Sunmook Choi, 최선묵

sc3377@cornell.edu

EDUCATION

Ph.D. student in Applied Mathematics, Cornell University — Aug. 2024 – Present

- Advisor: Sarah Dean
- Committee members: David Bindel, Robert Kleinberg
- Minors: Mathematics, Computer Science

M.S. in Mathematics, Korea University — Mar. 2022 – Aug. 2024

- Advisor: Seungsang Oh
- Thesis title: Three-dimensional dicube tilings of augmented Aztec bipyramids
- GPA: 4.5 / 4.5

B.S. in Mathematics, Korea University — Mar. 2016 – Feb. 2022

- Overall GPA: 4.3 / 4.5, Major GPA: 4.36 / 4.5
- Korean Mandatory Military Service (Auxiliary Police) — Jun. 2017 – Feb. 2019

RESEARCH INTERESTS

- **Machine Learning in Feedback Systems** (Bandits, Reinforcement Learning)
- **Optimal Control Theory**

PUBLICATIONS

Journal Publications

[1] S. Lee, **S. Choi**, T. Kang, S. Chung, S. Han, J. Seo, S. Park, E. Kim, S. Oh, I.-Y. Kwak, *iWAX: interpretable Wav2vec-AASIST-XGBoost framework for voice spoofing detection*, Scientific Reports **15 (1)** (2025) 40491

[2] S. Han, J. Seo, **S. Choi**, T. Kang, S. Chung, S. Lee, S. Park, S. Oh, I.-Y. Kwak, *Enhancing voice spoofing detection in noisy environments using frequency feature masking augmentation*, Engineering Science and Technology, an International Journal, **63** (2025) 101972

[3] **S. Choi**, S. Lee and S. Oh, *Augmented Aztec bipyramid and dicube tilings*, Discrete Mathematics **347 (1)** (2024) 113735

Refereed Conference Publications

[4] S. Chung, E. Kim, D. Kim, G. Heo, J. You, N. Lee, **S. Choi**, S. Han, S. Oh and I.-Y. Kwak, *BEAT2AASIST model with layer fusion for ESDD 2026 Challenge*, to appear in ICASSP 2026

[5] **S. Choi**, Y. Sattar, Y. Jedra, M. Fazel and S. Dean, *Explore-then-Commit for Nonstationary Linear Bandits with Latent Dynamics*, to appear in AISTATS 2026

[6] Y. Sattar, **S. Choi**, Y. Jedra, M. Fazel, S. Dean, *Sub-optimality of the Separation Principle for Quadratic Control from Bilinear Observations*, the 64th IEEE Conference on Decision and Control (CDC), Rio (2025) 3862-3867

[7] **S. Choi**, S. Chung, S. Lee, S. Han, T. Kang, J. Seo, I.-Y. Kwak and S. Oh, *TB-ResNet: Bridging the gap from TDNN to ResNet in Speaker Verification with Temporal-Bottleneck Enhancement*, 2024 IEEE International Conference on Acoustics, Speech and Signal Processing (ICASSP), Seoul (2024) 10291-10295

[8] S. Han*, T. Kang*, **S. Choi***, J. Seo, S. Chung, S. Lee, S. Oh and I.-Y. Kwak, *CAU KU deep fake detection system for ADD 2023 challenge*, Proceedings of IJCAI 2023 Workshop on Deepfake Audio Detection and Analysis, Macao, S.A.R (2023) 23-30. (*: equal contribution)

[9] I.-Y. Kwak, **S. Choi**, J. Yang, Y. Lee, S. Han and S. Oh, *Low-quality Fake Audio Detection through Frequency Feature Masking*, Proceedings of the 1st International Workshop on Deepfake Detection for Audio Multimedia (DDAM '22), New York (2022) 9-17

[10] **S. Choi**, I.-Y. Kwak and S. Oh, *Overlapped Frequency-Distributed Network: Frequency-Aware*

Voice Spoofing Countermeasure, Proceedings of Interspeech 2022, Incheon, Korea (2022) 3558-3562

[11] **S. Choi**, S. Oh, J. Yang, Y. Lee and I.-Y. Kwak, *Light-weight Frequency Information Aware Neural Network Architecture for Voice Spoofing Detection*, Proceedings of 2022 26th International Conference on Pattern Recognition (ICPR), Montreal (2022) 477-483

Preprints

[12] **S. Choi**, S. Lee and S. Oh, *Three-dimensional dicube tilings of an Aztec pyramid*, in submission

[13] T. Kang, S. Han, **S. Choi**, J. Seo, S. Chung, S. Lee, S. Oh and I.-Y. Kwak, *Experimental Study: Enhancing Voice Spoofing Detection Models with wav2vec 2.0.*, arXiv:2402.17127

Thesis

[14] *Three-dimensional dicube tilings of augmented Aztec bipyramids*, Master's thesis, Korea University DOI link

PRESENTATION

Oral Presentations

- Sub-optimality of the Separation Principle for Quadratic Control from Bilinear Observations, *64th IEEE Conference on Decision and Control (CDC 2025)*, Rio De Janeiro, Brazil
- Aztec bipyramid and dicube tilings, *Knots and Spatial Graphs 2023*, KAIST, Daejeon Korea.
- Aztec bipyramid and dicube tilings, *2022 Global KMS International Conference*, Korean Mathematical Society (KMS), Seoul Korea.

Poster Presentations

- Sub-optimality of the Separation Principle for Quadratic Control from Bilinear Observations, *Northeast Systems and Control Workshop*, Columbia University, USA
- Overlapped Frequency-Distributed Network: Frequency-Aware Voice Spoofing Countermeasure, *Interspeech 2022*, Incheon, Korea
- Light-weight Frequency Information Aware Neural Network Architecture for Voice Spoofing Detection, *ICPR 2022*, Montreal, Canada

Talks

- Sub-optimality of the Separation Principle for Quadratic Control from Bilinear Observations, *Student Colloquium in Applied Mathematics (SCAM)*, Center for Applied Mathematics, Cornell University Dec. 2025
- My Know-how of TF Tutorial based on Problem Solving, *Tutorial TF Workshop* (online), Center for Teaching and Learning, Korea University Fall 2023, Spring 2024, Spring 2025

RESEARCH PROJECTS

Optimal Control Theory Jan. 2025 – Present

- Description: Linear Dynamics with Bilinear Observations
- Principal Investigator: Sarah Dean (Cornell University)

Two-dimensional Tessellation Jan. 2025 – Present

- Description: Squaring Möbius band using State Matrix Recursion Method
- Co-worker: Seungsang Oh (Korea University), Seungeun Lee (NYU)

Drug discovery with DRL Jan. 2023 – Aug. 2024

- Description: Design potent and safe drug candidates through DRL algorithms
- Principal Investigator: Hyun-Kil Shin (Korea Institute of Toxicology)

Three-dimensional Tessellation Feb. 2022 – Aug. 2024

- Description: Construct an enumeration method of dicube tilings of three-dimensional polycubes
- Principal Investigator: Seungsang Oh (Korea University)

Deep Learning in Audio domain Feb. 2021 – Present

- Description: Design audio spoofing countermeasure system, automatic speaker verification system, audio data augmentation methods
- Principal Investigator: Il-Youp Kwak (Chung-Ang University), Seungsang Oh (Korea University)

Teaching Experience

Teaching Assistant, Dept. of Mathematics, Cornell University

- Linear Algebra (MATH 4310) Spring 2026
- Linear Algebra for Engineers (MATH 2940) Fall 2024, 2025, Spring 2025

Teaching Assistant, Dept. of Mathematics, Korea University

- Linear Algebra II With LAB (MATH 222) Fall 2022, 2023
- Linear Algebra I With LAB (MATH 221) Spring 2022, 2023

Awards & Honors

Fund Scholarship

- KUAA 2024 Scholarship (Korea University Alumni Association in NY) Fall 2024
- Sigma (Korea Univ. Dept. of Mathematics Alumni Association) Fall 2021
- SAMSUNG Welfare Foundation Scholarship (Dream Class), SAMSUNG Spring 2019

Honors, Korea University

- Dean's List, College of Science Fall 2020
- Semester High Honors Spring (2016, 2019, 2020, 2021), Fall (2019, 2020, 2021)

Challenge Awards

- ESDD Challenge
- IJCAI 2023 Competition and Challenge Award Aug. 2023
  - Ranked in the 3rd place of Track 1.2 (Audio Fake Game - Detection, FG-D) from the Second Audio Deepfake Detection Challenge (ADD 2023)
- ICASSP 2022 Grand Challenge Award Mar. 2022
  - Ranked in the 3rd place of Track 1 (Low-quality Fake Audio Detection, LF) from the 1st Audio Deep Synthesis Detection Challenge (ADD 2022)

Awards

- Editors' Choice Award 2024, Discrete Mathematics Mar. 2024

Seminars

Deep Learning Seminar Season 1 & 2 (Leader)

- https://github.com/smfelixchoi/MATH-DL-study-2 Jun. 2023 – Aug. 2023
- https://github.com/smfelixchoi/MATH-DL-study Sep. 2022 – Feb. 2023
- Theoretical Review and Python Implementation of SGD, MLP, CNN, RNN, AE, VAE, GAN.

Deep Reinforcement Learning Seminar (Leader) Mar. 2023 – Sep. 2023

- https://github.com/smfelixchoi/MATH-DRL-study
- Theoretical Review and Python Implementation of MDP, DP, RL, DQN, PG, AC, PPO.

Writing Samples

Summary Writing

- Deep Reinforcement Learning (https://github.com/smfelixchoi/All-about-DRL, in progress)
- Deep Learning (https://github.com/smfelixchoi/All-about-DL, in progress)

Competences

Languages Korean (native), English (proficient)

Techniques LaTeX, Python, TensorFlow, PyTorch, R, Julia

Extra-Curricular

Cornell Engineering High School Outreach Program Summer 2025

- CURIE Academy: Control & Navigation of Weather Balloons, led by Prof. Sarah Dean

SAMSUNG Dream Class Spring 2019

- Teaching Mathematics to middle school students as an after-school program.

References

Available on request