

JONGHA (JON) RYU

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RESEARCH INTERESTS	I develop statistical learning methods that are scalable, interpretable, and grounded in first principles, with the goal of supporting data-driven breakthroughs in science and engineering. Recent work includes neural network-based operator learning for scientific simulation [C1], [C7], [C8], score-based generative modeling [C4], [P1], and uncertainty quantification and anytime-valid inference [J2], [C2], [C3], [C6].	
EMPLOYMENT	Massachusetts Institute of Technology (MIT) Postdoctoral Associate at Electrical Engineering & Computer Science Department · Advisor: Prof. Gregory W. Wornell	Aug. 2022 – present
EDUCATION	University of California San Diego (UCSD) Ph.D. in Electrical Engineering (GPA: 3.99/4.0) · Thesis advisors: Prof. Young-Han Kim and Prof. Sanjoy Dasgupta · Thesis title: “From Information Theory to Machine Learning Algorithms: A Few Vignettes” M.S. in Electrical Engineering Seoul National University (SNU) Bachelor of Science (<i>summa cum laude</i> , GPA: 4.11/4.3) · Double major in Electrical and Computer Engineering & Mathematical Sciences ; minor in Physics	Sep. 2015 – Jun. 2022 Dec. 2018 Mar. 2008 – Aug. 2015
JOURNAL PAPERS	(* indicates equal contribution. † indicates alphabetical orders.) [J1] J. Jon Ryu* , Shouvik Ganguly*, Young-Han Kim, Yung-Kyun Noh, Daniel Lee, “Nearest neighbor density functional estimation from inverse Laplace transform”. <i>IEEE Trans. Info. Theory</i> , vol. 68, no. 6, pp. 3511-3551, Jun. 2022. [J2] J. Jon Ryu , Alankrita Bhatt, “On Confidence Sequences for Bounded Random Processes via Universal Gambling Strategies”, <i>IEEE Trans. Info. Theory</i> , vol. 70, no. 10, pp. 7143-7161, Oct. 2024.	
SELECTED CONFERENCE PAPERS	[C1] J. Jon Ryu , Xiangxiang Xu, Hasan Sabri Melihcan Erol, Yuheng Bu, Lizhong Zheng, Gregory Wornell, “Operator SVD with Neural Networks via Nested Low-Rank Approximation”, <i>International Conference on Machine Learning (ICML)</i> , Jul. 2024. [C2] J. Jon Ryu , Gregory W. Wornell, “Gambling-Based Confidence Sequences for Bounded Random Vectors”, <i>ICML</i> , Jul. 2024. Spotlight (top 3.5%). [C3] Maohao Shen*, J. Jon Ryu* , Soumya Ghosh, Yuheng Bu, Prasanna Sattigeri, Subhro Das, Gregory W. Wornell, “Are Uncertainty Quantification Capabilities of Evidential Deep Learning a Mirage?”, <i>Annual Conference on Neural Information Processing Systems (NeurIPS)</i> , Dec. 2024. [C4] Tejas Jayashankar*, J. Jon Ryu* , Gregory W. Wornell, “Score-of-Mixture Training: Training One-Step Generative Models Made Simple via Score Estimation of Mixture Distributions”, <i>ICML</i> , Jul. 2025. Spotlight (top 2.6%). [C5] J. Jon Ryu , Abhin Shah, Gregory W. Wornell, “A Unified View on Learning Unnormalized Distributions via Noise-Contrastive Estimation”, <i>ICML</i> , Jul. 2025. [C6] J. Jon Ryu , Jeongyeol Kwon, Benjamin Koppe, Kwang-Sung Jun, “Improved Offline Contextual Bandits with Second-Order Bounds: Betting and Freezing”, <i>Conference on Learning Theory (COLT)</i> , Jun. 2025. [C7] Minchan Jeong*, J. Jon Ryu* , Se-Young Yun, Gregory W. Wornell, “Efficient Parametric SVD of Koopman Operator for Stochastic Dynamical Systems”, <i>NeurIPS</i> , Dec. 2025. [C8] J. Jon Ryu , Samuel Zhou, Gregory W. Wornell, “Revisiting Orbital Minimization for Neural Operator Decomposition”, <i>NeurIPS</i> , Dec. 2025.	

PREPRINTS	<p>[P1] Tejas Jayashankar*, J. Jon Ryu*, Xiangxiang Xu, Gregory W. Wornell, “Lifted Residual Score Estimation”. Submitted. (Note: A preliminary version of this manuscript is to be presented at <i>ICML 2024 Workshop on Structured Probabilistic Inference & Generative Modeling</i>.)</p> <p>[P2] J. Jon Ryu, Yoojin Choi, Young-Han Kim, Mostafa El-Khamy, Jungwon Lee, “Learning with Succinct Common Representation with Wyner’s Common Information”, arXiv:1905.10945v2. (Note: A preliminary version of this manuscript was presented at <i>the Bayesian Deep Learning Workshop at NeurIPS 2018</i>, and an abridged version of the current version was presented at <i>the Bayesian Deep Learning workshop at NeurIPS 2021</i>.)</p>	
WORK IN PROGRESS	<p>[O1] J. Jon Ryu, Pavan Yeddanapudi, Xiangxiang Xu, Gregory W. Wornell, “Contrastive Predictive Coding Done Right for Mutual Information Estimation”. Submitted.</p>	
INVITED TALKS	<ul style="list-style-type: none"> • From Information Theory to Machine Learning Algorithms: Two Vignettes. <ul style="list-style-type: none"> · Signals, Information and Algorithms Laboratory, MIT, Cambridge, MA, USA, Mar. 2022 (remote). · Center for AI and Natural Sciences, KIAS, Seoul, South Korea, Mar. 2022 (remote). • From Wyner’s Common Information to Learning with Succinct Representation. <ul style="list-style-type: none"> · Information Theory and Applications (ITA) Workshop, La Jolla, CA, USA, May 2022. · Machine Intelligence and Data science Laboratory, Seoul National University, Seoul, South Korea, Jan. 2023. · Inference and Information for Data Science Lab, KAIST, Daejeon, South Korea, Jan. 2023. • Nearest Neighbor Density Functional Estimation From Inverse Laplace Transform. <ul style="list-style-type: none"> · Center for AI and Natural Sciences, KIAS, Seoul, South Korea, Aug. 2022 (remote). • On Confidence Sequences from Universal Gambling. <ul style="list-style-type: none"> · Prof. Aaditya Ramdas’ Group Meeting, CMU, Pittsburgh, PA, USA, Oct. 2022 (remote). · Hanyang University, Seoul, South Korea, Jan. 2023. • Operator SVD with Neural Networks via Nested Low-Rank Approximation. <ul style="list-style-type: none"> · MLTea talk, MIT, Cambridge, MA, USA, Nov. 2023. · Information Theory and Applications (ITA) Workshop, La Jolla, CA, USA, Feb. 2024. · Mitsubishi Electric Research Laboratories, Cambridge, MA, USA, Sep. 2024. · KAIST AI Graduate School of AI, Daejeon, South Korea, Sep. 2024 (remote). · Center for AI and Natural Sciences, KIAS, Seoul, South Korea, Oct. 2024 (remote). · Flatiron Institute, New York, NY, USA, Oct. 2024 (remote). · MIT JTL Urban Mobility Lab, Cambridge, MA, USA, Sep. 2025 (remote). • Efficient Generative Modeling and Operator Learning from First Principles. <ul style="list-style-type: none"> · Frontier Research, Prescient Design, Genentech, New York, NY, USA, May 2025 (remote). · Department of Electrical and Engineering, POSTECH, Pohang, South Korea, Jun. 2025 (remote). · Department of Computer Science and Engineering, POSTECH, Pohang, South Korea, Aug. 2025 (remote). 	
HONORS AND AWARDS	<p>Departmental Fellowship Department of ECE, UCSD</p> <p>Kwanjeong Scholarship for Graduate Study Kwanjeong Scholarship Foundation, South Korea</p> <p>Kwanjeong Scholarship for Undergraduate Study Kwanjeong Scholarship Foundation, South Korea</p> <p>University Students Contest of Mathematics Korean Mathematical Society</p> <ul style="list-style-type: none"> · Among non-math majors: Gold prize (2010), Honorable mention (2009) · Among math majors: Bronze Prize (2013) 	<p>Sep. 2015 – Jun. 2016</p> <p>Sep. 2015 – Jun. 2020</p> <p>Mar. 2010 – Dec. 2013</p>

INTERNSHIP EXPERIENCE	Research Intern	Jun. 2019 – Dec. 2019	
	AI Research Group, Qualcomm Technologies, Inc. <ul style="list-style-type: none">· Researched deep learning based sequential models for speech processing.		
TEACHING EXPERIENCE	Research Intern	Jun. 2018 – Sep. 2018	
	Deep Learning Team, SoC R&D, Samsung Semiconductor Inc. <ul style="list-style-type: none">· Developed a new information-theoretic representation learning principle [P2].		
	Instructor (MIT) <ul style="list-style-type: none">• 6.7800 Inference and Information Spring 2024, Spring 2025<ul style="list-style-type: none">· Designed and taught new research-related topics as special sessions as a co-instructor.· Topics: minimax bit prediction, universal inference and concentration, universal learning approach for Rock–Paper–Scissor machine, variational perspective on generative modeling.		
MENTORING EXPERIENCE	Teaching Assistant (UCSD) <ul style="list-style-type: none">• ECE 250 Random Processes Winter 2017• ECE 154C Communication Systems Spring 2017<ul style="list-style-type: none">· Designed hands-on programming assignments for the class based on Julia.· Topics: Basic source coding and channel coding algorithms.• ECE 225B Universal Probability and Applications in Data Science Spring 2018<ul style="list-style-type: none">· Designed hands-on programming assignments for the class based on Python.· Topics: Lempel–Ziv probability assignment, context-tree weighting, and universal portfolio.• ECE 269 Linear Algebra and Applications Winter 2019		
	Tejas Jayashankar , Ph.D. Student, MIT Sep. 2022 – present <ul style="list-style-type: none">· Topic: Developing new generative modeling techniques.· Outcome: Co-authored a paper on improved score estimation techniques, presented at a workshop at ICML’24 [P1]. Co-developed a new training technique for one-step high-quality image generators [C4].		
	Abhin Shah , Ph.D. Student, MIT Sep. 2022 – Aug. 2024 <ul style="list-style-type: none">· Topic: (1) Learning with fairness. (2) Learning principles for unnormalized probability models.· Outcome: Co-authored a paper on learning under fairness constraint with uncertain attributes, presented at ISIT’24. Co-authored a paper on unifying learning principles for unnormalized probability models [C5].		
	Maohao Shen , Ph.D. Student, MIT Sep. 2022 – present <ul style="list-style-type: none">· Topic: (1) Efficient uncertainty quantification algorithms. (2) Efficient LLM alignment with feedback data.· Outcome: Co-authored a paper on uncertainty quantification for black-box models, presented at NeurIPS’24 [C3]. Developing a unified RLHF framework for LLM alignment (work in progress).		
	Pavan Yeddanapudi , Undergraduate Student, MIT Sep. 2024 – present <ul style="list-style-type: none">· Topic: (1) Efficient estimation of information measures for high-dimensional data [O1]. (2) Score-based techniques for representation learning (work in progress).		
	Samuel Zhou , Undergraduate Student, MIT Mar. 2025 – present <ul style="list-style-type: none">· Topic: (1) New linear-algebraic optimization framework for representation learning [C8]. (2) New techniques for interpretable representation learning (work in progress).		
OTHER EXPERIENCE	Military Service (mandatory) Mar. 2011 – Dec. 2012		
REFERENCES	Gregory W. Wornell Professor of EECS, MIT Postdoc Advisor ✉ gww@mit.edu	Young-Han Kim Professor of ECE, UCSD Ph.D. Advisor ✉ yhk@ucsd.edu	Sanjoy Dasgupta Professor of CSE, UCSD Ph.D. Advisor ✉ sadasgupta@ucsd.edu