Sulin Liu

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Research Interests

My interests are in deep learning, probalisitic modeling and control theory. My current research focuses on scalable and robust automatic model selection with applications to AutoML and control. Previously, I have also worked on federated learning and multi-task learning.

Education

2017-pres. Ph.D. in Electrical Engineering, **Princeton University**
- Advisors : Ryan P. Adams (CS), Peter J. Ramadge (EE)
- GPA : 3.96/4.0

2011-2015 B.Eng. in Electrical Engineering, **National University of Singapore**
- Major GPA : 4.94/5.0, Minor in Mathematics

2014 Exchange student, **Georgia Institute of Technology**
- GPA : 4.0/4.0, only 9 students selected university wide

Research Experience

2018-pres. Research Assistant, **Princeton University** Advisors : Ryan P. Adams, Peter J. Ramadge

- Amortized model selection of Gaussian Process :
  - Developed an amortized inference framework for GP model selection
  - Proposed a novel self-attention based neural network architecture that could trained on problems with different data cardinality and dimension
  - Demonstrated that a single trained neural model is able to perform GP model selection on different benchmarks with comparable quality but $\sim$100 times faster than conventional approaches
- Gaussian Process for system identification with stability guarantees :
  - Identified a general class of stable GPs whose kernel's reproducing kernel Hilbert space (RKHS) corresponds to integrable functions
  - Proposed a probabilistic system identification method for linear dynamical systems with stability guarantees
- Optimization for deep learning (side projects) :
  - Studied second-order optimization method for better generalization in large batch training
  - Analyzed the noise component in stochastic gradient descent (SGD) from a low-rank perspective to help interpret its performance in deep learning

2015-17 Research Engineer, **Nanyang Technological University, Singapore** Advisor : Sinno Jialin Pan

- Distributed and federated learning, multi-task learning :
  - Established the first distributed (federated) learning algorithm for relationship-based multi-task learning with convergence guarantees
  - Developed a distributed primal-dual optimization algorithm for empirical risk minimization
  - Developed a new multi-task learning method that adaptively group correlated tasks

2015 Undergraduate Thesis, **National University of Singapore** Advisor : Loong Fah Cheong

- 3D reconstruction : proposed a new quadratic optimization formulation of multi-view homography-based planar reconstruction

2014 Research Intern, **Institute for Infocomm Research, Singapore**

- Implemented a 3D face pose alignment algorithm for face images in the wild

Publications

2020 | **S. Liu**, X. Sun, P. J. Ramadge, R. P. Adams Task-Agnostic Amortized Inference of Gaussian Process Hyperparameters, *under submission, preprint at ICML AutoML workshop*, 2020. Link.

2020 | H. Valavi, **S. Liu**, P. J. Ramadge Revisiting the Landscape of Matrix Factorization, in *International Conference on Artificial Intelligence and Statistics* (*AISTATS*), 2020. Link.

2018 | M. Zhao, B. An, Y. Yu, **S. Liu**, S. J. Pan Data Poisoning Attacks on Multi-Task Relationship Learning, in *AAAI Conference on Artificial Intelligence* (*AAAI*), 2018. Link.

2017 | **S. Liu**, S. J. Pan, Q. Ho Distributed Multi-task Relationship Learning, in *Conference on Knowledge Discovery and Data Mining* (*KDD*), 2017. Link.

2017 | Y. Yu*, **S. Liu***, S. J. Pan Communication-Efficient Distributed Primal-Dual Algorithm for Saddle Point Problems, in *Uncertainty in Artificial Intelligence* (*UAI*), 2017. Link.

2017 | **S. Liu**, S. J. Pan Adaptive Group Sparse Multi-task Learning via Trace Lasso, in *International Joint Conference on Artificial Intelligence* (*IJCAI*), 2017. Link.

Honors and Awards

2018 | Anthony Ephremides Fellowship
- awarded to the top one first year Ph.D. student in the information science track

2017 | Princeton University Fellowship in Natural Sciences and Engineering

2014 | IEEE Eta Kappa Nu Honor Society

2014 | Faculty of Engineering Annual General Electric Book Prize
- awarded to the top one student in the area of wireless communications

2013 | ST Electronics Book Prize
- awarded to the top one student in Electrical Engineering in the second year

2011-15 | Singapore Ministry of Education SM3 Undergraduate Scholarship

Coursework

Machine Learning and Pattern Recognition
New Directions in Theoretical Deep Learning
Theoretical Machine Learning
Statistical Optimization and Reinforcement Learning
Optimization for Machine Learning
Linear and Nonlinear Optimization
Large-scale Optimization
Statistical Theory and Methods
High-dimensional Probability

Programming Skills

- Proficient : Python (PyTorch, Tensorflow), MATLAB, Java, LaTeX
- Familiar : C/C++, R, Shell script, Julia, CSS, HTML, VHDL, Assembly

Languages

- Chinese (Native)
- English (Professional)

Academic Service

Reviewer for *JMLR*, *NeurIPS*, *ICML*, *ICLR*, *AAAI*, *ACML*

Teaching

Teaching assistant for
- Machine Learning and Pattern Recognition (ELE435/535, Princeton)
- Mathematics for Numerical Computing and Machine Learning (COS 302, Princeton)
- Introduction to Data Science (SML201, Princeton)
- Programming Methodology (CS1010E, NUS)