Sunmook Choi, 최선묵

CONTACT
INFORMATION
- Email Address   felixchoi@korea.ac.kr
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- GitHub   http://github.com/smfelixchoi

EDUCATION

M.S. in Applied Mathematics, Korea University   Mar. 2022 – Present
- Advisor: Prof. Seungsang Oh
- 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
- Mandatory Military Service (Auxiliary Police)   Jun. 2017 - Feb. 2019

RESEARCH
INTERESTS

Learning Theory, Gaussian Processes, and Kernels
- Statistical Learning Theory, Deep Learning Theory
- Neural Networks as Gaussian processes, Neural Tangent Kernel and convergence

Deep Learning Applications
- Audio spoofing countermeasure, Automatic Speaker Verification
- Learning low-dimensional representation

Reinforcement Learning / Deep Reinforcement Learning
- Wide range of DRL algorithms

Bayesian Deep Learning
- Bayesian Statistics, Bayesian Neural Networks, Variational Inference

TEACHING
EXPERIENCE

Teaching Fellow, Dept. of Mathematics, Korea University
- Linear Algebra II (MATH 222)   Fall 2023
- Linear Algebra I (MATH 221)   Spring 2023
- Linear Algebra II (MATH 222)   Fall 2022

Research Assistant, Dept. of Mathematics, Korea University
- Linear Algebra I (MATH 221)   Spring 2022

RESEARCH
EXPERIENCE

Designing Potent and Safe Drug candidates by DRL algorithms   Jan. 2023 – Present
- 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   Mar. 2022 – Present
- 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
- 2nd Audio Deep Synthesis Detection Challenge (ADD 2023),   Mar. 2023 – Apr. 2023
  Track 1.2 (Audio Fake Game - Detection) & Track 3 (Deepfake Algorithm Detection)
- 1st Audio Deep Synthesis Detection Challenge (ADD 2022),   Dec. 2021 – Jan. 2022
  Track 1 (Low-quality Fake Audio Detection)

Audio Spoof Countermeasure System   Feb. 2021 – Present
- Design spoofing countermeasure systems based on Convolutional Neural Networks.
- Joint Research with Prof. Il-Youp Kwak in Chung-Ang University

Veritas Program, Korea University
- 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

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.

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.

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

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)

Poster Encouragement Award (포스터논문상 장려상)   6th Nov. 2021
- 한국통계학회 창립 50주년 기념 추계학술논문발표회
- 수상논문제목: BC-ResNet을 활용한 음성 공격 탐지 시스템 경량화 모델

Dean's List (GPA 4.5 / 4.5), College of Science, Korea University   Fall 2020

Semester High Honors (GPA higher than 4.0 / 4.5), 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)

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

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)

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*)

EXTRA   **SAMSUNG Dream Class**   Spring 2019
CURRICULAR
- 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