

Sunmook Choi, 최선묵

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RESEARCH INTERESTS	Learning Theory <ul style="list-style-type: none">Statistical Learning Theory, Deep Learning Theory Gaussian Processes <ul style="list-style-type: none">Neural Networks as Gaussian processes, Neural Tangent Kernel and convergence Deep Learning Applications <ul style="list-style-type: none">Audio spoofing countermeasure, Automatic Speaker Verification Reinforcement Learning / Deep Reinforcement Learning <ul style="list-style-type: none">Wide range of DRL algorithms Bayesian Deep Learning <ul style="list-style-type: none">Bayesian Statistics, Bayesian Neural Networks, Variational Inference	
EDUCATION	M.S. in Applied Mathematics, Korea University <ul style="list-style-type: none">Advisor: Prof. Seungsang OhGPA: 4.5 / 4.5 B.S. in Mathematics, Korea University <ul style="list-style-type: none">Overall GPA: 4.3 / 4.5Major GPA: 4.36 / 4.5Mandatory Military Service (Auxiliary Police)	Mar. 2022 – Present Mar. 2016 – Feb. 2022 Jun. 2017 - Feb. 2019
TEACHING EXPERIENCE	Teaching Fellow, Dept. of Mathematics, Korea University <ul style="list-style-type: none">Linear Algebra II (MATH 222)Linear Algebra I (MATH 221)Linear Algebra II (MATH 222) Research Assistant, Dept. of Mathematics, Korea University <ul style="list-style-type: none">Linear Algebra I (MATH 221)	Fall 2023 Spring 2023 Fall 2022 Spring 2022
RESEARCH EXPERIENCE	Designing Potent and Safe Drug candidates by DRL algorithms <ul style="list-style-type: none">Formulate pre-existing DRL algorithms in drug environment.Joint Research with Ph.D Hyun-Kil Shin from Korea Institute of Toxicology Automatic Speaker Verification (ASV) System <ul style="list-style-type: none">Design ASV systems based on ResNet architectures.Joint Research with Prof. Il-Youp Kwak in Chung-Ang University Challenge Participations with Prof. Il-Youp Kwak in Chung-Ang University <ul style="list-style-type: none">2nd Audio Deep Synthesis Detection Challenge (ADD 2023), Track 1.2 (Audio Fake Game - Detection) & Track 3 (Deepfake Algorithm Detection)1st Audio Deep Synthesis Detection Challenge (ADD 2022), Track 1 (Low-quality Fake Audio Detection) Audio Spoof Countermeasure System <ul style="list-style-type: none">Design spoofing countermeasure systems based on Convolutional Neural Networks.Joint Research with Prof. Il-Youp Kwak in Chung-Ang University Veritas Program, Korea University	Jan. 2023 – Present Mar. 2022 – Present Mar. 2023 – Apr. 2023 Dec. 2021 – Jan. 2022 Feb. 2021 – Present

- Introduction to Deep Learning, supervised by Professor Seungsang Oh May. 2020 – Jan. 2021
- Introduction to Mathematica, supervised by Professor Seong-Deog Yang Jan. 2017 – Feb. 2017
- Introduction to Group theory, supervised by Professor Sangjib Kim Jul. 2016 – Aug. 2016

SEMINARS

Deep Learning Seminar Season 2 (Leader)

- Theoretical Review and Implementation of GD, MLP, CNN, RNN, AE, VAE, GAN.
- <https://github.com/smfelixchoi/MATH-DL-study-2>
 - * Theoretical Review and Implementation of GAN (planned) 28th Aug. 2023
 - * Implementation of Recurrent Neural Networks 31st Jul. 2023
 - * Implementation of Simple ResNet and MobileNet 17th Jul. 2023
 - * Gradient Descent from Scratch (Linear Regression, Classification) 26th Jun. 2023

Deep Reinforcement Learning Seminar (Leader)

- Theoretical Review and Implementation of MDP, DP, RL, DQN, PG, AC, PPO, DDPG.
- <https://github.com/smfelixchoi/MATH-DRL-study>
 - * Proximal Policy Optimization (planned) 1st Sep. 2023
 - * Policy Gradient Methods 2nd Jun. 2023
 - * Prioritized Experience Replay 26th May 2023
 - * Temporal-Difference RL algorithms (Sarsa, Q-learning, Double learning) 14th Apr. 2023
 - * Markov Decision Process and Dynamic Programming 25th Mar. 2023

Deep Learning Seminar Season 1 (Leader)

- Theoretical Review and Implementation of GD, MLP, CNN, RNN, AE, VAE, GAN.
- <https://github.com/smfelixchoi/MATH-DL-study>
 - * Theoretical Review and Implementation of Generative Adversarial Networks Feb. 2023
 - * Implementation of Recurrent Neural Networks Feb. 2023
 - * Implementation of ResNet and MobileNet Dec. 2022
 - * Linear Regression by Gradient Descent from Scratch Sep. 2022

POSTER PRESENTATIONS

- Overlapped Frequency-Distributed Network: Frequency-Aware Voice Spoofing Countermeasure. In *Proc. Interspeech 2022*. ISCA, Incheon.
- Light-weight Frequency Information Aware Neural Network Architecture for Voice Spoofing Detection. In *26th International Conference on Pattern Recognition (ICPR)*. IEEE Computer Society, Montreal Quebec

ORAL PRESENTATIONS

- Aztec Bipyramid and Dicube Tilings. In *Knots and Spatial Graphs 2023 Workshop*. KAIST, Daejeon Korea.
- Aztec Bipyramid and Dicube Tilings. In *2022 Global KMS International Conference*. KMS (Korean Mathematical Society), Seoul Korea.

PUBLICATIONS

- [1] **Sunmook Choi**, Soyul Han, Tae-in Kang, Sanghyeok Chung, Jaejin-Seo, Seungeun Lee, Il-Youp Kwak, and Seungsang Oh. (2023) TeT-ResNet: Time-enriched Transposed Residual Network Enhancing Text-Independent Speaker Verification Performance. (submitted to ICASSP 2024)
- [2] **Sunmook Choi**, Sangyop Lee, and Seungsang Oh. (2023) Aztec Bipyramid and Dicube Tilings. (submitted to Discrete Mathematics)
- [3] Soyul Han, Taein Kang, **Sunmook Choi**, Jaejin Seo, Sanghyeok Chung, Sumi Lee, Seungsang Oh, and Il-Youp Kwak. (2023) CAU KU deep fake detection system for ADD 2023 challenge. IJCAI 2023 Workshop on Deepfake Audio Detection and Analysis (DADA 2023), August 19, 2023, Macao, S.A.R (To appear)

- [4] Il-Youp Kwak, **Sunmook Choi**, Jonghoon Yang, Yerin Lee, Soyul Han, and Seungsang Oh. (2022) Low-quality Fake Audio Detection through Frequency Feature Masking. In Proceedings of the 1st International Workshop on Deepfake Detection for Audio Multimedia (DDAM '22), October 14, 2022, Lisboa, Portugal. ACM, New York, NY, USA, 9 pages. <https://doi.org/10.1145/3552466.3556533>
- [5] **Sunmook Choi**, Il-Youp Kwak, and Seungsang Oh. (2022) Overlapped Frequency-Distributed Network: Frequency-Aware Voice Spoofing Countermeasure. Proc. Interspeech 2022, 3558-3562, doi: 10.21437/Interspeech.2022-657
- [6] **Sunmook Choi**, Jonghoon Yang, Yerin Lee, Seungsang Oh, and Il-Youp Kwak. (2022) Light-weight Frequency Information Aware Neural Network Architecture for Voice Spoofing Detection. In *26th International Conference on Pattern Recognition (ICPR)*. IEEE Computer Society, Montreal Quebec, Canada.

HONORS & AWARDS

IJCAI 2023 Competition and Challenge Award

Aug. 2023

- The Second Audio Deepfake Detection Challenge ([ADD 2023](#))
- Ranking in the 3rd place of Track 1.2 (Audio Fake Game - Detection, FG-D)

ICASSP 2022 Grand Challenge Award

Mar. 2022

- 1st Audio Deep Synthesis Detection Challenge ([ADD 2022](#))
- Winning the top 3 of track 1 (Low-quality Fake Audio Detection, LF)

포스터논문상 장려상, 한국통계학회 창립 50주년 기념 추계학술논문발표회

6th Nov. 2021

- 수상논문제목: BC-ResNet을 활용한 음성 공격 탐지 시스템 경량화 모델

Dean's List (학장상, GPA 4.5), College of Science, Korea University

Fall 2020

Semester High Honors (학기 최우등생, GPA higher than 4.0), Korea University

- Spring (2016, 2019, 2020, 2021), Fall (2019, 2020, 2021)

Special Scholarships, Korea University

- Spring (2019, 2020, 2021), Fall (2019, 2020, 2021)

SAMSUNG Welfare Foundation Scholarship, SAMSUNG

Spring 2019

Veritas Program Scholarship, Korea University

- Spring (2016), Fall (2016, 2020)

COMPETENCES

Languages Korean (*fluent, native*), English (**TOEFL iBT 106**, RC 29, LC 28, SPK 23, WRT 26)

Techniques \LaTeX (*intermediate*), Python, [TensorFlow](#) (*intermediate*), [PyTorch](#) (*intermediate*)

TALKS

- Understanding Diffusion Models, Deep Learning Seminar, Korea University (11th and 18th Aug. 2023)
- Convergence of Perceptron, Deep Learning Seminar, Korea University (24th Jul. 2023)
- Review of Principal Component Analysis Deep Learning Seminar, Korea University (10th Mar. 2023)
- Review of Dynamic Convolution, 6th School on Advanced Deep Learning, Pyeongchang (6th Nov. 2022)
- Light-weight Frequency Information Aware Neural Network Architecture for Voice Spoofing Detection, 5th School on Advanced Deep Learning, Pusan (28th Jun. 2022)
- Introduction to Bayesian, Jeju (18th Feb. 2022)
- Visualization of Convolutional Filters, 4th School on Advanced Deep Learning, Chonbuk National University (26th Nov. 2021)
- Review & Implementation of Prioritized Experience Replay, Deep Learning Seminar, Korea University (1st Oct. 2021)

- CNN Backpropagation, Batch Normalization, and BC-ResNet Review, Pusan (24th Aug. 2021)
- Review & Implementation of Auto-Encoder and Variational Auto-Encoder, Gyeongju (8th Jul. 2021)
- Short-Time Fourier Transform for Audio Signal Processing, Daejeon (15th May 2021)
- Weight Initialization and its mathematical justification, Winter School of Elementary Quantum Computing, Yangpyeong (27th Jan. 2021)

EXTRA
CURRICULAR

SAMSUNG Dream Class

Spring 2019

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

REFERENCES

- Prof. Seungsang Oh, Department of Mathematics, Korea University
- Prof. Il-Youp Kwak, Department of Applied Statistics, Chung-Ang University