KIJUNG JEON

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EDUCATION

Korea Advanced Institute of Science and Technology (KAIST) Daejeon, Republic of Korea
B.S in Electrical Engineering & Mathematical Science (Double major) *Mar. 2018 ∼
GPA: 4.26/4.30 (Overall), 4.30/4.30 (EE/Math major)
(* Left for mandatory military service: Jan. 2020 ∼ Aug. 2021)

UC Berkeley (Exchange program) Berkeley, CA, USA
GPA: 4.0/4.0, Period: May. 2018 ∼ Aug. 2018 (Summer Session)

Selected courseworks
EE : Information theory, Signal processing, Linear system theory, Programming structure
Math : Statistical inference (Classical, Bayesian), Probability theory, Real analysis (+ Measure theory), Point-set topology, Linear algebra, Numerical analysis, Convex optimization, Differential geometry, Differential equations (PDE/ODE), Machine learning theory, Scientific machine learning (SciML)

RESEARCH INTERESTS

- High-dimensional statistics, probability theory (+ SDE), information theory and statistical learning theory, optimization in ML
- Theoretical aspects of machine learning and its applications to improve algorithm efficiency
  - Current interested applications: Bayesian deep learning, Data valuation for efficient deep learning, Contrastive learning.

RESEARCH EXPERIENCE

Inference and Information for Data Science (IIDS) Lab *Dec. 2021 ∼*
Advisor : Prof. Hye won Chung

- Efficient crowdsourcing algorithms
  - Studied spectral methods for data science via a statistical perspective and efficient crowdsourcing algorithms for multi-class labeling.
- Mix-up training based on data valuation scores
  - Studied various data valuation scores for efficient training of neural networks.
  - Implemented mix-up based on data-valuation scores and verified the characteristics of efficient mixup samples to accelerate transfer learning.

Algorithmic Intelligence Laboratory (ALIN-LAB) *Dec. 2022 ∼ Aug. 2023*
Advisor : Prof. Jinwoo Shin

- Information theory views of contrastive losses
  - Studied variational bounds of mutual information, Renyi-mutual information.
  - Compared mutual information estimation performance via neural network under correlated gaussian distribution.
- Analysis of mix-up in contrastive learning and its domain-agnostic application [pdf]

- Proved mix-up contrastive learning with InfoNCE loss contributes to regularization of input directional derivatives and verified its empirical evidence under supervised contrastive learning.
- Proposed domain-agnostic contrastive learning algorithm based on discrete patch mix-up exploiting transformer architecture.

Statistical Inference and Machine Learning (SIML) Lab *Jun. 2023 ∼*
Advisor : Prof. Juho Lee

- Understanding the cold posterior effect in bayesian deep learning
  - Studied the theoretical framework of SGMCMC algorithms and their variations for efficient sampling.
  - Verified the under/over-damping behaviors of SGHMC with respect to hyperparameters and asymptotic behavior of SGHMC when decayed momentum is periodically re-sampled.
  - Verified the constant weight norm behavior during training as a sampling from the typical set in SGHMC with iso-tropic gaussian prior assumption via analysis of Fokker-Planck equations.

IN-CLASS PROJECTS

Visualization of electric fields via PINNs (Physics-Informed Neural Networks) [pdf]

- Visualized the two-dimensioal electric field by solving differential form of Gauss's law via PINNs.
- Proposed an efficient method to stabilize training of PINNs based on data valuation scores.

An efficient clustering algorithm for mixtures of high-dimensional iso-tropic gaussians

- Clustered mixtures of high-dimensional iso-tropic gaussians using PCA followed by GM algorithm, verifying that iso-tropic gaussian is invariant under PCA.

ACTIVITIES & WORK EXPERIENCE

Freshman mentoring (Calculus 1) at KAIST *Mar. 2019 ∼ Jun. 2019*

Republic of Korea Army (ROK) *Jan. 2020 ∼ Aug. 2021*

- Work place : 102nd Signal Brigade - ROK II Corps

SKILLS

Programming Languages and Frameworks
Python (+ Pytorch), Matlab, R, C, Latex, HTML

Languages
Korean : Native, English : Fluent

AWARDS AND SCHOLARSHIPS

KAIST Presidential award, KAIST *Feb. 2018*
Awarded to students with high entrance scores

KAIST Presidential Fellowship (KPF), KAIST *Feb. 2018 ∼*

National Excellence Scholarship for Science & Engineering, KOSAF *Feb. 2018 ∼*

Dean's List, School of Freshman, KAIST *Fall 2018*

Dean's List, College of Engineering, KAIST *Spring 2019, 2023, Fall 2020, 2021, 2022*

Department Honors Scholarship, KAIST *Fall 2019, Spring 2022, 2023*
Awarded to Top 4 highest GPA students in EE department for each semester