

Hua Huang

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Objective

Pursue challenges and opportunities in state of the art research and development, preferably in the area of Internet of Things, Cyber-physical Systems, and Mobile Computing.

Education

PhD in Computer Engineering

Stony Brook University, NY, USA.(GPA: 3.7/4.0)

Jan 20. 2015.- May. 2020

Advisor: Shan Lin, Ph.D.

MS in Computer and Information Sciences

Temple University, PA, USA.(GPA: 3.7/4.0)

Sept. 2012 - Dec. 2014

BE in Electronic and Information Engineering (Advanced Class)

Huazhong University of Science and Technology, Wuhan, China (GPA: 86.7/100)

Sept. 2008 - May. 2012

Research Experience

Electric Toothbrushing Monitoring with Magnetic Sensing

March. 2017- Aug. 2019

- Designed the first electric toothbrushing monitoring system based on magnetic inductance sensing. It accurately recognizes the 15 tooth surfaces, with robustness to user movements.
- Constructed the first model to describe the electric motor magnetic field distribution in the space. Designed a positioning algorithm based on Expectation-Maximization (EM) and a roll angle recognition algorithm based on deep learning.
- Implemented a magnetic inductance sensing system using customized inductive sensor array, low-noise amplifiers, and high-resolution(16 bits) Analog-to-Digital converters.
- Designed unsupervised machine learning algorithms for toothbrushing surface recognition. They are based on Hidden Markov Model and Gaussian Mixture Model. The algorithm is training-free and robust to user movements.
- Achieved 85.4% surface recognition accuracy with in experiments with 14 users. Evaluated system robustness to user movements, environmental noises, distance changes, and user variations.

Safe Driving Monitoring based on Wearable Sensing

Dec. 2016 - Dec. 2018

- Designed the first wearable sensing system that simultaneously tracks the driver's both hands and head motions to enable safe driving monitoring.
- Designed a novel algorithm that simultaneously tracks and classifies the motions of two objects using one magnetic sensor.

- Achieved 89.7% of unsafe driving activity recognition accuracy in experiments conducted with 10 users. Tested system robustness to speeds, moving directions, and vehicle variations.

Toothbrushing Monitoring using Wrist Watch March. 2015- April. 2016

- Designed the first toothbrushing monitoring system using a smartwatch. The system automatically recognizes brushing techniques, coverage, and duration.
- Designed an accurate toothbrushing monitoring algorithms based on user motion models, customized features and neural networks. Demo.
- Implemented a cloud-based (Amazon AWS), user-friendly application that supports at-home data collection from 12 users for 3 weeks. Achieved 85.6% of surface recognition accuracy.

Device-free Indoor Localization Jan. 2014 - March. 2015

- Implemented testbed on Beaglebone with tcpdump library and C++ in the 802.11 MAC layer.
- Designed a Convolutional Neural Network (CNN) that detects pedestrians with 95.4% accuracy.

Mobile Charger Scheduling Jan. 2013 - Dec. 2014

- Defined the mobile charger scheduling problem that maximizes the sensor network coverage ratio.
- Designed novel algorithms that optimizes both traveling time and energy consumption. Achieved significant performance improvements over baseline solutions.
- Evaluated algorithms with trace-driven simulations.

Wireless Camera Network Deployment Sept. 2012 - Aug. 2013

- Designed a set cover-based algorithm that deploys cameras in the indoor areas to ensure visibility coverage while reducing the number of nodes. Designed an algorithm based on Minimum Spanning Tree with Neighborhoods to reduce the wireless connection cost.
- Proved feasibility with a beaglebone-based testbed deployment in an indoor office environment. Achieved significant improvement over baseline algorithms in simulations with real floor plans.

Publications

Activity Recognition with Mobile Sensing

- **Hua Huang** and Shan Lin. “MET: A Novel Electric Toothbrushing Monitoring System Based on Magnetic Inductance Sensing.” The 26th Annual International Conference on Mobile Computing and Networking (*MobiCom*) 2020. **Accepted** (17%)
- **Hua Huang**, Hongkai Chen, and Shan Lin. “MagTrack: Enabling Safe Driving Monitoring using Wearable Magnetics.” The International Conference on Mobile Systems, Applications, and Services (*Mobisys*), Seoul, South Korea, 2019. (17%)
- **Hua Huang** and Shan Lin. “Tooth brushing Recognition using Neural Networks.” Poster of IEEE *IoTDI*, 2017.
- **Hua Huang** and Shan Lin. “Toothbrushing Monitoring using Wrist Watch.” ACM Conference on Embedded Networked Sensor Systems (*SenSys*), Stanford, CA, 2016. (17%)

Scheduling and Deployment of Sensor Networks

- **Hua Huang**, Shan Lin, Lin Chen, Jie Gao, Anwar Mamat, Jie Wu. “ Dynamic Mobile Charger Scheduling in Heterogeneous Wireless Sensor Networks.” under submission to ACM Transaction on Sensor Networks (*TOSN*)

- **Hua Huang**, Chenchun Ni, Xiameng Ban, Jie Gao, Andrew T. Schneider and Shan Lin “Connected Wireless Camera Network Deployment with Visibility Coverage.” under submission to ACM Transaction on Internet of Things (*TIOT*).
- Kinsum Liu, Jie Gao, Shan Lin, **Hua Huang** and Brent Schiller. “Joint Sensor Duty Cycle Scheduling with Coverage Guarantee.” ACM International Symposium on Mobile Ad Hoc Networking and Computing (*MobiHoc*), Paderborn, Germany, 2016.
- Lin Chen, Shan Lin and **Hua Huang**. “Charge Me If You Can: Charging Path Optimization and Scheduling in Mobile Networks.” ACM International Symposium on Mobile Ad Hoc Networking and Computing (*MobiHoc*), Paderborn, Germany, 2016
- Lin Chen, Wei Wang, **Hua Huang**, Shan Lin “On Time-constrained Data Harvesting in WSNs: Approximation Algorithm Design.” IEEE/ACM Transactions on Networking (*ToN*), 2016.
- Lin Chen, Wei Wang, **Hua Huang**, and Shan Lin, “Time-constrained Data Harvesting in WSNs: Theoretical Foundation and Algorithm Design.” IEEE International Conference on Computer Communications (*INFOCOM*), Hong Kong, China, 2015.
- **Hua Huang**, Shan Lin, Lin Chen, Jie Gao, Anwar Mamat, Jie Wu. “ Dynamic Mobile Charger Scheduling in Heterogeneous Wireless Sensor Networks.” IEEE International Conference on Mobile Ad hoc and Sensor Systems (*MASS*), Dallas, TX, 2015.
- **Hua Huang**, Chenchun Ni, Xiameng Ban, Jie Gao, Andrew T. Schneider and Shan Lin “Connected Wireless Camera Network Deployment with Visibility Coverage.” IEEE International Conference on Computer Communications (*INFOCOM*), Toronto, Canada, 2014. (19%)
- **Hua Huang**, Shan Lin, Anwar Mamat and Jie Wu “Predictive Scheduling for Spatial-dependent Tasks in Wireless Sensor Networks”, Work-in-Progress of IEEE (*RTAS*), 2013.
- **Hua Huang**, Chenchun Ni, Xiaomeng Ban, Jie Gao and Shan Lin “Connected Wireless Camera Network Deployment with Visibility Coverage.” Poster of ACM (*IPSN*), 2013.

Device-free Indoor Localization

- **Hua Huang** and Shan Lin. “WiDet: Device-Free Intrusion Detection based on Deep Convolutional Neural Network.” Elsevier Computer Communication Journal, 2019.
- **Hua Huang** and Shan Lin. “WiDet: Device-Free Intrusion Detection based on Deep Convolutional Neural Network.” ACM International Conference on Modeling, Analysis and Simulation of Wireless and Mobile Systems (*MSWIM*), Montreal, Canada, 2018. *Best Paper Runner-up*

Smart City

- Fei Miao, Shuo Han, Shan Lin, John A. Stankovic, **Hua Huang**, Desheng Zhang, Sirajum Munir, Tian He, and George J. Pappas. “Taxi Dispatch with Real-Time Sensing Data in Metropolitan Areas: A Receding Horizon Control Approach.” IEEE Transactions on Automation Science and Engineering (*TASE*), 2016.
- Fei Miao, Shan Lin, Sirajum Munir, John A. Stankovic, **Hua Huang**, D. Zhang, T. He and G. J. Pappas “Taxi Dispatch with Real-Time Sensing Data in Metropolitan Areas.” ACM/IEEE International Conference on Cyber-Physical Systems (*ICCPs*), Seattle, WA, 2015.

Skills

- 4-year experience on mobile & wearable system design, implementation & evaluation.
- 2-year experience on computational geometric algorithm design, analysis & implementation.
- Over 7 years of experience on embedded system design & implementation.
- Strong background on machine learning and convex optimization

Teaching Experience

<i>Guest Lecture</i>	Android Basics, Device-free Localization, Localization Techniques
<i>Teaching Assistant</i>	Mobile & Wireless Networks, Mobile Cloud Computing, Lower-Level Programming
<i>Course Project Advisee</i>	Riddhi Rex: Body Motion Tracking using Wearable Magnetics (Master) Rong Chen: Indoor UAV Route Scheduling (Bachelor)

Services

TPC member for ICCCN 2020

Reviewer for ACM Sensys, IEEE Infocom, ACM IPSN, IEEE MASS, ACM Transaction of Sensor Networks (TOSN), ACM Transaction of Mobile Computing (TMC), IEEE Internet of Things Journal (IOTJ), IEEE Access.

Awards

Student Travel Grant MASS 2015, Sensys 2016,2019, Mobihoc 2016, CPSWeek 2017, Mobisys 2019