Hoang Truong

Human-centered Sensing System & Mobile Healthcare

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Education

- **University of Colorado Boulder** — USA
  Ph.D., Computer Science — *Jan. 2017 – Present*
- **Korea Advanced Institute of Science and Technology - KAIST** — Republic of Korea
  Cum Laude, Electrical & Electronic Engineering - M.S., Computer Science — *2008 – 2014*

Honors and awards

- CACM Research Highlights 2020.
- ACM SIGMOBILE Research Highlights 2020.
- Ralph J. Slutz Student Excellence Award 2019.
- Best Paper Award, ACM MobiCom 2019.
- Best Paper Award Runner Up, ACM SenSys 2018.
- NSF Travel Grant Award, ACM SenSys 2018.
- NSF Travel Grant Award, ACM MobiCom 2017.
- Best Paper Award Nominee, ACM SenSys 2017.
- Best Paper Award, ACM MobiCom-S3 2017.
- ACM SIGMOBILE Research Highlights 2017.

Research Experience

- **Pain Quantification**, *Project Lead* — **Published in ACM MobiSys'20**
  - Developed the Sweep Impedance Profiling (SIP) sensing method to capture the activity of a selected muscle group accurately at high-spatial-resolution compared to conventional EMG.
  - Designed and implemented hardware prototype of the multimodal sensing headband (including EEG, GSR, PPG, and SIP) for objective and continuous quantification of pain (89.5% and 76.7% accuracy of quantification under 3 and 4 pain states respectively on 8832 data points from 23 subjects).
- **Battery-free Gesture Recognition**, *Project Lead* — **Published in ACM WearSys'17, ACM SenSys'18**
  - Developed an ultra-low-power capacitance-based sensing mechanism and custom capacitance sensor to capture the skin deformation due to hand gesture and muscle activities.
  - Designed and implemented hardware prototype of a capacitance sensing wristband for battery-free hand gesture recognition (95% accuracy with 15 gestures) using multiple energy harvesting modalities (solar cell and RF).
- **Respiration Rate and Pulmonary Function**, *Project Lead* — **On-going**
  - Developed a sensor combination to capture all 3 breathing physical properties (acoustic, thermal and pressure) and derived an algorithm to accurately measure respiration rate using the fusion sensor measurement.
  - Developed an active airflow sensing technique to capture the whole range of patients' air blow in a spirometry test.
  - Designed hardware prototype that can plug-and-play with Android phones and test in Children's Hospital Colorado.
- **Drone Detection System**, *Project Co-Lead* — **Published in ACM MobiSys'17, ACM SenSys'20**
  - Developed a low-cost RF detection system that detects physical characteristics of the drone (i.e. body vibration and body shifting) from wireless communication signals between the drone and its controller.
  - Implemented this drone detection system that detects drone appearance at $600m$ and classifies 7 drone types.
- **Capacitive Touch Communication**, *Project Co-Lead* — **Published in ACM S3'17, ACM MobiCom'18**
  - Developed a channel model for Body-guided Communications which enables the Through-body communication between wearable devices and touch-enabled devices.
  - Designed and implemented hardware prototypes of wearable rings and wristbands for securely authenticating and identifying users with commercial-off-the-shelf touch-enabled devices on every single touch.

Industry Experience

- **HUMAX Co., Ltd, Korea**, *Software Engineer/Android Team Manager* — **Jan. 2015 – Jan. 2017**
  - **Set-top Box Development**: Developed Android-based set-top box production (device drivers, Bluetooth stacks, hardware verification, and factory application). Managed factory mass production verification process. Designed and developed company own DVB engine for Android platform which was integrated into 2016 OTT set-top box productions.
  - **Android Team Manager**: Trained and mentored Android-platform junior team for R&D center.
- **KAIST Startup Program, Korea**, *Software Developer* — **May. 2014 – Nov. 2014**
  - **Product Development**: Design and build an on-demand video platform for movie sharing.

Patents

- "Drone Presence Detection", App. No. 62/516,875, CU4333D-PPA1, 2017.
  *Tam Vu, Richard Han, Phuc Nguyen, **Hoang Truong**, Mahesh Kumar Ravindranathan*
- "Respiration Rate Measurement System", App. No. 62/744,062, 2018.
  *Tam Vu, Robin Deterding, **Hoang Truong**, Nam Bui*
- "Wearable System for Automated, Objective and Continuous Quantification of Pain", App. No. 62/900,176, 2019.
  *Tam Vu, Robin Deterding, **Hoang Truong***

Selected Publications

1. "Painometry: Wearable and Objective Quantification System for Acute Postoperative Pain"
   ***H. Truong**, N. Bui, Z. Raghebi, M. Ceko, N. Pham, P. Nguyen, A. Nguyen, T. Kim, K. Siegfried, E. Stene, T. Tvrdy, L. Weinman, T. Payne, D. Burke, T. Dinh, S. D'Mello, F. Banaei-Kashani, T. Wager, P. Goldstein, and T. Vu*
   ACM MobiSys 2020 - ACM International Conference on Mobile Systems, Applications and Services 2020
   (Acceptance rate: 19.4%)

2. "WAKE: A Behind-the-ear Wearable System for Microsleep Detection"
   *Nhat Pham, Tuan Dinh, Zohreh Raghebi, Taeho Kim, Nam Bui, Phuc Nguyen, **Hoang Truong**, Farnoush Banaei-Kashani, Ann Halbower, Thang Dinh, and Tam Vu*
   ACM MobiSys 2020 - ACM International Conference on Mobile Systems, Applications and Services 2020
   (Acceptance rate: 19.4%)

3. "eBP: A Wearable System For Frequent and Comfortable Blood Pressure Monitoring From User's Ear"
   *Nam Bui, Nhat Pham, Jessica Jacqueline Barnitz, Phuc Nguyen, **Hoang Truong**, Taeho Kim, Anh Nguyen, Zhanan Zou, Nicholas Farrow, Jianliang Xiao, Robin Deterding, Thang Dinh, and Tam Vu*
   ACM MobiCom 2019 - The ACM International Conference on Mobile Computing and Networking 2019
   (Acceptance rate: 16.1%) - **BEST PAPER AWARD**
   CACM Research Highlight, ACM SIGMOBILE Research Highlight 2020

4. "CapBand: Battery-free Successive Capacitance Sensing Wristband for Hand Gesture Recognition"
   ***H. Truong**, J.S. Zhang, U. Muncuk, P Nguyen, N. Bui, A. Nguyen, Q. Lv, K. Chowdhury, T. Dinh, and T. Vu*
   ACM SenSys 2018 - The ACM Conference on Embedded Networked Sensor Systems 2018
   (Acceptance rate: 15.6%) - **BEST PAPER AWARD RUNNER-UP**

5. "Body-Guided Communications: A Low-Power, Highly-Confined Primitive to Track and Secure Every Touch"
   *Viet Nguyen, Mohamed Ibrahim, **Hoang Truong**, Phuc Nguyen, Richard Howard, Tam Vu, and Marco Gruteser*
   ACM MobiCom 2018 - The ACM International Conference on Mobile Computing and Networking 2018
   (Acceptance rate: 22.5%)

6. "TYTH-Typing On Your Teeth: Tongue-Teeth Localization for Human-Computer Interface"
   *P. Nguyen, N. Bui, A. Nguyen, **H. Truong**, A. Suresh, M. Whitlock, D. Pham, T. Dinh, and T. Vu*
   ACM MobiSys 2018 - ACM International Conference on Mobile Systems, Applications and Services 2018
   (Acceptance rate: 26.8%)

7. "PhO2: Smartphone based Blood Oxygen Level Measurement Systems using Near-IR and RED Wave-guided Light"
   *Nam Bui, Anh Nguyen, Phuc Nguyen, **Hoang Truong**, Ashwin Ashok, Thang Dinh, Robin Deterding, and Tam Vu*
   ACM SenSys 2017 - The ACM Conference on Embedded Networked Sensor Systems 2017
   (Acceptance rate: 14.3%) - **BEST PAPER AWARD NOMINEE**

8. "Matthan: Drone Presence Detection Using Physical Signatures in the Drone's RF Communication"
   *Phuc Nguyen, **Hoang Truong**, Mahesh Ravindranathan, Anh Nguyen, Richard Han, and Tam Vu*
   ACM MobiSys 2017 - ACM International Conference on Mobile Systems, Applications and Services 2017
   (Acceptance rate: 18%) - **ACM SIGMOBILE Research Highlight 2017**

9. "Photometry based Blood Oxygen Estimation through Smartphone Cameras"
   *Nam Bui, Anh Nguyen, Phuc Nguyen, **Hoang Truong**, Ashwin Ashok, Thang Dinh, Robin Deterding, and Tam Vu*
   ACM S3 2017 - **BEST PAPER AWARD**

Technical Skills

- **Languages**: C, Java, Python, MATLAB.
- **Platform**: Linux, Android, SDR, openBCI.
- **Hardware design**: Altium.
- **Tools**: TI Microcontroller, GNURadio.
- **Sensors**: Experience with human biosignal and vital signal sensing.