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), Major GPA: 4.30/4.30 (EE & Math)
(* Left for mandatory military service: Jan. 2020 ∼ Aug. 2021)

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

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, Statistical learning theory, Bayesian inference, Nonlinear dynamics, Optimization
- Theoretical aspects of machine learning and its applications to improve algorithm efficiency

RESEARCH EXPERIENCE

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

(1) **Efficient data crowdsourcing algorithms**

- Studied matrix perturbation theory and efficient data crowdsourcing algorithms for multi-class labeling.

(2) **Mix-up training based on data valuation scores** [lead project]

- Studied various data valuation scores for efficient training of neural networks.
- Devised a mix-up variant algorithm based on data valuation scores to accelerate mix-up training speed via feature learning perspective.
- Verified the data-dependent characteristics of efficient mix-up samples to accelerate transfer learning.

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

(1) **Information theoretical views of contrastive losses**

- Studied variational bounds of mutual information, Renyi-mutual information, and compared mutual information estimation performance of variational bounds via neural network under correlated Gaussian distribution.

(2) **Analysis of mix-up in contrastive learning and its domain-agnostic application** [lead project] [pdf]

- Proved mix-up in contrastive learning with InfoNCE loss regularizes input directional derivatives.
- Verified empirical effect of mix-up and theoretical generalization performance guarantee under supervised contrastive learning setting.
- Proposed domain-agnostic contrastive learning algorithm based on discrete patch mix-up exploiting transformer architecture.

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

(1) **Understanding the cold posterior effect in Bayesian deep learning** [lead project]

- Studied theoretical framework of SGMCMC algorithms and their variations for efficient sampling.
- Verified under/over-damping behaviors of SGHMC with respect to hyperparameters and asymptotic behavior of SGHMC when decayed momentum is periodically re-sampled.
- Proved asymptotic weight norm behavior of SGHMC induces sampling from typical set under iso-tropic Gaussian posterior 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 effective 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*

SKILLS & LANGUAGE

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

Languages
Korean : Native, English : Fluent [TOEFL iBT MyBestScore™: 30/28/23/25 (R/L/S/W), Total:106/120]

AWARDS AND SCHOLARSHIPS

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

KAIST Presidential Fellowship (KPF), KAIST *Feb. 2018 ∼ Aug. 2024*

National Excellence Scholarship for Science & Engineering, KOSAF *Feb. 2018 ∼ Aug. 2023*

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