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Programming: C++, Matlab, Python (Keras, Tensorflow), Julia, R, Go, MySQL, etc. **Site:** <https://xinyuwusjtu.github.io/wxy/>

EDUCATION

Massachusetts Institute of Technology (MIT), Laboratory of Information and Decision Systems (LIDS)

- **M.S./Ph.D.** in Aeronautics and Astronautics & Interdisciplinary Doctoral Program in Statistics Sept. 2018 – Dec. 2023
- **Research Interests:** Control & Optimization in Computer Networking **Advisor:** Eytan Modiano **GPA:** 5.0/5.0
- **Courses:** Reinforcement Learning; Statistical Learning; Inference (Bayesian, MAP, etc.); Math Programming (LP, MIP), etc.
- **MIT AeroAstro MathWorks Fellowship**, awarded to students with strong coding experiences in MathWorks products

WORK EXPERIENCE

Google LLC | Cloud Team | Research Intern | Timely Topology Restripe in Datacenter Networks May. 2022 - Aug. 2022

- Implemented 5 timely restripe methods through C++ in fleet analysis pipeline, tested over 4 Jupiter datacenter network fabrics with >30 superblocks and >10,000 connected links, and evaluated max link utilization (MLU) through MySQL and Python.
- Proposed a *block-utilization-based* restripe method based on balancing the top-K most utilized superblocks, and a *demand-distance-based* restripe method via formulating a max-min fairness optimization framework, both of which gained a 3% reduction in p99-MLU compared with existing methods on some fabrics.
- Showed that proposed methods can achieve within 2% gap towards the optimum with consistent restripes by at most only 6 restripes, demonstrating the power of intelligent restripe time selection that achieves nice performance with low restripe cost.
- Implemented a tool to allow the manual setting of restripe times, together with the proposed methods submitted as changelists.
- Continue to extend this work to a research paper by designing auto-tuning mechanisms for the restripe parameters.

RESEARCH EXPERIENCE

MIT | QoS Improvement When Network is Overloaded | [Datacenter; Network Optimization] Mar. 2020 - Sept. 2021

- Delay-Optimal Rate Control: Identified and proved a set of queueing-delay-optimal rate control policies in data networks (server farms, Fat-tree, Clos, etc.) when overloaded, and showed a 10% reduction of average delay and 50% reduction of maximum delay compared to serving with maximum resources, revealing the resource-saving benefit of our proposed method.
- Overload Balancing: Proposed and proved that a maxweight scheduling policy with backpressure mechanism achieves most balanced queue overload, under both sufficient and limited network capacity, in both centralized and distributed way.
- Overload Mitigation: Proved a sufficient condition that generalizes a set of network control policies to avoid queue overloading in multi-hop data networks through investigation over the stability of (nonlinear) queue dynamics.

MIT | Failure Cascade Prediction in Power Systems | [Time Series Analysis; Machine Learning] Nov. 2018 - Jan. 2020

- Proposed a learning framework to estimate the underlying influence among components in power systems via Monte-Carlo approach & parallelizable convex programming, using Interior Point Optimizer (IPOPT) for large-scale nonlinear optimization.
- Predicted failure cascades with final state error <10% for power systems from northern America with ~3000 nodes, and revealed a 2-order-of-magnitude reduction in computational time cost compared with power flow simulation method.
- Identified power lines prone to induce large-scale power failures in $O(n^2)$ time, with an $O(n^{0.373})$ reduction over flow simulation.
- Complete Matlab code for learning, and Python code with Tensorflow for LSTM-based method comparison are in Github site.
- Shared the work in C3.AI DTI Research Symposium 2022. (<https://c3dti.ai/events/symposia/annual-2022/>)

SJTU | Wireless Fingerprint based Localization | [Data Inference; Numerical Optimization] Sept. 2016 - Mar. 2017

- Modeled the reference signal receiving power (RSRP, a.k.a. fingerprint) prediction as matrix completion, and proposed gradient descent on Stiefel manifold for prediction based on sparse fingerprint samples, through SVD and QR Decomposition.
- Evaluated our algorithm over 8,820,000 data records of RSRP & location information in a 69.8km² urban region, and showed that 71% and 98% users can be localized based on the predicted fingerprints within an error of 100m and 300m respectively.

SJTU | Social Network De-Anonymization | [Integer Programming; Approximation Algorithm] Mar. 2017 - May. 2018

- Modeled user identity de-anonymization into a combinatorial edge matching problem based on the mean square error metric, and put forward an algorithm based on the convex-concave optimization to solve the edge matching problem.
- Identified ~90% anonymized users on the Microsoft Academic Graphs with ~3000 nodes & ~80% on the Stanford SNAP social networks with 500~2000 nodes, which revealed one potential threat of privacy security in real social networks.

PUBLICATIONS

- **Xinyu Wu**, Dan Wu, Eytan Modiano, “Queueing Delay Minimization in Overloaded Networks via Rate Control”, to appear in *58th Annual Allerton Conference on Communication, Control, and Computing, 2022*.
- **Xinyu Wu**, Dan Wu, Eytan Modiano, “Overload Balancing in Switched Networks with Bounded Buffers”, *IFIP Networking Conference 2022*.
- **Xinyu Wu**, Dan Wu, Eytan Modiano, “An Ordinary Differential Equation Framework for Stability Analysis of Networks with

Finite Buffers”, submitted to *IEEE Conference on Decision and Control (CDC)* 2022.

- **Xinyu Wu**, Dan Wu, Eytan Modiano, “Predicting Failure Cascades in Large Scale Power Systems via the Influence Model Framework”, *IEEE Transactions on Power Systems*, vol. 36, no. 5, pp. 4778-4790, 2021.
- **Xinyu Wu**, Dan Wu, Eytan Modiano, “An Influence Model Approach to Failure Cascade Prediction in Large Scale Power Systems”, *the 2020 American Control Conference (ACC)*, Denver, USA, Jul. 1st-3rd, 2020.
- **Xinyu Wu**, Zhongzhao Hu, Xinzhe Fu, Luoyi Fu, Xinbing Wang, Songwu Lu, “Social Network De-Anonymization with Overlapping Communities: Analysis, Algorithm, and Experiments”, *IEEE International Conference on Computer Communications (INFOCOM)*, 2018. (extended version in *IEEE Transactions on Networking*, vol. 28, no. 1, pp. 360-375, 2020)
- **Xinyu Wu**, Xiaohua Tian, Xinbing Wang, “Large-scale Wireless Fingerprints Prediction for Cellular Network Positioning”, *IEEE INFOCOM*, 2018. (extended version in *IEEE Transactions on Mobile Computing*, vol. 19, no. 2, pp. 450-465, 2019)

PROJECTS & TA

Project (Python, librosa): Implemented *Normalizing Flow-based unsupervised learning* to identify anomalous machine audios on the basis of mel-frequency cepstrum coefficients (MFCC) analysis through librosa package. Spring 2022

Project (Matlab): Reviewed kernel learning methods with polynomial & Gaussian kernels implemented. (Github) Fall 2019

Project (Python): Implemented *Metropolis-Hasting MCMC* to decipher texts with >70,000 characters. (Github) Spring 2019

Project (Julia): Implemented integer programming to solve Sudoku & Directed TSP in Julia. Fall 2018

Project (Verilog, C): Designed Gobang game through Verilog (hardware) and C (software) on Xilinx Platform Studio. Fall 2017

TA -- Communication System: Aloha; CSMA; TCP/IP; UDP; Scheduling; Packet Switching, etc. (**Matlab** coding) Spring 2020

TA -- Algorithms: Dynamic Programming; Graph; Simplex Method; Randomized Algorithm, etc. (**C++** coding) Spring 2018