# 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, Information theory, 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 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**                    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 two-dimensioal 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.

**An efficient clustering algorithm for mixtures of high-dimensional iso-tropic Gaussians** [PDF]

- 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