KIJUNG JEON

Email : krait@kaist.ac.kr / Homepage : KraitGit.github.io / Citizenship : Republic of Korea

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
Math : Statistical inference (Classical, Bayesian), Probability theory, Real analysis, Linear algebra, Numerical analysis, Convex optimization, Differential geometry, Machine learning theory, Differential equations (PDE/ODE)

RESEARCH INTERESTS

- High-dimensional statistics, probability theory, and information theory
- Theoretical aspects of machine learning and its applications
  - Theoretical analysis of regularization techniques on neural networks
  - Tight generalization measure for neural networks
  - Bayesian deep learning
  - Data valuation for efficient neural network training

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 persepctive and efficient crowdsourcing algorithms for multi-class labeling.
- Mix-up training based on data valuation scores **[Project lead]**
  - 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 during training.
- Gradient norm based data valuation score via contrastive losses (without labels) **[Project lead]**
  - Devised a heuristical score using InfoNCE loss to filter noisy, irregular data without labels

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 application on domain-agnostic environment [**Project lead**]
  - Proved mix-up contrastive learning with InfoNCE loss contributes to regularization of input directional derivatives and verified its empirical evidence under supervised contrastive learning (SupCon)
  - 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 [**Project lead**]
  - Studied the theoretical framework of SGMCMC algorithms and their variations for an efficient sampling.
  - Proved the constant weight norm behavior during training as a sampling from the typical set in SGHMC with iso-tropic gaussian prior assumption.
  - Verified the approximation error of SGHMC compared to HMC under an overparmetrized bayesian linear regression.

IN-CLASS PROJECTS

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

- Visualized the two-dimensioal electric field by solving differential form of Gauss's law via PINNs.
- Proposed a 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