Libin Liu

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Education:

Ph.D. in Electrical and Computer Engineering   Aug. 2015 — present
University of Southern California (USC)   Advisor: Prof. Urbashi Mitra

B.E. in Electronic Engineering and Information Science   Aug. 2011 — Jun. 2015
University of Science and Technology of China (USTC)

Publications:

Journal Papers

1. L. Liu and U. Mitra, "On Sampled Reinforcement Learning in Wireless Networks: Exploitation of Policy Structures", *IEEE Transactions on Communications*, under revision.

2. L. Liu, A. Chattopadhyay and U. Mitra, "On Solving Large Scale MDPs: Expoitation 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 — present

- *Teaching Assistant*: EE562 Random Processes in Engineering

Adaptive Spectrum and Signal Alignment, Incorporated (ASSIA) May. 2019 — Aug. 2019

Technical Manager: Jisung Oh

- *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)
        * Convolutioned 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**
        * LaTeX   * 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