

# KIJUNG JEON

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## EDUCATION

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### Korea Advanced Institute of Science and Technology (KAIST)

Daejeon, Republic of Korea

B.S in Electrical Engineering & Mathematical Science (Double major)

\*Mar. 2018 ~

GPA: 4.25/4.30 (Overall), Major GPA: 4.28/4.30 (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

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- High-dimensional statistics, Statistical learning theory, Bayesian inference, Sampling & Optimization, Information theory
- Theoretical aspects of machine learning and its applications to improve algorithm efficiency

## RESEARCH EXPERIENCE

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### 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 mix-up variant algorithm based on data valuation scores to accelerate mix-up training speed via feature learning perspective.
- Verified 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

Advisor : Prof. Juho Lee

KAIST AI

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.
- Developed SGHMC variant for efficient exploration of multimodal distributions with mitigated cold posterior effect by adopting decaying momentum and underdamping condition. **(in preparation for ICML 2024)**

## IN-CLASS PROJECTS

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

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

### Efficient clustering algorithm for mixtures of high-dimensional iso-tropic Gaussians [PDF]

- Clustered mixtures of high-dimensional iso-tropic Gaussians using PCA followed by EM algorithm, verifying that iso-tropic Gaussian is distribution-invariant under PCA.

## ACTIVITIES & WORK EXPERIENCE

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Freshman mentoring (Calculus 1) at KAIST

Mar. 2019 ~ Jun. 2019

Republic of Korea Army (ROK)

Jan. 2020 ~ Aug. 2021

## SKILLS & LANGUAGE

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### 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

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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