

Sungyoon Kim

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I seek to open the black box of deep learning with theory and experiments.

EDUCATION

Seoul National University , Seoul, South Korea	Mar.2017 – Current
<i>Bachelor of Engineering (Electrical & Computer Engineering)</i>	
<i>Bachelor of Natural Sciences (Mathematics)</i>	
Accumulative GPA: 4.21/4.3 (Major: 4.26/4.3(ECE), 4.3/4.3(Math))	
Gyeonggi Science High School , Suwon, South Korea	Mar.2014 – Feb.2017

RESEARCH INTERESTS

My research interest lies in understanding how neural networks generalize and how neural networks learn. The specific topics I find interesting are:

- Deep Learning Theory
- Optimization in Machine Learning / Deep Learning
- Representation Learning

PUBLICATIONS

1. **Euna Jung, Jungwon Park, Jaekel Choi, Sungyoon Kim, Wonjong Rhee**, “Isotropic Representations Can Improve Dense Retrieval”, arXiv, 2022
2. **Sungyoon Kim, Joongbo Shin, Yoonhyung Lee, Kyomin Jung**, “Improving Data Augmentation in cGANs by Feature Vector Diversification”, Korea Computer Congress, 2020
3. **Seonhong Kim, Sungyoon Kim, Taehyung Kim, Sangheon Lee**, “Roots and critical point behaviors of certain sums of polynomials”, Proceedings – Mathematical Sciences, 2018

RESEARCH EXPERIENCE

Deep Representation Learning Research Group	June.2022 – August.2022
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Internship

Research Topic: Postprocessing representations to Improve information retrieval

Principal Investigator: Wonjong Rhee

- Implemented cluster validation, isotropy measurement, and the visualization of the learned representations
- Manuscript on arXiv

Project: Understanding the hardness-aware property of supervised contrastive learning

Principal Investigator: Wonjong Rhee

- Investigated the intrinsic hardness-aware property of contrastive loss in supervised setting
- Verified how augmentation strength affects the hardness-aware property for different temperature parameters.
- Verified how different loss structures affect the hardness-aware property of contrastive loss

CORE LAB	Jan.2022 – June.2022
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Graduate Project

Research Topic: Gradient restarting for Nesterov’s algorithm

Principal Investigator: Insoon Yang

- Proved the convergence rate of the gradient restarting version of Nesterov’s algorithm when using proximal gradients
- Showed that the optimal momentum coefficients are in a class of restarting methods by using the ODE formulation of Nesterov’s algorithm
- Empirically showed that using large constant momentum can help the algorithm converge faster

Machine Intelligence LAB	Jan.2019 – May.2020
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Internship

Research Topic: Improving Data augmentation using cGANs

Principal Investigator: Kyomin Jung

- Developed a conditional GAN that creates images with intermediate semantic information by enforcing uniformity of the representations of generated images
- Verified using the conditional GAN as a data augmentation technique may improve the pre-trained classifier
- Published as a conference paper in Korea Computer Congress 2020

Project: Emotion-controllable TTS

Principal Investigator: Kyomin Jung

- Aimed to implement a text-to-speech model with controllable emotional strength
- Experimented with baseline TTS models and data augmentations techniques such as Mixup to obtain emotional embedding space that is stably controllable

AWARDS & HONORS

Presidential Scholarship of Science (Field: Math) 2017 – Current

- Full tuition scholarship & Additional living support of \$2500 each semester awarded by the president of Korea

Gold Prize, University Students Contest of Mathematics, Korea Mathematics Society 2017, 2019

Finalist, Samsung Collegiate Programming Cup 2022

Round 2, Google Codejam 2020

Hansung Sonjaehan Scholarship, Hansung Sonjaehan Scholarship Foundation 2016 – 2017

SKILLS

Deep learning frameworks: Pytorch, Tensorflow

Programming Languages: C, C++, Python

Simulation Software: Verilog, MATLAB

ENGLISH PROFICIENCY

GRE: Verbal Reasoning 164/170, Quantitative Reason 170/170, Analytical Writing 4.5/6.0

TOEFL: 116/120

ADDITIONAL INFORMATION

Undergraduate Tutor: Writing in Science & Technology Sep.2022 – Current

Military Service: Sergeant, Republic of Korea Army May.2020 – Nov.2021