in the U.S. This interdisciplinary research will guide healthcare providers, social workers and public health officials to employ lung cancer screening for early detection. The objectives of this proposed study aim

to :1) developing a machine learning workflow to predict the overuse and underuse of preventive lung cancer screening, and 2) identify and evaluate key risk factors of the lung cancer screening overuse and underuse. Data for this study will be retrieved from the 2018 Behavioral Risk Factor Surveillance System. Several types of data-driven machine learning (ML) models including random forest, neural network, and support vector machines will be employed to predict potential overuse and underuse of preventive lung cancer screening. Random forest models will be developed to identify important factors that determine lung cancer screening overuse and underuse.

Dr. Yuqi Guo (PI, School of Social Work, College of Health and Human Services)
Dr. Yaorong Ge (PI, Software and Information Systems, College of Computer and Informatics)
Dr. Shi Chen (Co-PI, Department of Public Health, College of Health and Human Services)

(3) Project: Characterizing Online Right-Wing Radicalization Through Social Media

Our project tackles the question: how to characterize online radicalization using social media? With the upcoming Republican National Convention and the national general elections, there is a critical need for this research. We propose an analytical framework that uses data-driven approaches combined with a theoretical grounding in social science and criminal justice to tackle this question. Online social media has often served as a platform for polarizing conversation, particularly in the context of radicalization. UNC-Charlotte is uniquely suited to create a testbed. The outcome will make enriched datasets available to the university community for both research and education.

Dr. Shannon Reid (PI, Department of Criminal Justice, College of Liberal Arts and Sciences)
Dr. Siddharth Krishnan (PI, Department of Computer Science, College of Computing and Informatics)

(4) Project: Applying Machine Learning to the Study of Ethical Leadership

Ethical leadership is recognized as important across academic domains of research as well as in public, private, and non-profit organizations. Studies of ethical leadership have been based on self- or observer-surveys which are prone to bias, conflate behaviors with perceptions, evaluations, as well as values, and do not allow for causal inferences because of endogeneity bias. The solution to these problems is the creation of a machine-learning algorithm using Natural Language Processing (NLP) that can automatically score text, such as emails and meeting transcripts, as well as transcribed videos. Our project aims to complete (1) the training and testing of NLP models for text-analysis as well as (2) complementary experiments that allow for causal inferences.

Dr. George C. Banks (PI, Department of Management, Belk College of Business)
Dr. Scott Tonidandel (PI, Department of Management, Belk College of Business)
Dr. Wenwen Dou (PI, Department of Computer Science, College of Computing and Informatics)

(5) Project: Analytical Modeling of IoMT Data to Predict Onset And Progression of Alzheimer's

We will analyze data from Internet of Medical Things (IoMT) devices to measure and predict risk of onset of Alzheimer's disease (AD). Our project aims to computationally identify certain behaviors (sleep, exercise, and sedentary lifestyle) that impact brain health and how changes in these behaviors may highlight risk to aid in the detection of neurodegenerative trajectories during middle age. Identifying risk factors, particularly low-cost modifiable behaviors, during the preclinical stage represents the most effective method for combatting AD and improving quality of life for future generations. It remains unknown why people at high-risk of AD progress to disease and others do not. In 2020, the cost of caring for 5.8 million Americans living with AD will reach nearly $290 billion and will rise to $1.1 trillion (in 2019 dollars) by 2050. Financial approximations cannot measure the total physical, health, and emotional strain placed on family members and AD caregivers. While there's no drug treatment for the disease, new research indicates that delaying onset by just 5 years will cut an individual's risk for diagnosis by 50%.

Dr. George Shaw; (PI, Department of Public Health Services, College of Health and Human Services)
Dr. Colby Ford; (Co-PI, College of Computing and Informatics)
Dr. Xi Niu; (Co-PI, Department of Software and Information Systems, College of Computing and Informatics)
Mr. Jon Corkey; (Co-Investigator, Founder, Amissa LLC)