

**Education:**

**Ph.D. in Electrical and Computer Engineering**  
**University of Southern California (USC)**

Aug. 2015 — present  
 Advisor: Prof. Urbashi Mitra

**B.E. in Electronic Engineering and Information Science**  
**University of Science and Technology of China (USTC)**

Aug. 2011 — Jun. 2015

**Publications:****Journal Papers**

1. L. Liu and U. Mitra, “On Sampled Reinforcement Learning in Wireless Networks: Exploitation of Policy Structures”, *IEEE Transactions on Communications*, accepted.
2. L. Liu, A. Chattopadhyay and U. Mitra, “On Solving Large Scale MDPs: Exploitation of Policy Structures and Spectral Properties”, *IEEE Transactions on Communications*, vol. 67, no. 6, pp. 4151-4165, 2019.
3. L. Liu, Y. Zhong, W. Zhang and M. Haenggi, “On the impact of Cooperation on Local Delay and Energy Efficiency in Poisson Networks”, *IEEE Wireless Communications Letters*, vol. 4, no. 3, pp. 241-244, 2015.

**Conference Articles**

1. L. Liu, and U. Mitra, “Policy Sampling and Interpolation for Wireless Networks: A Graph Signal Processing Approach”, *IEEE International Global Communications Conference (GLOBECOM)*, IEEE, 2019. Accepted.
2. L. Liu, A. Chattopadhyay and U. Mitra, “Exploiting Policy Structure for Solving MDPs with Large State Space”, *52nd Annual Conference on Information Sciences and Systems (CISS)*, IEEE, Mar, 2018.
3. L. Liu, A. Chattopadhyay and U. Mitra, “On Exploiting Spectral Properties for Solving MDP with Large State Space”, *55th Annual Allerton Conference on Communication, Control and Computing*, pp. 1213-1219, IEEE, Oct, 2017.

**Research/Project Experience:**

**Communication Science Insitute, USC**

Aug. 2015 — present

Advisor: Prof. Urbashi Mitra

- *Efficient Representation and Policy Optimization for Markov Decision Processes Problems with Large State Space*
  - Proposed various subspace design methods for reduced dimensional Markov decision processes using graph signal processing techniques. One particular method achieved both complexity reduction and perfect reconstruction of the optimal policy.
  - Exploited policy structure to accelerate policy iteration.
- *Application of Graph Signal Processing to Reinforcement Learning*
  - Proposed policy sampling and reconstruction algorithms for structured optimal policy in reinforcement learning problems. The proposed algorithms achieve both complexity reduction and similar performance as the classical reinforcement learning algorithm.
  - Derived analytical bounds for the proposed algorithms.
  - Further proposed policy refinement algorithms, which achieve better policy reconstruction with minor increase in complexity.

**Communication Science Insitute, USC**

Aug. 2019 — Dec. 2019

- *Teaching Assistant:* EE562 Random Processes in Engineering

- *Improvement of Broadband Network Speed Measurement*
  - Software implementation of broadband and Wi-Fi speed test
  - Optimization on codes for improved performance
  - Conducted comparison with the current flooding algorithm and showed robustness and better performance of the developed algorithm under heavy network traffic scenario.
- *Multi-AP (Wi-Fi Mesh) Network*
  - Investigation and understanding of WFA (Wi-Fi Alliance) Mesh Standard

**Department of Electronic Engineering and Information Science, USTC**

- *Impact of Coordinated Transmission on Delay and Energy Efficiency in Wireless Networks:*  
Advisor: Prof. Wenyi Zhang Jan. 2014 — Oct. 2014
  - Derived formulas for delay and energy efficiency in non-coordinated transmission and coordinated transmission.
  - Conducted numerical comparisons and analyzed their engineering significance.
  - Demonstrated that networks can strongly benefit from coordinated transmission.
- *Course projects: Principles of Modern Communication* Fall 2013
  - Built a mini toolbox of communication in MATLAB, including:
    - \* Modulation and Demodulation (BPSK/QPSK)
    - \* Convolutional Channel Codec (Viterbi algorithm)
    - \* Carrier Recovery and Symbol Timing

**Courses and Skills:**

---

- **Graduate Courses**
  - Introduction to Computer Networks   ◦ Digital Communication and Coding Systems
  - Probability for Electrical and Computer Engineers   ◦ Fundamental Concepts of Analysis
  - Information Theory and Compression   ◦ Random Processes in Engineering
  - Applied Matrix Analysis   ◦ Stochastic Processes   ◦ Analysis of Algorithms
  - Computational Solution of Optimization Problems   ◦ Stochastic Network Optimization
  - Wavelets and Graphs for Signal Processing and Machine Learning
  - Dynamic Programming and Markov Decision Processes
- **Software skills and Packages**
  - **Programming and Toolbox**
    - \* C   \* Matlab   \* Python   \* SDR simulink Matlab   \* SQL
  - **Others**
    - \* L<sup>A</sup>T<sub>E</sub>X   \* VHDL

**Honors & Awards:**

---

- |   |               |
|---|---------------|
| 1, Electronic Institute Scholarship (USTC)                      | 2014          |
| 2, Outstanding Undergraduate Scholarship (Gold Prize, 3%, USTC) | 2013 and 2012 |
| 3, Outstanding Freshman Scholarship (USTC)                      | 2011          |

**References:**

---

- Prof. Urbashi Mitra (Ph.D advisor)  
Ming Hsieh Department of Electrical and Computer Engineering, University of Southern California, USA.  
Email: ubli@usc.edu
- Prof. Antonio Ortega (Project collaborator)  
Ming Hsieh Department of Electrical and Computer Engineering, University of Southern California, USA.  
Email: antonio.ortega@gmail.com
- Prof. Wenyi Zhang (Undergraduate advisor)  
Department of Electronic Engineering and Information Science, University of Science and Technology of China, China.  
Email: wenyizha@ustc.edu.cn