

# SEGWANG KIM

Samsung MX Division

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## EDUCATION

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### ***Doctor of Philosophy***

Department of Electrical and Computer Engineering

Seoul National University

Advisor: [Kyomin Jung](#)

Mar 2016 - Fall 2022

Seoul, Korea

### ***Bachelor of Science (Cum Laude)***

College of Liberal Studies (Major: Mathematics, Minor: Statistics)

Seoul National University

Mar 2012 - Feb 2016

Seoul, Korea

### ***Korea Science Academy of KAIST***

High School for Gifted Students ([KAIST 부설 한국과학영재학교](#))

Mar 2009 - Feb 2012

Busan, Korea

## RESEARCH INTERNSHIPS

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### **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

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### **SNU AIIS Spring Retreat Best Poster Award (3rd place)**

April 2021

Neural Sequence-to-grid Module for Learning Symbolic Rules (AAAI 2021)

## RESEARCH INTEREST

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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 successfully 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 finetuning 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

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- 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, Empirical Methods in Natural Language Processing (EMNLP) Findings - Dec 2023, Singapore
- Kangil Lee, **Segwang Kim**, Kyomin Jung, Weakly Supervised Semantic Parsing with Execution-based Spurious Program Filtering, Empirical Methods in Natural Language Processing (EMNLP) - Dec 2023, Singapore
- **Segwang Kim**, Joonyoung Kim, and Kyomin Jung, [Compositional Generalization via Parsing Tree Annotation](#), IEEE ACCESS 2021 [[code](#)]
- **Segwang Kim**, Hyounghwook 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

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### **Improving Reliability of Large-scale Language Models** 2021 - 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

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### **NAVER AI Colloquium**

Mar 2018

Rumor Detection on Social Media

## PROGRAMMING SKILLS

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

## TEACHING EXPERIENCE

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### Teaching Assistant

Department of Electric and Computer Engineering

Lecturer: *Kyomin Jung*

Mar 2016 -  
Seoul National University

- (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

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### 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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