Junghyun Lee

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PARTICULARS

EDUCATION

Korea Advanced Institute of Science and Technology (KAIST) — Seoul, ROK
MSc in Artificial Intelligence (GSAI) — *August 2023 (expected)*
Advisor: Se-Young Yun, Graduate School of AI

Korea Advanced Institute of Science and Technology (KAIST) — Daejeon, ROK
BSc in Mathematical Sciences, Computer Science(*Double Major*) — *August 2021*
Cumulative GPA: 3.77 / 4.3 (Cum laude), Major GPA: 3.78 / 4.3

Changwon Science High School (CSHS) — Changwon, ROK
Early graduation — *March 2017*

CURRENT STATUS

Citizen of Republic of Korea (ROK).

RESEARCH INTERESTS

- Theoretical Machine/Deep Learning
- Probabilistic Machine/Deep Learning
- Related mathematical theories (e.g. Probability Theory, Optimization, Statistics)
- GNN, Graphs
- Various applications of ML/DL
- Algorithmic fairness
- "Other" mathematics (graph theory, discrete geometry, algorithms, mathematical biology...etc.)

ACADEMIC HONORS

- Cum laude, 2021.
- Freshmen Dean's List, Spring 2017.
- Hansung Son Jae Han Scholarship for Gifted Students, 2016.

PROFESSIONAL EXPERIENCE

GRAD AND ABOVE

- **MSc Candidate/Graduate Researcher at OSI Lab, GSAI, KAIST, South Korea.**
  - (Summer 2021 - Present) Analyzing the loss surface and behaviors of stochastic optimization algorithms in deep neural networks - *Joint Principal Investigator*
  - (Summer 2021 - Present) - Extending theoretical results for GNNs to graph-related tasks (tbd) - *Joint Principal Investigator*
  - (Summer 2021 - Present) Developing ML/DL methodologies for combinatorial optimization for NeurIPS 2021 Competition: "Machine Learning for Combinatorial Optimization"

- **Graduate (Associate) Researcher at AIM Lab, School of EE, KAIST, South Korea.**
  - (Summer 2021 - Present) Developing a novel fair PCA algorithm via manifold optimization - *Principal Investigator*
- **Graduate (Associate) Researcher at BIMAG, IBS, South Korea.**
  - (Summer 2021 - Present) Applying ML methodologies to plant circadian model inference - *Joint Principal Investigator*

UNDERGRAD AND BELOW

- **Optimization and Statistical Inference Lab (OSI Lab)**, Spring 2020 - Summer 2021.
  Advisor: Se-Young Yun (Graduate School of AI, KAIST)
  Collaborators[1]**:** SeongYoon Kim*, Namgyu Ho**, Minchan Jeong*** (*Industrial and System Engineering, KAIST; **Intern, OSI Lab; ***Graduate School of AI, KAIST)
  Research topic: *Toward a Better Understanding of Dynamics of Deep Neural Networks and SGD*

- **Artificial Intelligence & Machine Learning Lab (AIM Lab)**, Fall 2019 - Summer 2021.
  Advisor: Chang Dong Yoo*, Gwangsu Kim* (*School of Electrical Engineering, KAIST)
  Collaborator: Matt Olfat (UC Berkeley & Citadel)
  Research topic: *Can Fairness in Principal Components be Obtained, Even in High Dimensions?*

- **Biomedical Mathematics Group (BIMAG)**, Spring 2021 - Summer 2021.
  Advisor: Jae Kyoung Kim (Dept. of Mathematical Sciences, KAIST)
  Collaborator: Seokmin Ha*, Dae Wook Kim* (*Dept. of Mathematical Sciences, KAIST)
  Research topic: *Applying machine learning methodologies to plant circadian clock model inference*

- **Computational Intelligence for Software Engineering Lab (COINSE Lab)**, Fall 2020 - Summer 2021.
  Advisor: Shin Yoo (School of Computing, KAIST)
  Collaborator: Chani Jung*, Yoo Hwa Park*, Dongmin Lee*, Juyeon Yoon* (*School of Computing, KAIST)
  Research topic: *SWAY for Decision Space of Permutations with Case Study on Test Case Prioritisation*

- **[Alone] Individual Study**, Summer 2019 - Fall 2019.
  Advisor: Andreas Holmsen (Dept. of Mathematical Sciences, KAIST)
  Research topic 1: *Asymptotics for the number of C_4's in a graph under certain condition*,
  Research topic 2: *Maximum number of columns in a 0-1 $2n \times n$ matrix with no induced 2×2 identity matrix*

- **CSHS Mathematics Research and Education Program (R&E)**, Mar 2015 - Feb 2017.
  Advisor: Seungkyun Cha*, Jisoo Byun** (*Division of Mathematics, CSHS; **Dept. of Mathematics Education, Kyungnam University)
  Collaborator: Minyoung Hwang*, Cheolwon Bae* (*Division of Mathematics, CSHS)
  Research topic: *Some Loci in the Animation of a Sangaku Diagram*

PUBLICATIONS

WORKING/PENDING PAPERS

1. **Junghyun Lee**, Gwangsu Kim, Matt Olfat, Chang D. Yoo. "Fair PCA via Optimization over Stiefel Manifold (tbd)" (Work in progress)
2. **Junghyun Lee***, Chani Jung*, Yoo Hwa Park†, Dongmin Lee†, Juyeon Yoon, Shin Yoo. "Preliminary Evaluation of SWAY in Permutation Decision Space via a Novel Euclidean Embedding" (Under review)
   ($\star$, $\dagger$: equal contributions)

JOURNAL

1. **Junghyun Lee**, Minyoung Hwang, Cheolwon Bae. "Some Loci in the Animation of a Sangaku Diagram", *Forum Geometricorum*, 2016, vol. 16, pp. 187-191.

[1] Briefly collaborated with Cheolhyeong Lee (currently post-doctoral associate of Center for Data Science at NYU)

TEACHING EXPERIENCE

TEACHING ASSISTANT (HUMANITIES)

- **HSS302: Special Lectures on Linguistics <Language Register and English>**, Prof. Seonmin Park, Spring 2018, KAIST.
- **English Camp for Incoming Freshmen**, EFL Office, Jan 2019, KAIST.
- **English Camp for Incoming Freshmen**, EFL Office, Jan 2018, KAIST.

FRESHMEN TUTORING

- **MAS102: Calculus 2**, Fall 2018, KAIST.
- **MAS101: Calculus 1**, Spring 2018, KAIST.

UNOFFICIAL/VOLUNTARY TUTORING

- **MAS102, PH142, MAS109**, Fall 2017, KAIST.
  with 10∼15 freshmen taking the courses
- **MAS101, PH141, CH101, MAS109**, Spring 2017, KAIST.
  with 10∼15 freshmen taking the courses

COURSEWORKS

PROJECTS

- **CS454: Artificial Intelligence based Software Engineering**, Fall 2020.
  Instructor: Prof. Shin Yoo (School of Computing, KAIST)
  Collaborator: Chani Jung*, Yoo Hwa Park*, Dongmin Lee* (*School of Computing, KAIST)
  Project topic: *SWAY for Decision Space of Permutations, with Case Study on Test Case Prioritisation*

- **CS376: Machine Learning**, Fall 2018.
  Instructor: Prof. Eunho Yang (School of Computing, KAIST; now at Graduate School of AI, KAIST)
  Collaborators: Youngjin Jin*, Minsung Park**, Hyunjin Kim*** (*School of Electrical Engineering, KAIST; **Dept. of Biological Sciences, KAIST; ***School of Computing, KAIST)
  Project topic: *Building a predictive model for predicting Gotham city's apartment prices*

- **MAS480(B): Introduction to Mathematical Biology**, Fall Semester, 2018.
  Instructor: Prof. Jaekyung Kim (Dept. of Mathematical Sciences, KAIST)
  Collaborator: Seokmin Ha (Dept. of Mathematical Sciences, KAIST)
  Project topic: *Reverse Analysis Problem of Two-gene System in the Perspective of Adaptation*

- **CS492(I): Special Topics in Computer Science <Deep Learning for Real-World Problems>**, Fall 2020.
  Instructors: Prof. Seunghoon Hong*, Prof. Alice Oh* (*School of Computing, KAIST)
  Collaborators: Minyoung Hwang*, Junseok Choi* (*School of Computing, KAIST)
  Project topic: *Deep learning based solution for semi-supervised classification on Naver Fashion Dataset, and Korean Open-Domain QA task on Naver KorQuAD-Open dataset. (2nd, 1st place in leaderboard, respectively)*

- **CS470: Introduction to Artificial Intelligence**, Fall Semester, 2019.
  Instructor: Prof. Seunghoon Hong (School of Computing, KAIST)
  Collaborator: Youngjin Jin*, Minsung Park** (*School of Electrical Engineering, KAIST; **Dept. of Biological Sciences, KAIST)
  Project topic: *Implementing a model for music genre classification problem.*

REPORTS

1. **Junghyun Lee**, Chani Jung, Yoo Hwa Park, Dongmin Lee. "SWAY for Decision Space of Permutations with Case Study on Test Case Prioritisation", *CS454: Artificial Intelligence Based Software Engineering*, 2020 Fall.

2. Seokmin Ha, **Junghyun Lee**. "Reverse Analysis Problem of Two-gene System in the Perspective of Adaptation", *MAS480(B): Topics in Mathematics <Introduction to Mathematical Biology>*, 2018 Fall.
3. **Junghyun Lee**. "Lecture Note 5: Randomized Algorithms", *CS500: Design and Analysis of Algorithm*, 2020 Spring.
4. **Junghyun Lee**. "Critical Review on Theoretical Aspects of Binary Decision Diagram, with a Focus in Variable Ordering", *CS402: Introduction to Logic for Computer Science*, 2020 Spring.
5. Junseok Choi, Minyoung Hwang, **Junghyun Lee** "Semi-Supervised Learning Task on Naver Fashion Dataset", *CS492(I): Special Topics in Computer Science <Deep Learning for Real-World Problems>*, 2020 Fall.
6. Minyoung Hwang, Junseok Choi, **Junghyun Lee** "Korean Open-Domain QA Task on Naver KorQuAD-Open Dataset", *CS492(I): Special Topics in Computer Science <Deep Learning for Real-World Problems>*, 2020 Fall.

SKILLS

PROGRAMS

- Languages: **Python, Matlab**
- Applications : **LaTex**

LANGUAGE

- **Korean**: Native
- **English**: Highly proficient
  TOEIC 985/990 (2021) (Mock) TOEFL iBT 118 (2017)

MISC.

KAIST Mathematical Sciences Student Council

- Member of department student council, Mar 2018 - Present.
- In charge of *Mathematical Sciences Help-Desk* (Mar 2018 - June 2019)
  A short lecture series (given by selected math undergrad.) that takes place a week before the exam period to help all students with Basic Elective courses. (MAS109, MAS201, MAS250)

KAIST ORCHESTRA

- First Violinist, Mar 2017 - Present.
- **Principal First Violinist**, Jan 2018 - Dec 2018.

ICISTS

- Division of Global Partnership, Sep 2018 - Aug 2019.
- **TF leader** of *Opening/Gala Night* (ICISTS-2019)
- TF member of *Science in a Nutshell* (ICISTS-2019)
- **Vice President**, Sep 2019 - Jul 2020.