Sungyoon Kim

clifter0122@snu.ac.kr / +82)10-6241-0293 / Seoul, South Korea

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

EDUCATION

Seoul National University, Seoul, South Korea Mar.2017 – Current
Bachelor of Engineering (Electrical & Computer Engineering)
Bachelor of Natural Sciences (Mathematics)
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, Jaekeol 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
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
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
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

- Div 2 (For non-math majors)

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