Namuk Park

Email: namuk.park@gmail.com   **GitHub**: xxxnell   **Homepage**: namukpark.com

RESEARCH SUMMARY

The focus of my research has been on understanding how deep neural networks work, and why they work that way, in order to build a more generalizable machine learning system. In particular, my research covered the following topics: (i) empirical analysis of **Vision Transformers**, (ii) ensemble method, and (iii) trustworthy machine learning. Recently, I have been interested in (iv) **representation learning** and (v) multimodal Transformer.

EDUCATION

Yonsei University, Incheon, South Korea   Mar 2011 – Feb 2022

M.S. and Ph.D. in School of Integrated Technology (Computer Science)

▹ Thesis: "Practical Bayesian Neural Networks: A Data Uncertainty Perspective"

▹ Advisor: Prof. Songkuk Kim [mail]

Yonsei University[wiki], Seoul, South Korea   Mar 2008 – Feb 2011

B.S. in Physics

▹ *GPA: 4.18/4.30.*, Valedictorian of the College of Sciences & 1 year early graduation based on academic excellence.

Daejeon Science High School[wiki], Daejeon, South Korea   Mar 2006 – Feb 2008

▹ 1 year early graduation based on academic excellence.

PUBLICATIONS

[3] <u>Namuk Park</u> and Songkuk Kim. **"How Do Vision Transformers Work?"** ICLR 2022. **Spotlight.** arXiv, code.

▹ We show that the success of *"multi-head self-attentions"* (MSAs) lies in the *"spatial smoothing"* of feature maps, *not* in the capturing of long-range dependencies. In particular, we demonstrate that MSAs (i) flatten the loss landscapes, (ii) are low-pass filters, contrary to Convs, and (iii) significantly improve accuracy when positioned at the end of a stage. See also [2].

[2] <u>Namuk Park</u> and Songkuk Kim. **"Blurs Behave Like Ensembles: Spatial Smoothings to Improve Accuracy, Uncertainty, and Robustness."**, ICML 2022. **Winner of Qualcomm Innovative Fellowship South Korea.** arXiv, code.

▹ We show that *"spatial smoothing"* (a simple blur filter) improves the accuracy, uncertainty, and robustness of CNNs, all at the same time. This is primarily due to that spatial smoothing flattens the loss landscapes by *"spatially ensembling"* neighboring feature maps of CNNs. See also [1].

[1] <u>Namuk Park</u>, Taekyu Lee, and Songkuk Kim. **"Vector Quantized Bayesian Neural Network Inference for Data Streams."** AAAI 2021. arXiv, code.

▹ We show that *"temporal smoothing"* (moving average of recent predictions) significantly improves the computational performance of Bayesian NN inference without loss of accuracy. To do so, we propose *"ensembles for proximate data points"* as an alternative to ensembles for *a single data point*.

AWARDS & HONORS

Outstanding Thesis Award, Third prize (Yonsei University)   Jun 2022

Winner of Qualcomm Innovative Fellowship South Korea (Qualcomm)   Nov 2021

Research Grant Support for Ph.D. Students (National Research Foundation of
South Korea)   Jun 2021 - Feb 2022
National Fellowship from Global Open Source Frontier (NIPA[1])   Jun 2019 – Dec 2020
China–Japan–South Korea OSS Award (The Organizing Committee of
the CJK OSS Award)   Nov 2019
OSS Competition, Honorable mention (NAVER Corporation)   Feb 2019
OSS Challenge, First prize—the Award From the Minister of Science and ICT   Nov 2018
OSS Competition (2nd phase), First prize (NAVER Corporation)   Aug 2018
OSS Competition (1st phase), Second prize (NAVER Corporation)   Feb 2018
National Ph.D. Full Ride Fellowship (Institute for Information and Communications
Technology Promotion of South Korea)   Mar 2011 – Feb 2016
Yonsei University Alumni Full Ride Scholarship, GE Scholarship, National Scholarship
for Science and Engineering, and other merit-based scholarships   Sep 2008 – Feb 2011

INVITED TALKS

"How Do Vision Transformers Work?"
▷ AI Seminar at UNIST   Mar 2022
▷ Tech talk at NAVER WEBTOON   Jan 2022
▷ NAVER Tech Talk at NAVER Corporation   Dec 2021

"Uncertainty in AI: Deep Learning Is Not Good Enough for Safe AI"
▷ Keras Korea Meetup at AI Yangjae Hub   Dec 2019
▷ OSS Contribution Festival organized by NIPA   Dec 2019
▷ South Korea-Uzbekistan SW Technology Seminar at Tashkent University of
Information Technologies   Oct 2019

"A Fast and Lightweight Probability Tool for AI in Scala"
▷ North-East Asia OSS Forum organized by NIPA   Nov 2019
▷ OSS Day (Keynote) organized by NIPA   Nov 2018
▷ Scala Night Korea organized by Scala User Group Korea   Apr 2018

INDUSTRY EXPERIENCE

NAVER, Seongnam, South Korea   Feb 2022 – Present
Visiting Researcher at NAVER AI Lab
▷ We focus on conducting fundamental machine learning research and contributing to NAVER and
AI communities (Research topic: representation learning).

Probe Technology, Seoul, South Korea   Mar 2013 – Feb 2018
Co-founder and CEO
▷ We provided enterprise resource planning & data analysis tool for small businesses.

SKILLS   PyTorch, TensorFlow, Python, Scala

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[1]National IT Industry Promotion Agency, an IT industry promotion organization operated by the Government of South Korea