Samy Jelassi

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Employment

Harvard University, Research fellow, Center of Mathematical Sciences and Applications 2023- Present

Hosts: Boaz Barak and Sham Kakade
Research topics: alternatives to Transformers (Mixture-of-Experts, SSMs), Model Merging, Length Generalization, as well as ongoing work on RLHF.

Education

Princeton University, PhD, Operations Research Department. 2017 – 2023

Advised by Boris Hanin
Thesis: Algorithmic and architectural implicit biases in deep learning

ENS Cachan, Master of Arts in Applied Mathematics with distinction. 2015 – 2017

Advised by Francis Bach
Thesis: Variance-Reduced Gradient Descent Methods

ENS Lyon, Bachelor in Computer Science with distinction. 2014 – 2015

Lycée Louis-le-Grand, Classes Préparatoires aux Grandes Écoles. 2011 – 2014

University-level preparation for the competitive entrance to French Engineering Schools

Internships

Google Research (NYC), hosted by Srinadh Bhojanapalli and Sashank Reddi 2022

Google Deepmind (London), hosted by Bernardo Avila Pires and Rémi Munos 2021

Facebook AI Research (NYC), hosted by Aaron Defazio 2020

Preprints

Mixture of Parrots: Experts improve memorization more than reasoning 2024

S. Jelassi, C. Mohri, D. Brandfonbrener, A. Gu, N. Vyas, N. Anand, D. Alvarez-Melis, Y. Li, S. Kakade, E. Malach
In submission, **oral presentation (top 10%)** at the "Mathematics of modern machine learning" workshop, NeurIPS 2024, `https://arxiv.org/abs/2410.19034`

Collective Model Intelligence Requires Compatible Specialization 2024

J. Pari, **S. Jelassi**, P. Agrawal
In submission, `https://arxiv.org/abs/2411.02207`

Universal length generalization with turing programs 2024

K. Hou, D. Brandfonbrener, S. Kakade, **S. Jelassi***, E. Malach*
In submission, `https://arxiv.org/abs/2407.03310`

Depth Dependence of μP Learning Rates in ReLU MLPs 2023

S. Jelassi, B. Hanin, Z. Ji, S. Reddi, S. Bhojanapalli, S. Kumar
`https://arxiv.org/abs/2305.07810`

Length generalization in arithmetic transformers 2023

S. Jelassi, S. d'Ascoli, C. Domingo-Enrich, Y. Wu, Y. Li, F. Charton
`https://arxiv.org/abs/2306.15400`

Conference papers

LoRA Soups: Merging LoRAs for Practical Skill Composition Tasks 2025

A. Prabhakar, Y. Li, K. Narasimhan, S. Kakade, E. Malach, **S. Jelassi**
International Conference on Computational Linguistics (COLING) 2025, Industry track.
https://arxiv.org/abs/2410.13025

Repeat after me: Transformers are better than state space models at copying 2024

S. Jelassi, D. Brandfonbrener, S. Kakade, E. Malach
International Conference on Machine Learning (ICML) 2024, https://arxiv.org/abs/2402.01032

Q-Probe: A Light Approach to Reward Maximization for Language Models 2024

K. Li, **S. Jelassi**, H. Zhang, S. Kakade, M. Wattenberg, D. Brandfonbrener
International Conference on Machine Learning (ICML) 2024, https://arxiv.org/abs/2402.14688

Vision transformers provably learn spatial structure 2022

S. Jelassi, M. Sander, Y. Li
Conference on Neural Information Processing Systems (NeurIPS) 2022, https://arxiv.org/abs/2210.09221

Towards understanding how momentum improves generalization in deep learning 2022

S. Jelassi, Y. Li
International Conference on Machine Learning (ICML) 2022, https://arxiv.org/abs/2207.05931
Oral presentation (top 5%**)** at "Overparameterization: Pitfalls & Opportunities" workshop, ICML 2021.

Auction learning as a two-player game 2021

J. Rahme, **S. Jelassi**, S. M. Weinberg
International Conference on Learning Representations (ICLR) 2021, https://arxiv.org/abs/2006.05684

A Permutation-Equivariant Neural Network Architecture For Auction Design 2021

J. Rahme, **S. Jelassi**, J. Bruna, S. M. Weinberg
AAAI Conference on Artificial Intelligence 2021, https://arxiv.org/abs/2003.01497

Extragradient with player sampling for faster Nash equilibrium finding 2020

S. Jelassi, C. Domingo-Enrich, D. Scieur, A. Mensch, J. Bruna
International Conference on Machine Learning (ICML) 2020, https://arxiv.org/abs/1905.12363

A mean-field analysis of two-player zero-sum games 2019

C. Domingo-Enrich, **S. Jelassi**, A. Mensch, G. M. Rotskoff, J. Bruna
Conference on Neural Information Processing Systems (NeurIPS) 2019, https://arxiv.org/abs/2002.06277

Towards closing the gap between the theory and practice of SVRG 2019

O. Sebbouh, N. Gazagnadou, **S. Jelassi**, F. Bach, R. M. Gower
Conference on Neural Information Processing Systems (NeurIPS) 2019, https://arxiv.org/abs/1908.02725

Global convergence of neuron birth-death dynamics 2019

G. Rotskoff, **S. Jelassi**, J. Bruna, E. Vanden-Eijnden
International Conference on Machine Learning (ICML) 2019, https://arxiv.org/abs/1902.01843

Smoothed analysis of low-rank approach for smooth semidefinite programs 2019

T. Pumir*, **S. Jelassi***, N. Boumal
Oral presentation (top 3%) at the Conference on Neural Information Processing Systems (NeurIPS) 2018,
https://arxiv.org/abs/1806.03763

Journal papers

Adaptivity without Compromise: A Momentumized, Adaptive, Dual Averaged Gradient Method for Stochastic Optimization 2022

A. Defazio, **S. Jelassi**

Journal of Machine Learning Research 2022, `https://arxiv.org/abs/2101.11075`

Depth separation beyond radial functions 2022

L. Venturi, **S. Jelassi**, T. Ozuch, J. Bruna

Journal of Machine Learning Research 2022, `https://arxiv.org/abs/2102.01621`

Teaching

COS 485 Neural Networks: Theory and Applications, Teaching Assistant, Spring 2023.

ORF 350: Analysis of Big Data, Head Teaching Assistant, Spring 2019, 2021, 2022.

ECE 435/535, Machine Learning and Pattern Recognition, Teaching Assistant, Fall 2018, 2019, 2021.

ORF 409: Introduction to Monte Carlo Simulation, Teaching Assistant, Fall 2020.

Service

Reviewer, NeurIPS 2019-24, ICML 2020 & 2023, ICLR 2025, STOC 2025, JMLR.

Organizer, New Technologies in Mathematics Seminar at Harvard CMSA, Fall 2023 & Spring 2024.

Talks

Mixture of Parrots: Experts improve memorization more than reasoning 2024

Mathematics of Modern Machine Learning workshop, NeurIPS 2024.

Algorithmic and architectural implicit biases in deep learning 2022

EPFL, Caltech, University of Toronto

Towards understanding how momentum improves generalization in deep learning 2022

International Conference on Machine Learning (ICML) 2021, 2022

Smoothed analysis of some machine learning problems 2019

Google Montreal

Smoothed analysis of the low-rank approach for smooth semidefinite program 2018

Plenary oral presentation at the Conference on Neural Information Processing Systems (NeurIPS) 2018.