Bosung Jung

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Mathematical Data Science
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EDUCATION

M.S.	Korea University Graduate School, Department of Mathematics, Mathematical Data Science, 2025 (expected)
B.S.	Korea University, College of Science, Department of Mathematics, 2024

SCOLARSHIP

2016 ∼ 2019	BITCOMPUTER, Cho Hyun-jung Foundation's 18th scholarship student
2019	Korea University, Seokrim Association Scholarship
2022	Korea University, Academic Excellence Scholarship
2023	Korea University, Danglim Association Scholarship

RESEARCH AREAS

Improving Small Language Model for Solving Mathematical Problems.

Bayesian Optimization in Various Situations(Multi-Objective, Mixed-Space, Constraint)

Natural Language Processing with AI(Text, Dialogue, Raman Spectrum, Spectrogram)

Analyzing optimizers through fractional derivatives and applying fractional derivatives in Gradient Descent.

SKILLS

Programming Language

Python	Capable of implementing desired algorithms and writing deep learning training code.
R	Can understand R code and translate to Python
SQL	Acquired the SQL Developer (SQLD) certification administered by the Korea Data Agency(K-DATA).
Collaboration Tools	Git, Docker, NAS

WORK EXPERIENCE

September 2024 – December 2024: Nara-Information Co., Ltd.

Fine-tuned Small Language Models (SLMs), including LLaMA 3.2, Polyglot-ko, and Gemma2. Utilized various Parameter-Efficient Fine-Tuning(PEFT) methods, such as Full Fine-Tuning, QLoRA, and Rank-Stabilized LoRA.

The training data consisted of Q&A datasets related to civil complaints, which were transformed into chat dialogue using OpenAI's Batch API for instruction tuning.

Fine-tuned SLM with RAG to enable In-Context Learning (ICL).

Contributed to deploying a chatbot service on the KEAD (Korea Employment Agency for the Disabled) website by providing fine-tuned LLMs. Additionally, Develop a database service for RAG integration.

Established a periodic web crawling pipeline using Scrapy, Selenium, and BeautifulSoup to construct and maintain databases for the website.

Built and presented an end-to-end GraphRAG pipeline utilizing LangChain, OpenAI API, and Upstage API for corporate analysis reports within the organization.

PUBLICATIONS

Conference Articles

2024 Jaeheun Jung, Jaehyuk Lee, Chang-Hae Jung, Hanyoung Kim, Bosung Jung, and Donghun Lee. (2024). "Broadband Ground Motion Synthesis by Diffusion Model with Minimal Condition."*Arxiv*, Preprint

2024 Bosung Jung, Donghun Lee, Doyoon Kim "Impossibility of Optimizing Time-Fractional Gradient Descent With a Convex Function As the Objective Function." *Korea Computer Congress 2024*, Poster.

Journal Articles

2023 Sungwon Park, Bosung Jung, and Hongjoong Kim, "Generating Synthetic Raman Spectra of DMMP and 2-CEES by Mathematical Transforms and Deep Generative Models" *Journal of the KIMST 2023, vol.26, no.6, pp. 422-430 (9 pages)*.

COMPETITION EXPERIENCE

2024: AIMO Kaggle competition project in AI+Math Lab@K

Apply DPR in prompt engineering to enhance LLM's mathematical problem-solving abilities in few-shot learning.

Build America Mathematics Olympiad datasets for Fine-Tuning, by Crawling the websites with the BeautifulSoup library. Finetune LLM by applying Quantization, DDP, and LoRA.

2024: Hansoldeco Dacon competition project in AI+Math Lab@K

Augment laguage datasets for Fine-Tuning using the Backtranslation method in English and Japanese.

Finetune LLM by applying RAG.

RESEARCH EXPERIENCE

2025: Collaborative Project with KOLON

Develop diverse Bayesian Optimization loop with BoTorch

Implement Multi-Objective · Constraint · Mixed Space Bayesian Optimization algorithm

2024: Earthquake imputation Project in AI+Math Lab@K

Dataset: SCEDC(Southern California Earthquake Data Center)

Select datasets for inference and evaluation from approximately $17,000$ waveforms,

Implement Ground Motion Prediction Equation metric for evaluation, and identifying issues within the code.

2023: Collaborative Project with Korea Exchange (KRX)

Dataset: IRS contracts of KRX's members

Contributed to the development of a hedging algorithm for IRS products of defaulting members

Designed a grouping algorithm using dynamic programming to minimize the sum of absolute values of group $PV01$ values

2022: Collaborative Project with Agency for Defense Development (ADD)

Data: Ramam Spectrums of DMMP, CEES-2

Contributed to simulating Raman spectra data

Utilizing discrete Fourier transform and discrete wavelet transform, etc, simulate graphs 1 to 2700.

After visualizing and saving as image data simulated graphs, VAE and GAN were trained for additional simulation.

Updated January 2025