Juno Kim

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Profile

Master's student with a passion for learning theory and a strong publication record. My research interests lie in the **mathematical foundations of modern deep learning**, focusing on nonconvex optimization, dynamical analysis and statistical guarantees for neural networks, as well as exploring emergent capabilities of foundation models. Currently studying under Prof. Taiji Suzuki at the University of Tokyo, I graduated as Valedictorian of the College of Natural Sciences at Seoul National University and aim to develop new theories which deepen our understanding of AI.

Education

University of Tokyo, Tokyo, Japan — Apr 2023 – present
M.Sc. in Mathematical Informatics (expected Mar 2025, GPA 4.0/4.0)

Seoul National University, Seoul, South Korea — Mar 2018 – Feb 2023
B.Sc. in Statistics
B.Sc. in Mathematical Sciences
Valedictorian of the College of Natural Sciences (GPA 4.28/4.3)

Publications

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

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.

*equal contribution

Experience

RIKEN Center for Advanced Intelligence Project, Part-time Researcher — Dec 2023 – present

- Member of the Deep Learning Theory Team

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's causal inference group on the benefits of deep neural features for instrumental variable regression 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

- Collaborated on cultural exchange activities and initiatives to improve Korean-Japanese relations

Honors & Awards

- DC1 Research Fellowship, Japan Society for the Promotion of Science — Selected
- Japanese Government (MEXT) Scholarship — Apr 2023 – present
- 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 2023/24, ICLR 2024, ICML 2024, MLSS 2024, FIMI 2024, DL 2024 Tokyo, IBIS 2023/24