YUE SUN

yuesun9308@gmail.com

EDUCATION

University of Washington Seattle, WA, US
Ph.D. in Electrical Engineering 2016.9 - 2022.3
Academics: Overall GPA 3.83/4
Thesis: *Nonconvex Optimization and Model Representation with Applications in Control Theory and Machine Learning*

Tsinghua University Beijing, China
Bachelor of Engineering in Electronic Engineering 2012.8 - 2016.7
Academics: Overall GPA 89.2/100

WORKING EXPERIENCE

Nokia Bell Labs, Math & ALGO Bell Labs Summer Intern Seattle, WA, US
Project: Audio Echo Cancellation with Sparse Coefficients 2021.6 - 2021.8
Host: Shirin Jalali

- Reframed audio echo cancellation problem as online least squares and implemented SGD, APA, IML, Catalyst.
- Combined with sparsity of the parameters, incorporated RIP of circulant matrix into algorithm analysis. Derived and implemented proportionate algorithms and regularized algorithms for sparse coefficient estimation.

Google, Software Engineering Intern (PhD) Mountain view, CA, US
Project: Online Learning for Entropy Coding in Next-generation Video Codec 2019.6 - 2019.9
First authored paper in **DCC 2020**, *with a* **patent**. *Host: Jingning Han*

- Implemented online update algorithm for probability estimation for entropy coding.
- Generalized baseline algorithm by maximum apriori estimator with online optimization for adaptive learning.
- Implemented experiments on real dataset and the compressed file is 2% smaller than baseline (**C++ & python**).

RESEARCH EXPERIENCE

Papers published in **NeurIPS, CDC, ICASSP, L4DC, ICML workshop, TSP**

University of Washington, Research Assistant Seattle, WA, US
Project: Towards Understanding the Role of Representation Dimension in Meta-Learning 2020.9 - 2022.3
First/second authored paper accepted by **NeurIPS 2021, TOPML 2021, ICASSP 2021**, *Advisor: Maryam Fazel*

- Demonstrated the procedure and obtained statistical guarantee (sample complexity & error) of meta-learning.
- Obtained guarantee of meta-learning accuracy in the overparametrized regimes, theoretically proved the double descent phenomenon and verified it by numerical experiments.
- Generalized to non-linear models, e.g., multiple class classification, validated on image (CNN/Resnet) and text (LSTM/attention/transformer) classification with MAML as baseline (**python/pytorch, AWS**).

Project: Learning Linear Dynamical System via Regularization 2018.10 - 2022.3
First authored paper **(oral)** *in* **L4DC 2020**, *Advisor: Maryam Fazel*

- Obtained optimal error rate of unregularized method for linear system identification.
- Learning with provably fewer data and smaller error by Hankel nuclear norm (low rank) regularization.
- Implemented regularized method on Daisy, Gym and Mujoco dynamical systems and observed the advantage in input sensitivity, simplicity of tuning parameters, training data size and estimation error (**python/pytorch**).

Project: Policy Gradient Descent in Control and Reinforcement Learning 2018.10 - 2022.3
First authored paper in **CDC 2021**, *Advisor: Maryam Fazel*

- Proved the global convergence of non-convex policy optimization for a generic family of optimal control problems.
- Proposed the connection between policy optimization in RL and convexification method in control theory.

Side Project: Learning Yelp Votes Data

- Used **Python/Pandas** and **Python/Seaborn** for visualizing and preprocessing Yelp votes data. Implemented neural networks for learning (**Python/Pytorch & Pyspark**).
- Processed text by transformer (**Python/Pytorch**). Compared error of NNs' with different depth and structure.
- Implemented the entire model by ensemble learning (**Python/Xgboost, AWS**).

Simons Institute for the Theory of Computing, Visiting Graduate Student Berkeley, CA, US
Project: Perturbed Gradient Descent Method for Non-convex Optimization 2017.9 - 2017.12
First authored paper in **NeurIPS 2019, ICML workshop 2018**

- Derived convergence rate of noisy gradient descent method for nonsmooth nonconvex optimization problems and extended approximation strategy to Riemannian metric.
- Applied to image processing task where the retraction operator is trained by conditional GAN (**python/tensorflow**).

Ohio State University, Research Assistant Columbus, OH, US
Project: Phase Retrieval and Low Rank Matrix Completion 2015.7 - 2015.9
First/second authored papers in **ICASSP 2016, TSP**, *Advisor: Yuejie Chi*

- Reproduced the derivation and conduced performance test for various phase retrieval algorithms.
- Derived an extension of Wirtinger Flow algorithms by expanding it from rank 1 case to low rank case. Analyzed the advantages with outliers.

PUBLICATIONS

1. **Yue Sun**, Samet Oymak and Maryam Fazel, "System Identification via Nuclear Norm Regularization", submitted to IEEE Open Journal of Control Systems (OJ-CSYS).
2. Yang Zheng, **Yue Sun**, Maryam Fazel and Na Li, "Escaping High-order Saddles with Policy Gradient Descent for Linear Quadratic Gaussian Control", submitted to 61st Conference on Decision and Control (CDC 2022).
3. **Yue Sun**, Adhyyan Narang, Ibrahim Gulluk, Samet Oymak and Maryam Fazel, "Towards Sample-Efficient Overparameterized Meta-Learning", in 35th Conference on Neural Information Processing Systems (NeurIPS 2021) & 2021 Workshop on the Theory of Overparameterized Machine Learning (TOPML).
4. **Yue Sun** and Maryam Fazel, "Learning Optimal Controllers by Policy Gradient: Global Optimality via Convex Parameterization", in 60th Conference on Decision and Control (CDC 2021) **&** 2021 INFORMS Annual Meeting.
5. Ibrahim Gulluk[†], **Yue Sun**[†], Samet Oymak and Maryam Fazel, "Sample Efficient Subspace-Based Representations for Nonlinear Meta-Learning", in 2021 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).
6. **Yue Sun**, Samet Oymak and Maryam Fazel, "Finite Sample System Identification: Improved Rates and the Role of Regularization", (**oral**) in 2020 Conference of Learning for Dynamics and Control (L4DC).
7. **Yue Sun**, Jingning Han and Yaowu Xu, "Online Probability Model Estimation for Video Compression", in 2020 Data Compression Conference (DCC). Patent: Probability Estimation for Entropy Coding (WO 2021/092531 A1).
8. **Yue Sun**, Nicolas Flammarion and Maryam Fazel. "Escaping from Saddle Points on Riemannian Manifolds," in 33rd Conference on Neural Information Processing Systems (NeurIPS 2019).
9. **Yue Sun** and Maryam Fazel. "Escaping Saddle Points Efficiently in Equality-constrained Optimization Problems", in ICML Workshop on Modern Trends in Nonconvex Optimization for Machine Learning, 2018.
10. Yuanxin Li, **Yue Sun** and Yuejie Chi. "Low-Rank Positive Semidefinite Matrix Recovery From Corrupted Rank-One Measurements". IEEE Transactions on Signal Processing 65.2 (2017): 397-408.
11. **Yue Sun**, Yuanxin Li and Yuejie Chi. "Outlier-Robust Recovery of Low-Rank Positive Semidefinite Matrices from Magnitude Measurements", in 2016 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP).
12. Zhong Hua, Yixin Su, **Yue Sun** and Xin Wang, "Handwritten Numeral Recognition Algorithms and Implementation Based on the Multifunction Touch Screen", in 2014 Asia-Pacific Congress on Sports Technology and Engineering.

TECHNICAL REPORTS

Scholar page: https://scholar.google.com/citations?hl=en&user=IxBPfiYAAAAJ

1. **Yue Sun**, "Linear System Identification with Redundancy in Output".
2. **Yue Sun**, "A Short Note on Solving Box Inequality and Linear Equality Constrained Optimization Problem".
3. **Yue Sun**, "Globally Optimizing the Learning Rate of the Heavy Ball Method".

REVIEWING SERVICE

NeurIPS 2019/20, L4DC 2020, ICLR 2021/22, ALT 2021, ISIT 2021, KDD 2021, JMLR, SICON, TIT, TAC