
Smart Home Health Analytics Spring 2017

Research Project Reflections

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Health Technology

- ❑ Interdisciplinary academic and professional field
 - Health
 - Technology

- ❑ Use technology to study aging

- ❑ Design technology to provide solutions to deal with the challenges of aging

- ❑ [NIH workshop on Technologies for Improving the Independence of Older Adults and Individuals with Disabilities](#)

NIH Research Grant Initiatives

- Diet and Physical Activity Assessment Methodology (R21)
- Design and Development of Novel Technologies for Healthy Independent Living (R21)
- mHealth Tools for Individuals with Chronic Conditions to Promote Effective Patient-Provider Communication, Adherence to Treatment and Self-Management (R21)
- Collaborative Aging (in Place) Research Using Technology (CART) (U2C)
 - <http://cra.org/ccc/events/aging-in-place/>

NIH Research Grant Initiatives

- Mobile Health: Technology and Outcomes in Low and Middle Income Countries (R21)
- mHealth Tools for Individuals with Chronic Conditions to Promote Effective Patient-Provider Communication, Adherence to Treatment and Self-Management (R01)
- Active Aging: Supporting Individuals and Enhancing Community-based Care through Health Information Technology (HIT) (P50)

Relevant NIH Funded Research Centers

- National Institutes of Health [Big Data to Knowledge](#) (BD2K) Center of Excellence
 - [Centers of Excellence for Big Data Computing](#)
- [Center of Excellence for Mobile Sensor Data-to-knowledge](#) (MD2K)
 - Advancing biomedical discovery and improving health through mobile sensor Big Data
 - <https://md2k.org/software/>
- [The National Center for Mobility Data Integration to Insight](#) (The Mobilize Center)
 - Revolutionizing mobility research through innovative data science methods

NSF Supported Research Programs

- Smart and Connected Health
- NSF Funded Research
 - A scientific smartphone tool for personalized health
 - Researchers from Carnegie Mellon University and PARC use predictive analytics and artificial intelligence to develop tailored, health interventions for personalized wellness
 - FITTLE+: Theory and Models for Smartphone Ecological Momentary Intervention
 - CMU project
 - Xerox PARC project

NSF Supported Research Programs

- USC research project
 - SCH: INT: Collaborative Research: Monitoring and Modeling Family Eating Dynamics (M2 FED): Reducing Obesity Without Focusing on Diet and Activity
- MIT research project
 - SCH: EXP: Collaborative Research: THink - Inferring Cognitive State From Subtle Behaviors

NSF Supported Research Programs

- UC Berkeley + OHSU research project
 - SHB: Large: Collaborative Research: Integrated and Inference Systems for Continuous Coordinated Care of Older Adults in the Home
- University of Colorado at Boulder
 - Health Sense: Motivating Health Awareness in Children through Wearable Computing

NSF Supported Research Programs

- Virginia Tech + North Carolina Agricultural & Technical State University research project
 - SCH: INT: Collaborative Research: BESI: Behavioral and Environmental Sensing and Intervention for Dementia Caregiver Empowerment
 - BESI Project
 - <http://wirelesshealth.virginia.edu/content/BESI>
- Many more.....

Random Search

- UMass Center for mHealth and Social Media
 - <http://www.umassmed.edu/mhealth/>

CRA workshop

- NIH Aging In Place Workshop
 - Aging in Place Panel: Innovation Needed: Sensing, actuation and system integration technology

MIT News

- Wearable AI system can detect a conversation's tone
 - Coupled with audio and vital-sign data, deep-learning system could someday serve as a “social coach” for people with anxiety or Asperger’s
 - http://news.mit.edu/2017/wearable-ai-can-detect-tone-conversation-0201?utm_content=buffer8c45c&utm_medium=social&utm_source=twitter.com&utm_campaign=buffer#.WJijz4R5o9c.twitter
- Detecting emotions with wireless signals
 - Measuring your heartbeat and breath, CSAIL device can tell if you’re excited, happy, angry, or sad.
 - <http://news.mit.edu/2016/detecting-emotions-with-wireless-signals-0920>

Machine Learning Techniques & Tools

- MLPack: a scalable machine learning library
 - <http://mlpack.org/>
- Theano: A Deep Learning Toolkit
 - <http://deeplearning.net/software/theano/tutorial/>
- TensorFlow: An open-source software library for Machine Intelligence
 - <https://www.tensorflow.org/>
 - How a Japanese cucumber farmer is using deep learning and TensorFlow!
 - <https://cloud.google.com/blog/big-data/2016/08/how-a-japanese-cucumber-farmer-is-using-deep-learning-and-tensorflow>
- TensorFlow Tutorials
 - <https://www.tensorflow.org/tutorials/>

Machine Learning Techniques & Tools

- Café: Deep learning framework
 - <http://caffe.berkeleyvision.org/>
- Lasagne is a lightweight library to build and train neural networks in Theano
 - <https://lasagne.readthedocs.io/en/latest/>
- ImageNet
 - <http://image-net.org/>
- ImageNet Large Scale Visual Recognition Challenge 2016 (ILSVRC2016)
 - <http://image-net.org/challenges/LSVRC/2016/>

Machine Learning Techniques & Tools

- Deep Learning Part 1: Comparison of Symbolic Deep Learning Frameworks -- by Microsoft Data Scientist
 - <http://blog.revolutionanalytics.com/2016/08/deep-learning-part-1.html>
- Deep Learning Part 2: Transfer Learning and Fine-tuning Deep Convolutional Neural Networks -- by Microsoft Data Scientist
 - <http://blog.revolutionanalytics.com/2016/08/deep-learning-part-2.html>

Machine Learning Techniques & Tools

- Google DeepMind
 - <https://deepmind.com/>
- Open-sourcing DeepMind Lab
 - <https://deepmind.com/blog/open-sourcing-deepmind-lab/>
- Deep Learning Research
 - <http://deeplearning.net/>

White House Press Release

- Smart Cities Initiatives
- One research project from UMBC has been mentioned!
 - NSF is bringing together academic researchers from an array of disciplines with community stakeholders to unlock transformational progress on important community challenges. Examples of this work includeand a **flood-warning pilot project in several Maryland cities that integrates sensor data and social media posts in a novel way to potentially save lives by providing advance notice of flash floods, which kill more people in the United States each year than tornadoes, hurricanes, or lightning.**
- Who is working on this project?
 - One of our last semester course students!!

Why do we want to do this exercise?

- Research of the people, by the people, for the people!!