

# Samy Jelassi

sjelassi@fas.harvard.edu | 609-933-5773 | sjelassi.github.io

## Employment

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<b>Harvard University</b> , Postdoctoral Fellow, School of Engineering and Applied Sciences (SEAS) Hosts: Boaz Barak and Sham Kakade <b>Research topics:</b> LLM architectures, Optimization, Long-context, RL with LLMs.	2025 - Present
<b>Harvard University</b> , Research fellow, Center of Mathematical Sciences and Applications	2023 - 2025

## Education

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<b>Princeton University</b> , PhD, Operations Research Department. Advised by Boris Hanin Thesis: Algorithmic and architectural implicit biases in deep learning	2017 – 2023
<b>ENS Cachan</b> , Master of Arts in Applied Mathematics with distinction. Advised by Francis Bach Thesis: Variance-Reduced Gradient Descent Methods	2015 – 2017
<b>ENS Lyon</b> , Bachelor in Computer Science with distinction.	2014 – 2015
<b>Lycée Louis-le-Grand</b> , Classes Préparatoires aux Grandes Écoles. University-level preparation for the competitive entrance to French Engineering Schools	2011 – 2014

## Internships

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<b>Google Research (NYC)</b> , hosted by Srinadh Bhojanapalli and Sashank Reddi	2022
<b>Google Deepmind (London)</b> , hosted by Bernardo Avila Pires and Rémi Munos	2021
<b>Facebook AI Research (NYC)</b> , hosted by Aaron Defazio	2020

## Selected works

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<b>Matching Features, Not Tokens: Energy-Based Fine-Tuning of Language Models</b> S. Jelassi*, M. Kwun*, R. Zhao*, Y. Li, N. Fusi, Y. Du, S. Kakade, C. Domingo-Enrich* submitted	2026
<b>Let's (not) just put things in Context: Test-time Training for Long-context LLMs</b> R. Bansal, A. Zhang, R. Tiwari, L. Madaan, S. Duvvuri, F. Devvrit, D. Brandfonbrener, D. Alvarez-Melis, P. Bhargava, M. Kale, <b>S. Jelassi</b> International Conference on Learning Representations (ICLR) 2026, <a href="https://arxiv.org/abs/2512.13898">https://arxiv.org/abs/2512.13898</a>	2026
<b>Echo chamber: RL post-training amplifies behaviors learned in pretraining</b> R. Zhao*, A. Meterez*, S. Kakade, C. Pehlevan, <b>S. Jelassi</b> <sup>†</sup> , E. Malach <sup>†</sup> Conference on Language Modeling (COLM) 2025, <a href="https://arxiv.org/abs/2504.07912">https://arxiv.org/abs/2504.07912</a>	2025
<b>Mixture of Parrots: Experts improve memorization more than reasoning</b> S. Jelassi, C. Mohri, D. Brandfonbrener, A. Gu, N. Vyas, N. Anand, D. Alvarez-Melis, Y. Li, S. Kakade, E. Malach International Conference on Learning Representations (ICLR) 2025, <b>oral presentation (top 10%)</b> at the "Mathematics of modern machine learning" workshop, NeurIPS 2024, <a href="https://arxiv.org/abs/2410.19034">https://arxiv.org/abs/2410.19034</a>	2025
<b>Repeat after me: Transformers are better than state space models at copying</b> <b>S. Jelassi</b> , D. Brandfonbrener, S. Kakade, E. Malach	2024

## Conference papers

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<b>Parameter-Efficient Reinforcement Learning using Prefix Optimization</b>	2026
<b>S. Jelassi*</b> , I. Rocha Filho*, R. Zhao, S. Kakade, E. Malach	
International Conference on Learning Representations (ICLR) 2026, <a href="https://openreview.net/forum?id=SLhLUdlaqc">https://openreview.net/forum?id=SLhLUdlaqc</a>	
<b>Let Me Think! A Long Chain-of-Thought Can Be Worth Exponentially Many Short Ones</b>	2025
P. Mirtaheri*, E. Edelman*, <b>S. Jelassi</b> , E. Malach, E. Boix-Adsera	
Conference on Neural Information Processing Systems (NeurIPS) 2025, <a href="https://arxiv.org/abs/2505.21825">https://arxiv.org/abs/2505.21825</a>	
<b>To backtrack or not to backtrack: When sequential search limits model reasoning</b>	2025
T. Qin, D. Alvarez-Melis, <b>S. Jelassi</b> , E. Malach*	
Conference on Language Modeling (COLM) 2025, <a href="https://arxiv.org/abs/2504.07052">https://arxiv.org/abs/2504.07052</a>	
<b>Universal length generalization with turing programs</b>	2025
K. Hou, D. Brandfonbrener, S. Kakade, <b>S. Jelassi</b> , E. Malach*	
International Conference on Machine Learning (ICML) 2025, <a href="https://arxiv.org/abs/2407.03310">https://arxiv.org/abs/2407.03310</a>	
<b>The Role of Sparsity for Length Generalization in Transformers</b>	2025
N. Golowich, <b>S. Jelassi</b> , D. Brandfonbrener, S. Kakade, E. Malach	
International Conference on Machine Learning (ICML) 2025, <a href="https://arxiv.org/abs/2502.16792">https://arxiv.org/abs/2502.16792</a>	
<b>LoRA Soups: Merging LoRAs for Practical Skill Composition Tasks</b>	2025
A. Prabhakar, Y. Li, K. Narasimhan, S. Kakade, E. Malach, <b>S. Jelassi</b>	
International Conference on Computational Linguistics (COLING) 2025, Industry track. <a href="https://arxiv.org/abs/2410.13025">https://arxiv.org/abs/2410.13025</a>	
<b>Q-Probe: A Light Approach to Reward Maximization for Language Models</b>	2024
K. Li, <b>S. Jelassi</b> , H. Zhang, S. Kakade, M. Wattenberg, D. Brandfonbrener	
International Conference on Machine Learning (ICML) 2024, <a href="https://arxiv.org/abs/2402.14688">https://arxiv.org/abs/2402.14688</a>	
<b>Vision transformers provably learn spatial structure</b>	2022
<b>S. Jelassi</b> , M. Sander, Y. Li	
Conference on Neural Information Processing Systems (NeurIPS) 2022, <a href="https://arxiv.org/abs/2210.09221">https://arxiv.org/abs/2210.09221</a>	
<b>Towards understanding how momentum improves generalization in deep learning</b>	2022
<b>S. Jelassi</b> , Y. Li	
International Conference on Machine Learning (ICML) 2022, <a href="https://arxiv.org/abs/2207.05931">https://arxiv.org/abs/2207.05931</a>	
<b>Oral presentation (top 5%) at "Overparameterization: Pitfalls &amp; Opportunities" workshop, ICML 2021.</b>	
<b>Auction learning as a two-player game</b>	2021
J. Rahme, <b>S. Jelassi</b> , S. M. Weinberg	
International Conference on Learning Representations (ICLR) 2021, <a href="https://arxiv.org/abs/2006.05684">https://arxiv.org/abs/2006.05684</a>	

<b>A Permutation-Equivariant Neural Network Architecture For Auction Design</b>	2021
J. Rahme, <b>S. Jelassi</b> , J. Bruna, S. M. Weinberg	
AAAI Conference on Artificial Intelligence 2021,	
<a href="https://arxiv.org/abs/2003.01497">https://arxiv.org/abs/2003.01497</a>	
<b>Extragradient with player sampling for faster Nash equilibrium finding</b>	2020
<b>S. Jelassi</b> , C. Domingo-Enrich, D. Scieur, A. Mensch, J. Bruna	
International Conference on Machine Learning (ICML) 2020,	
<a href="https://arxiv.org/abs/1905.12363">https://arxiv.org/abs/1905.12363</a>	
<b>A mean-field analysis of two-player zero-sum games</b>	2019
C. Domingo-Enrich, <b>S. Jelassi</b> , A. Mensch, G. M. Rotskoff, J. Bruna	
Conference on Neural Information Processing Systems (NeurIPS) 2019,	
<a href="https://arxiv.org/abs/2002.06277">https://arxiv.org/abs/2002.06277</a>	
<b>Towards closing the gap between the theory and practice of SVRG</b>	2019
O. Sebbouh, N. Gazagnadou, <b>S. Jelassi</b> , F. Bach, R. M. Gower	
Conference on Neural Information Processing Systems (NeurIPS) 2019,	
<a href="https://arxiv.org/abs/1908.02725">https://arxiv.org/abs/1908.02725</a>	
<b>Global convergence of neuron birth-death dynamics</b>	2019
G. Rotskoff, <b>S. Jelassi</b> , J. Bruna, E. Vanden-Eijnden	
International Conference on Machine Learning (ICML) 2019,	
<a href="https://arxiv.org/abs/1902.01843">https://arxiv.org/abs/1902.01843</a>	
<b>Smoothed analysis of low-rank approach for smooth semidefinite programs</b>	2019
T. Pumir*, <b>S. Jelassi</b> *, N. Boumal	
<b>Oral presentation (top 3%)</b> at the Conference on Neural Information Processing Systems (NeurIPS) 2018,	
<a href="https://arxiv.org/abs/1806.03763">https://arxiv.org/abs/1806.03763</a>	

## Journal papers

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<b>Adaptivity without Compromise: A Momentumized, Adaptive, Dual Averaged Gradient Method for Stochastic Optimization</b>	2022
A. Defazio, <b>S. Jelassi</b>	
Journal of Machine Learning Research 2022, <a href="https://arxiv.org/abs/2101.11075">https://arxiv.org/abs/2101.11075</a>	
<b>Depth separation beyond radial functions</b>	2022
L. Venturi, <b>S. Jelassi</b> , T. Ozuch, J. Bruna	
Journal of Machine Learning Research 2022, <a href="https://arxiv.org/abs/2102.01621">https://arxiv.org/abs/2102.01621</a>	

## Preprints

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<b>Depth Dependence of <math>\mu</math>P Learning Rates in ReLU MLPs</b>	2023
<b>S. Jelassi</b> , B. Hanin, Z. Ji, S. Reddi, S. Bhojanapalli, S. Kumar	
<a href="https://arxiv.org/abs/2305.07810">https://arxiv.org/abs/2305.07810</a>	
<b>Length generalization in arithmetic transformers</b>	2023
<b>S. Jelassi</b> , S. d'Ascoli, C. Domingo-Enrich, Y. Wu, Y. Li, F. Charton	
<a href="https://arxiv.org/abs/2306.15400">https://arxiv.org/abs/2306.15400</a>	

## Teaching

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**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

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**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

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<b>Understanding RL with Verifiable Rewards through Distribution Sharpening</b>	2025
Foundations of Post-training workshop, COLT 2025.	
<b>Mixture of Parrots: Experts improve memorization more than reasoning</b>	2024
Mathematics of Modern Machine Learning workshop, NeurIPS 2024.	
<b>Algorithmic and architectural implicit biases in deep learning</b>	2022
EPFL, Caltech, University of Toronto	
<b>Towards understanding how momentum improves generalization in deep learning</b>	2022
International Conference on Machine Learning (ICML) 2021, 2022	
<b>Smoothed analysis of some machine learning problems</b>	2019
Google Montreal	
<b>Smoothed analysis of the low-rank approach for smooth semidefinite program</b>	2018
Plenary oral presentation at the Conference on Neural Information Processing Systems (NeurIPS) 2018.	