

# YUE SUN

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## EDUCATION

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### University of Washington

*Ph.D. candidate in Electrical Engineering*

**Academics:** Overall GPA 3.82/4

Seattle, WA, US

2016.9 - 2022.3

### Tsinghua University

*Bachelor of Engineering in Electronic Engineering*

**Academics:** Overall GPA 89.2/100

Beijing, China

2012.8 - 2016.7

**Programming:** Python, Matlab, JAVA, C/C++; Pytorch, Keras, Tensorflow, Scikit-learn, Xgboost; Spark; AWS

**Key Words:** Nonconvex Optimization, Compressive Sensing, Control, Representation Learning

## WORKING EXPERIENCE

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### Nokia Bell Labs, Math & ALGO Bell Labs Summer Intern

Project: Audio Echo Cancellation with Sparse Coefficients

Host: Shirin Jalali

Seattle, WA, US

2021.6 - 2021.8

- Reframed audio echo cancellation problem as online least squares.
- Implemented online LS algorithms including SGD, tail averaged 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)

Project: Online Learning for Entropy Coding in Next-generation Video Codec

First authored paper in **DCC 2020**, with a **patent**. Host: Jingning Han

Mountain view, CA, US

2019.6 - 2019.9

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

## RESEARCH EXPERIENCE

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

### University of Washington, Research Assistant

Project: Towards Understanding the Role of Representation Dimension in Meta-Learning

First/second authored paper accepted by **NeurIPS 2021**, **TOPML 2021**, **ICASSP 2021**, Advisor: Maryam Fazel

Seattle, WA, US

2020.9 - 2022.3

- 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

First authored paper (**oral**) in **L4DC 2020**, Advisor: Maryam Fazel

2018.10 - 2022.3

- 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**).

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**).

- Proposed a generic approach to connect policy gradient method to convexification method.
- Generalized from static controller to dynamic controller design, and proposed the convergence guarantee of policy gradient method when quadratic invariance holds.

**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 conducted 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 convexity of L1 distance function and its advantages with outliers.

**PUBLICATIONS**

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1. Yang Zheng<sup>†</sup>, **Yue Sun**<sup>†</sup>, 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).
2. **Yue Sun**, Adhyayan 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).
3. **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.
4. Ibrahim Gulluk<sup>†</sup>, **Yue Sun**<sup>†</sup>, 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).
5. **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).
6. **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).
7. **Yue Sun**, Nicolas Flammarion and Maryam Fazel. “Escaping from Saddle Points on Riemannian Manifolds,” in 33rd Conference on Neural Information Processing Systems (NeurIPS 2019).
8. **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.
9. 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.
10. **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).
11. 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**

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<https://scholar.google.com/citations?user=3wR9USQAAAAJ&hl=en>

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**

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