Juno Kim

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Profile

I am a first-year Ph.D. student in Electrical Engineering and Computer Sciences at the University of California, Berkeley. My interests lie in the **mathematical foundations of deep learning**, with a focus on nonconvex optimization, dynamical analysis, and statistical guarantees for neural networks. I am also interested in understanding emergent capabilities of foundation models such as chain-of-thought reasoning.

Previously, I received my B.Sc. in Mathematics and Statistics at Seoul National University as Valedictorian of '23, and my M.Sc. in Mathematical Informatics at the University of Tokyo advised by Prof. Taiji Suzuki, where I received the Dean's Award for outstanding research.

Publications

Jihun Yun*, **Juno Kim***, Jongho Park, Junhyuck Kim, Jongha Jon Ryu, Jaewoong Cho, Kwang-Sung Jun. Alignment as Distribution Learning: Your Preference Model is Explicitly a Language Model. *Under review.* (*equal contribution)

Anming Gu*, **Juno Kim***. Mirror Mean-Field Langevin Dynamics. *Under review.*

Juno Kim, Denny Wu, Jason D. Lee, Taiji Suzuki. Metastable Dynamics of Chain-of-Thought Reasoning: Provable Benefits of Search, RL and Distillation. **ICML 2025**.

Naoya Yamamoto, **Juno Kim**, Taiji Suzuki. Hessian-guided Perturbed Wasserstein Gradient Flows for Escaping Saddle Points. *Under review.*

Juno Kim, Taiji Suzuki. Transformers Provably Solve Parity Efficiently with Chain of Thought. **ICLR 2025 Oral**.

Juno Kim, Dimitri Meunier, Arthur Gretton, Taiji Suzuki, Zhu Li. Optimality and Adaptivity of Deep Neural Features for Instrumental Variable Regression. **ICLR 2025**.

Juno Kim, Tai Nakamaki, Taiji Suzuki. Transformers are Minimax Optimal Nonparametric In-Context Learners. **NeurIPS 2024** and *ICML 2024 TF2M Workshop* **(Best Paper Award)**.

Juno Kim, Taiji Suzuki. Transformers Learn Nonlinear Features In Context: Nonconvex Mean-field Dynamics on the Attention Landscape. **ICML 2024 Oral**.

Juno Kim, Kakei Yamamoto, Kazusato Oko, Zhuoran Yang, Taiji Suzuki. Symmetric Mean-field Langevin Dynamics for Distributional Minimax Problems. **ICLR 2024 Spotlight**.

Juno Kim*, Jaehyuk Kwon*, Mincheol Cho*, Hyunjong Lee, Joong-Ho Won. t^3-Variational Autoencoder: Learning Heavy-tailed Data with Student's t and Power Divergence. **ICLR 2024**.

Juno Kim, Otto van Koert. Hessian Based Smoothing Splines for Manifold Learning. arXiv preprint *arXiv:2302.05025*, 2023.

Juno Kim*, Yonghwan Kim*, Otto van Koert. Reeb Flows without Simple Global Surfaces of Section. *Involve: A Journal of Mathematics*, 15(5), pp. 813–842, 2022.

Education

University of California, Berkeley Aug 2025 – current
Ph.D. student in Electrical Engineering and Computer Sciences

University of Tokyo Apr 2023 – Mar 2025
M.Sc. in Mathematical Informatics (GPA 4.0/4.0)
Dean's Award for Research Achievement
Thesis: Statistical and Dynamical Analysis of Transformers: In-Context Learning and CoT Reasoning

Seoul National University Mar 2018 – Feb 2023
B.Sc. in Statistics & Mathematical Sciences (GPA 4.28/4.3)
Valedictorian of the College of Natural Sciences
Thesis: Token and Corpus Imputation in Statistical Language Modeling via Semantic Embeddings

Experience

Invited Talks

- NLP Colloquium, Japan (online), host: Sho Yokoi — May 21, 2025
- Flatiron Institute, Center for Computational Mathematics, New York, host: Denny Wu — Mar 14, 2025
- Vector Institute, Toronto (online), host: Anastasis Kratsios — Jan 24, 2025

Reviewer

- AISTATS'24, ICML'24/25, NeurIPS'24/25, ICLR'25 (Notable Reviewer), various workshops

KRAFTON AI, Research Intern 2025

RIKEN Center for Advanced Intelligence Project, Part-time Researcher Dec 2023 – Mar 2025

Simons Institute, **UC Berkeley**, Visiting Student Nov 2024 – Dec 2024

- Participated in the *Modern Paradigms in Generalization* program

Gatsby Computational Neuroscience Unit, **UCL**, Visiting Researcher Aug 2024

- Collaborated with Prof. Arthur Gretton on the benefits of neural features for causal inference algorithms

Seoul National University, Undergraduate Research Intern Jun 2019 – Feb 2023

- Studied Bayesian neural networks and covariance estimation under Prof. Jaeyong Lee
- Analyzed dynamical systems with quasi-compact transfer operators under Prof. Seonhee Lim
- Studied algebraic & differential topology and conducted research into vector flow dynamics on contact manifolds and manifold learning algorithms under Prof. Otto van Koert

Seoul National University, Department of Statistics Peer Tutor Mar 2022 – Feb 2023

- Provided comprehensive tutoring for Mathematical Statistics I & II courses to junior students

Military Service, Republic of Korea Auxiliary Police Sep 2020 – Mar 2022

SNU-UTokyo Joint Summer Program Jun 2019 – Aug 2019

Honors & Awards

- Dean's Award for Research Achievement, IST, University of Tokyo — 2025
- Doctoral Course (DC1) Research Fellowship, JSPS — Declined
- Japanese Government (MEXT) Scholarship — Apr 2023 – Mar 2025
- President Award, Highest Honors, Seoul National University — 2023
- President Award, Korean Statistical Society — 2023
- National Scholarship, Kwanjeong Educational Foundation — Mar 2020 – Feb 2023
- 4th Place, Simon Marais Mathematics Competition — 2022
- Eminence Scholarship, Seoul National University — Sep 2018 – Feb 2020
- Gold Prize, College Mathematics Competition, Korean Mathematical Society — 2019

Skills

Languages	Korean: Native, English: Fluent (TOEFL 117), Japanese: Fluent (JLPT N1), German: Basic
Coding	(Advanced) Python, PyTorch, R (Basic) C++, Java, MATLAB
Presentation	Presented research at various machine learning conferences and workshops, including: NeurIPS'23/24/25, ICLR'24/25, ICML'24/25, MLSS'24, FIMI'24, DL'24 Tokyo, IBIS'23/24