Ming **Li**

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Skills

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

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

Projects

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 Bi-LSTM networks.
- Utilized: Recurrent Neural Networks, Compressed Sensing, Android Programming.

MoVo : 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.

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 to test the system.
- Utilized: Arduino programming, Digital Signal Processing.

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.
- Algorithm Design, Contract Theory.

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.

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.

IntelliSample : Self-tuning Program to Output the Shortest Paths Efficiently on Very Large Graphs

- Implemented three shortest path algorithms (Bellman Ford's, Dijkstra's, and Gabow's) and two sampling methods based on Forest Fire Algorithm.
- Provided a framework which predicts the best shortest path algorithm by pre-running on the sample graph.
- Utilized: Algorithm Selection, Graph Sampling.

PaperSelect : Program to Automatically Select Academic Papers for Researchers

- Provided two greedy approaches to solve the problem, one is heuristic and the other is $(1-1/e)$-approximate.
- Utilized: Algorithm Design.

Education

Colorado School of Mines — **Ph.D. in Computer Science** — **GPA: 3.98**
Golden, USA — *Sep. 2015 - Aug. 2020 (Expected)*

Colorado School of Mines — **M.S. in Computer Science** — **GPA: 3.94**
Golden, USA — *Jan. 2014 - May. 2015*

Peking University — **B.S. in Geochemistry** — **GPA: 3.57**
Beijing, China — *Sep. 2009 - Jul. 2013*

Publications

- 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.

Employment

Course Instructor — *Colorado School of Mines*
CSCI 358: Discrete Math — *Fall 2019 Semester*

Course Instructor — *Colorado School of Mines*
CSCI 561: Theory to Computation — *Fall 2016 Semester*

Research Assistant — *Colorado School of Mines*
NEMOS lab — *Fall 2015 - now*