SEGWANG KIM

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EDUCATION

Doctor of Philosophy   Mar 2016 - Fall 2022
Department of Electrical and Computer Engineering   Seoul, Korea
Seoul National University
Advisor: *Kyomin Jung*

Bachelor of Science (Cum Laude)   Mar 2012 - Feb 2016
College of Liberal Studies (Major: Mathematics, Minor: Statistics)   Seoul, Korea
Seoul National University

Korea Science Academy of KAIST   Mar 2009 - Feb 2012
High School for Gifted Students (KAIST 부설 한국과학영재학교)   Busan, Korea

RESEARCH INTERNSHIPS

Undergraduate Internship   Summer 2014
Driven Cavity Problem with 5th WENO
The fluid dynamics in a 2d-rectangle with obstacles can be described as Navier-stokes equations. To obtain a numerical solution of the non-linear PDEs, I did a C++ implementation of 5th WENO methods using sparse matrices. Refer to MATLAB simulations of computed solutions (demo1, demo2).
Numerical Computing and Image Analysis Lab, Dept. of Mathematical Science, SNU
Advisor: *Meongju Kang*, Mentor: *Seongju Do*

HONORS AND AWARDS

SNU AIIS Spring Retreat Best Poster Award (3rd place)   April 2021
Neural Sequence-to-grid Module for Learning Symbolic Rules (AAAI 2021)

RESEARCH INTEREST

My main interest lies in Natural Language Processing (NLP), particularly in compositional generalization abilities of deep learning sequence-to-sequence models.

- Exploring the expressivity of deep learning models: Prior to attacking tasks using a deep learning model, one needs to check that the expressivity of the model is enough. Inspired by number sequence prediction problems for testing human intelligence, we measured the computational powers of deep learning models using the problems and corresponding Automata **(published in AAAI 2019)**.

- Proposing models that learn inductive bias: A possible deep learning method for learning a task is to design a new architecture specialized for the task. Motivated by an inductive bias necessary for learning arithmetic operations, I suggested a neural sequence-to-grid module that can automatically align an input sequence into a grid **(published in AAAI 2021)**. The module successfuly enhanced a neural network like CNN to generalize on out-of-distribution examples of number sequence prediction problems or computer program evaluation problems.

- Designing effective fintuning methods for the standard NLP models: Pretrained language models (PLMs) that leverage the vast volume of natural language corpus are becoming universal tools to attack all NLP tasks. Hence, it is desirable to suggest effective finetuning methods for PLM rather than designing specialized architectures only applicable to specific domains. In compositional generalization tasks, I suggested a parsing tree annotation techniques that significantly enhance PLMs' accuracy **(published in IEEE ACCESS 2021)**.

Other than that, I am also interested in techniques to compress large models for edge computing.

PUBLICATIONS

- Dongryeol Lee*, **Segwang Kim***, Minwoo Lee, Hwanhee Lee, Joonsuk Park, Sang-Woo Lee, Kyomin Jung, Asking Clarification Questions to Handle Ambiguity in Open-Domain QA, Findings of the Association for Computational Linguistics: EMNLP 2023 (Findings of EMNLP) - Dec 2023, Singapore, Singapore [code, poster, slides]

- Kangil Lee, **Segwang Kim**, Kyomin Jung, Weakly Supervised Semantic Parsing with Execution-based Spurious Program Filtering, The 2023 Conference on Empirical Methods in Natural Language Processing: EMNLP 2023 (EMNLP) - Dec 2023, Singapore [poster, slides]

- Taegwan Kang, **Segwang Kim**, Hyeongu Yun, Hwanhee Lee, and Kyomin Jung, Gated Relational Encoder-Decoder Model for Target-Oriented Opinion Word Extraction, IEEE Access 2022

- **Segwang Kim**, Joonyoung Kim, and Kyomin Jung, Compositional Generalization via Parsing Tree Annotation, IEEE ACCESS 2021 [code]

- **Segwang Kim**, Hyoungwook Nam, Joonyoung Kim, and Kyomin Jung, Neural Sequence-to-grid Module for Learning Symbolic Rules, AAAI Conference on Artificial Intelligence (AAAI) - 2021, A Virtual Conference [code, poster, slides]

- Hyoungwook Nam, **Segwang Kim**, Kyomin Jung, Number Sequence Prediction Problems for Evaluating Computational Powers of Neural Networks, AAAI Conference on Artificial Intelligence (AAAI, Oral), Jan 2019, Honolulu, Hawaii, USA [poster, slides]

PROJECTS

Improving Reliability of Large-scale Language Models   2021 - 2023
NAVER
Co-working with NAVER's language research team, I am developing reliable open domain QA systems for ambiguous user queries.

Developing Deep Learning Architecture for Logical Inference   2019 - 2021
Samsung Research Funding & Incubation Center for Future Technology
I led this research project to design novel architectures and learning methods to make deep learning models have logical inference abilities.

Developing Automatic Temperature System   2018 - 2019
Dasan DNG
I led this project to implement a smart thermostat system that can automatically control and suggest optimal temperatures. Proceeding with this project, I not only coordinated with workers from Dasan DNG but also cleansed raw data obtained from status sensors and Korea Meteorological Administration DB.

Rumor Detection on NAVER Blog Spaces   2017 - 2018
NAVER
This research project was aimed to propose machine learning methods to debunk malicious rumors on social media like NAVER blogs. To do so, I suggested an accurate XGBoost-based tree boosting method that can explain which word combinations in a post affect the post being classified as a rumor.

Improving Japaneses-Korean Neural Machine Translation Models   2016 - 2017
NAVER
This research project was aimed to improve RNN sequence-to-sequence neural machine translation models in terms of their accuracy and vocabulary coverage. In particular, to cover more out-of-vocabulary words, I implemented the LightRNN method that represents a single word as two subwords, enabling the model to cover N^2 words with $2N$ subwords.

INVITED TALK

NAVER AI Colloquium   Mar 2018
Rumor Detection on Social Media

PROGRAMMING SKILLS

Python, PyTorch, TensorFlow, C++, MATLAB.

TEACHING EXPERIENCE

Teaching Assistant   Mar 2016 -
Department of Electric and Computer Engineering   Seoul National University
Lecturer: *Kyomin Jung*

- (Graduate Class) Machine Learning   Fall 2021
- (Undergraduate Class) Programming Methodologies   Spring 2020
- (Undergraduate Class) Programming Methodologies   Spring 2019
- (Graduate Class) Advanced Programming Methodologies   Fall 2018
- (Graduate Class) Advanced Programming Methodologies   Fall 2017
- (Graduate Class) Advanced Programming Methodologies   Spring 2016

EXTRACURRICULAR ACTIVITIES

Sports
Soccer   Spring 2012 -

- 1st place, SNU President's Cup Soccer Tournament   Spring 2015
- 1st place, SNU President's Cup Soccer Tournament   Spring 2013

Swimming   Summer 2016 -
Tennis (active)   Summer 2017 -

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