

Ming Li

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Skills

Languages Java, C++, Python, Bash, Matlab, C, R.

Techniques Digital Signal Processing, Android Programming, Machine Learning, Algorithm Design, Speech Recognition, Computer Vision, Object-Oriented Programming, ROS Robot Programming, Arduino Programming, Game Theory, Git Version Control, LaTeX Writing.

Research Interests

Machine Learning, Digital Signal Processing, Security and Privacy in Mobile IoT Sensing, Computer Vision, Algorithmic Game Theory, Incentive Mechanism Design, Networks, Crowdsourcing.

Education

Colorado School of Mines
GOLDEN, USA

Ph.D. in Computer Science **GPA: 3.98**
Aug. 2015 - Aug. 2020

Colorado School of Mines
GOLDEN, USA

M.S. in Computer Science **GPA: 3.94**
Jan. 2014 - May. 2015

Peking University
BEIJING, CHINA

B.S. in Geochemistry **GPA: 3.57**
Sep. 2009 - Jul. 2013

Experience

Software Engineer

MACHINE LEARNING APPLIED TO WI-FI FINGERPRINTING

Sticker Control

Nov. 2020 - Now

- Built an Android App to collect wifi BSSID and RSSI data along with users' walking trajectories for floor map construction.
- Tested five machine learning models and embedded the model to the app to support real-time room-level localization.

Course Instructor

Colorado School of Mines

CSCI 358: DISCRETE MATH

Aug. 2019 - Dec. 2019

CSCI 561: THEORY TO COMPUTATION

Aug. 2016 - Dec. 2016

- Planned, prepared and delivered lessons, homework, and exams to 62 undergraduate students (CSCI 358) and 33 graduate students (CSCI 561).

Projects

2019-2020 SpyPhone : EAVESDROPPING ON SMARTPHONE SPEAKERS WITH MOTION SENSORS

- Identified a security issue on smartphones that **motion sensors** (access granted to any app) can **eavesdropping on speakers**.
- Developed an **Android** app to collect motion sensor (accelerometer and gyroscope) data while playing sounds through speakers.
- Reconstructed the high frequency (16,000 Hz) sound information from low frequency (400 Hz) motion data by building **K-SVD dictionaries** and recognized the speech using **Bi-LSTM networks**.
- Utilized: Recurrent Neural Networks, Compressed Sensing, Android Programming.

2019-2020 UltraUnlock : SMARTPHONE AUTHENTICATION USING GESTURES IN THE AIR

- Implemented a novel smartphone authentication system so that the user draw gestures in the air to unlock the phone.
- Adopted **active acoustic sensing** technique where the smartphone actively sends near-ultrasound baseband and classified hand gestures using the received modulated signals.
- Extracted **in-phase/quadrature components** using **CIC Decimation filter** and feed the I/Q data to train the **SVM**.
- Utilized: Digital Signal Processing, Machine Learning.

2018-2019 MotionVoice : A SPOOF-PROOF VOICE AUTHENTICATION SYSTEM FOR SMARTPHONES

- Proposed a new **voice authentication** system that is immune to **replay attacks** by leveraging the self demodulation and acoustic attenuation effect when sound signals transmitted through human body.
- Designed an Android app to collect the **body-borne vibration** and **sound data** simultaneously.
- Applied signal processing techniques such as syllable separation to sound data and using **sequence-to-sequence LSTM** network on vibration data to identify users.
- Utilized: Machine learning, Digital Signal Processing, Android Programming.

2018 DriverDetect : USING ATMOSPHERIC PRESSURE SENSORS TO DETERMINE WHETHER THE USER IS THE DRIVER OR A PASSENGER

- Proposed a new driver detection system based on the fact that each seat in the vehicle is expected to experience differences in **atmospheric pressure** for each vehicle acceleration dynamic.
- Designed a circuit with **Arduino** and **barameters** to test the system.
- Utilized: Arduino programming, Digital Signal Processing.

2016-2017 QUAC : QUALITY-AWARE CONTRACT-BASED INCENTIVE MECHANISMS FOR CROWDSENSING

- Design two quality-aware contract-based **incentive mechanisms** for crowdsensing, named QUAC-F and QUAC-I, under full information model and incomplete information model, respectively, which differ in the level of users' information known to the system.
- Mathematically proved that both QUAC-F and QUAC-I are guaranteed to maximize the platform utility while satisfying individual rationality and incentive compatibility.
- Utilized: Algorithm Design, Contract Theory.

2016 TurtleBot : USING RTAB-MAP AND A TURTLEBOT TO CREATE A FLOOR MAP

- Used a **TurtleBot** to perform graph-based simultaneous localization and mapping (**SLAM**) by using **RTAB-Map**.
- Programmed speech control and voice feedback on the TurtleBot.
- Utilized: ROS Robot Programming, Computer Vision.

2015-2017 SpecWatch : SOLVING ADVERSASIAL SPECTRUM USAGE MONITORING PROBLEM WITH UNKNOWN STATISTICS IN CRNS.

- Modeled the monitoring problem as an **adversarial multi-armed bandit** problem with switching cost.
- Designed an asymptotically optimal online algorithm, termed SPECWATCH, and prove its normalized expected weak regret is $O(1/\sqrt[3]{T})$, which converges to 0 as time horizon T approaches to ∞ .
- Utilized: Algorithm Design, Game Theory.

Publications

- Yuhui Zhang, **Ming Li**, Dejun Yang, Jian Tang, Guoliang Xue, and Jia Xu. Trade-off Between Location Quality and Privacy in Crowdsensing: An Optimization Perspective. *IEEE Internet of Things Journal*, 7(4): 3535-3544, 2020.
- Yuhui Zhang, **Ming Li**, Dejun Yang, Guoliang Xue. A Budget Feasible Mechanism for k-Topic Influence Maximization in Social Networks. *IEEE Global Communications Conference (GLOBECOM)*, 2019.
- Yuhui Zhang, **Ming Li**, Dejun Yang, Jian Tang, and Guoliang Xue. Optimizing Location Quality in Privacy Preserving Crowdsensing. *IEEE Global Communications Conference (GLOBECOM)*, 2019.
- Jian Lin, Dejun Yang, **Ming Li**, Jia Xu, and Guoliang Xue. Frameworks for Privacy-Preserving Mobile Crowdsensing Incentive Mechanisms. *IEEE Transactions on Mobile Computing (TMC)*, 17(8): 1851-1864, 2018.
- **Ming Li**, Dejun Yang, Jian Lin, Ming Li, and Jian Tang. SpecWatch: A Framework For Adversarial Spectrum Monitoring With Unknown Statistics. *Computer Networks (COMNET)*, 143: 176-190, 2018.
- Jian Lin, **Ming Li**, Dejun Yang, and Guoliang Xue. Sybil-Proof Online Incentive Mechanisms for Crowdsensing. *IEEE International Conference on Computer Communications (INFOCOM)*, 2438-2446, 2018.
- **Ming Li**, Jian Lin, Dejun Yang, Guoliang Xue, and Jian Tang. QUAC: Quality-Aware Contract-Based Incentive Mechanisms for Crowdsensing. *IEEE International Conference on Mobile Ad Hoc and Sensor System (MASS)*, 72-80, 2017.
- Jian Lin, **Ming Li**, Dejun Yang, Guoliang Xue, and Jian Tang. Sybil-Proof Incentive Mechanisms for Crowdsensing. *IEEE International Conference on Computer Communications (INFOCOM)*, 2017.
- Michael Brown, Colin Marshall, Dejun Yang, **Ming Li**, Jian Lin, Guoliang Xue. Maximizing Capacity in Cognitive Radio Networks Under Physical Interference Model. *IEEE/ACM Transactions on Networking (TON)*, 25(5): 3003-3015, 2017.
- Yuhui Zhang, Dejun Yang, Jian Lin, **Ming Li**, Guoliang Xue, Jian Tang, and Lei Xie. Spectrum Auctions Under Physical Interference Model. *IEEE Transactions on Cognitive Communications and Networking (TCCN)*, 3(4): 719-728, 2017.
- **Ming Li**, Dejun Yang, Jian Lin, Ming Li, and Jian Tang. SpecWatch: Adversarial Spectrum Usage Monitoring in CRNs with Unknown Statistics. *IEEE International Conference on Computer Communications (INFOCOM)*, 2016
- Jian Lin, Dejun Yang, **Ming Li**, Jia Xu, and Guoliang Xue. BidGuard: A Framework for Privacy-Preserving Crowdsensing Incentive Mechanisms. *IEEE Conference on Communications and Network Security (CNS)*, 145-153, 2016.