Inkee Jung

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SUMMARY

PhD in Mathematics with research expertise in geometry, topology, and hands-on experience in machine learning, AI applications, and designing end-to-end experiment pipelines. Proven ability to translate complex mathematical ideas into practical models, with proficiency in Python and TensorFlow. Seeking a research-driven role in AI, data science, or machine learning where mathematical depth and model interpretability are valued.

EDUCATION

Boston University, *PhD of Mathematics* **2020 - 2026**

- Geometric application to Data structure and machine learning, Topological Data Analysis, Fuzzy logic.

Yonsei University, *Bachelor of Science in Mathematics* **2020**

Selected Projects & Publications

Law of Learning Dynamics and Core of Learners – *Boston University, arXiv:2602.05026* **Spring 2025 – Spring 2026**

- Proposed entropy-routed ensemble (IMM) that improves CIFAR-10 robustness vs. a baseline ensemble and yields higher reliability (measured by total entropy 1.9782 to 0.2054 under strong adversarial attacks).
- Decomposed inputs into entropy-based core / out-of-core (safe/unsafe) regions and routed uncertain samples to specialists via a gating aggregator.
- Implemented the full pipelines: trained 8 base Keras models; generated APGD and AutoAttack adversarial samples (PyTorch/TF); selected domain-wise entropy thresholds on validation; fintuned specialists and evaluated IMM per domain.

Persistent Laplacian Diagrams – arXiv:2512.05463 **Spring 2025 – Present**

- Developed structure-aware representations (Persistent Laplacian features) to analyze geometry/topology of evolving data
- Defined signatures of Persistent Laplacian and developed analysis for the stability of Persistent Laplacian Diagram & Images
- Applying our method and design experiments on biomolecule, molecular dataset and GNN structure.

A Logifold Structure for Measure Space **Spring 2024 – Spring 2025**

- Developed Logifold theory, `atlas' geometric structure on topological measure space where each chart is a graph of (fuzzy) logical function and proved the universality theorem supporting broad representational coverage.
- Designed and implemented Logifold algorithms for domain/target-wise aggregation, and chart migration/specialization, enabling uncertainty-aware routing of predictions across charts.
- Validated on CIFAR-10 with an implemented Logifold structure, achieving ~24% improvement vs. the average ensemble
- Related publications:
  i) Jung, I., & Lau, S.-C. (2024). Logifold: A Geometrical Foundation of Ensemble Machine Learning. 2024 4th International Conference on Electrical, Computer, Communications and Mechatronics Engineering (ICECCME), 1–6
  ii) Jung, I., & Lau, S.-C. (2025). A Logifold Structure for Measure Space. Axioms, 14(8), 599.

Team Predicting Aviation Accident Severity - *The Erdős Institute* **Summer 2025**

- Developed ensemble models. Achieved F1 score of 0.459 (Extra Trees) in aircraft damage classification vs. 0.316 baseline (Majority) and delivered interpretable insights into accident severity.
- Led data extraction and cleaning by converting *.mdb* files to *.csv*, integrating event, aircraft, and sub-aircraft tables into a unified dataset; engineered, imputed, and prepared features for classification and regression.

SKILLS & CERTIFICATIONS

- Programming Languages, Skils & Platforms: Python, Tensorflow, Keras, PyTorch, Git
- Mathematical skills: Statistics and Probability, Optimization, Geometry and Topology, Topological Data Analysis
- Soft Skills: Experiment design, Collaboration, Analytical thinking, Research development, Problem-Solving
- ML Skills: Adversarial Robustness, Ensemble machine learning, Deep Learning, Uncertainty Quantification, Calibration
- Certifications: The Erdős Institute Data Science Boot Camp, Korean Certified Investment Manager

Work & Leadership Experience

University Teaching Assistant & Lecturer – *Boston University* **2020 - Present**

Lectured in and led discussions for over 400 students across 10 semesters. Developed course materials. Subjects taught include Calculus I, II, Multivariable Calculus, Complex analysis, Mathematical Statistics, Probability and Linear Algebra.

Directed Reading Program - *Boston University* **Spring 2023, Fall 2025**

- Mentored 2 undergraduate students through a 10-week research project, directing them into feasible research questions (riffle shuffles & Markov chains; Maxwell's equations via differential forms & Hodge Theory) and weekly milestones to build conceptual and computational intuitions.