

RESEARCH INTEREST

My research interests include integrating a **Deep Understanding of Finance** with **AI Development Capabilities** to explain financial phenomena from an engineering-oriented perspective.

- **Finance, especially Insurance & Risk Management:** [1], [2].
- **AI, especially Deep Learning:** [3], [4], [5], [6].

EDUCATION

- **POSTECH** Pohang, South Korea
M.S. in Industrial and Management Engineering (Advisor: Kwangmin Jung).
GPA: 3.53/4.30 Sep. 2023 - **Present.**
- **Inha University** Incheon, South Korea
B.S. in Industrial Engineering.
GPA: 3.93/4.50, Major GPA: 4.00/4.50 May. 2019 - Aug. 2023

PUBLICATIONS

- [1] Keywoong Bae, Kwangmin Jung, Linfeng Zhang, “Systemic cyber risk and insurance regulatory capital”, manuscript in process.
- [2] Kwangmin Jung, Keywoong Bae, “A Classification and Statistical Analysis on Systemic Cyber Risks”, *Korean Journal of Insurance (KJI)*, Accepted.
- [3] Keywoong Bae, Suan Lee, Wookey Lee, “Diffusion-C: Unveiling the Generative Challenges of Diffusion Models through Corrupted Data,” *Conference on Neural Information Processing Systems (NeurIPS), Workshop on Diffusion Models*, Dec, 2023.
[Paper] [Video Link] [Github]
- [4] Keywoong Bae, Suan Lee, Wookey Lee, “Robustness Analysis of Diffusion Generation model Using Noises and Corruptions”, *Korea Software Congress (KSC)*, pp.1,091-1,093, Dec, 2022.
[Paper]
- [5] Keywoong Bae, Suan Lee, Wookey Lee, “Robust Multimodal Classification Model Using Homogeneous Features,” *Korea Computer Congress (KCC)*, pp.1,776-1,778, Jun, 2022.
[Paper] [Github]
- [6] Keywoong Bae, Suan Lee, Wookey Lee, “Transformer Networks for Trajectory Classification,” *IEEE international Conference on Big Data and Smart Computing (BigComp)*, pp.331-333, Jan, 2022.
[Paper] [Video Link]

PRESENTATIONS

- Presented the work on “A Classification and Statistical Analysis on Systemic Cyber Risks,” The 2024-2025 3rd Social Science Korea (SSK) Networking Symposium, Online, Feb 2025.
- Presented the work on “A Classification and Statistical Analysis on Systemic Cyber Risks,” Korean Insurance Academic Society (KIAS), Cheonan, South Korea, Feb 2025.

EXPERIENCE

- **Informatics and Deep Learning Lab.** Incheon, Republic of Korea
Undergraduate Researcher (Advisor: Wookey Lee). Apr. 2021 - Jun. 2023
 - Researched the impact of Corruptions on Diffusion Generative models by examining how corrupting on images affects the models’ learning process and its performance.

- SL Solution Co. Ltd.** Seoul, South Korea
Internship course at Software Team *Aug. 2020*
 - Developed a Responsive Web Application, called Corona Map, using the TMAP API (REST API) during an internship.
- UDMTEK Co. Ltd.** Suwon, South Korea
Internship course at MES Team *Dec. 2019 – Feb. 2020*
 - Worked as a Software Engineer on the Web Application team managing Manufacturing Execution System (MES) data and report services.

PROJECTS

• Valuation on Cyber Insurance Companies

Project on Corporate Valuation and Case Studies Course (IMEN-891H) *Sep. 2024 - Dec. 2024*

- Evaluated the changes in corporate value of two major cyber insurers, AIG and AXA, before and after the COVID-19 pandemic. [[Github](#)]
- Implemented Free Cash Flow (FCF) using financial metrics from each insurer's Income Statement and assessed their values through Discounted FCF Projections.

• Assessment of the Corporate Customer Service and Proposal for the Improvement.

Korean Fire Protection Association (KFPA) *Sep. 2024 - Nov. 2024*

- Analyzed the attributes of KFPA inspection staff based on employment types (Subsidiary, Contract worker, Outsourcing) and proposed workforce management strategies for enhancing inspection efficiency.
- Optimized the number of personnel for building inspections using Linear Programming.

• Data-driven Evaluation for Safety Assessment of the KFPA and its Future Strategy.

Korean Fire Protection Association (KFPA) *Apr. 2024 - Jul. 2024*

- Conducted data-driven analysis to estimate the efficiency of digital transformation strategies in building inspections.
- Utilized a machine learning algorithm, such as random forest, to examine the impact of building features on inspection time and employed eXplainable AI (XAI) techniques for ensuring the interpretability of the results.

• Prediction on Sunspot using Time-Series model.

Project on Time-Series Analysis Course (IMEN-677) *Mar. 2024 - Jun. 2024*

- Analyzed the statistical characteristics of sunspots based on their count and size over time. [[Github](#)]
- Performed ADF and KPSS test to assess the stationarity and conducted the predictive performance across different models (e.g., Moving Average, SARIMA, RNN, LSTM, and GRU).

• Analysis on Cyber risks caused by Natural Catastrophes.

Project on Integrated Risk Management Course (IMEN-891G) *Sep. 2023 - Dec. 2023*

- Conducted statistical analysis on cyber risk, natural catastrophe risk, and cyber risks triggered by natural catastrophes. [[Github](#)]
- Defined keywords describing each type of risk and utilized pretrained Large Language Model (LLM) to extract relevant samples.
- Estimated distributions for frequency and severity using Goodness-of-fit (GoF) test and performed factor analysis through Generalized Linear Models (GLM).

• Classification on CIFAR-10 using CNN-Based Deep Learning Models.

Project on Advanced Machine Learning (IEN-4116) *Mar. 2023 - Jun. 2023*

- Generated the images by class in order to improve classification performance by using unsupervised learning, including DCGAN and DDPM. [[Github](#)]

- Constructed a large image dataset and classified them by using supervised learning models (e.g., ResNet, Dilated Residual Networks, and EfficientNet).

- **Computer Vision Anomaly Detection.**

Computer Vision Anomaly Detection Algorithm Competition by DACON

Mar. 2022 - May. 2022

- Developed an algorithm to distinguish whether an object is normal or abnormal with class imbalanced dataset.
- Used Deep Learning model (EfficientNet) to achieve better performances with fewer parameters.
- Used Machine Learning Method (Class Weighting) to solve class imbalance.

- **Computer Vision Face Verification.**

2021 Inha Artificial Intelligence Challenge by DACON

Aug. 2021

- Developed a face verification algorithm, such as Face-Net, to extract embedding vectors from images effectively.

- **Database design for a Restaurant Time-Saving System.**

Project on Database Design Course (IEN-2201)

Sep. 2020 - Dec. 2020

- Developed a database system for a fast-food restaurant that utilizes customer scoring methods based on visit frequency to reduce waiting times.
- Designed the diagram of database using ErWin and systematized the designed diagrams into databases using Oracle.

- **Responsive Web Application Development.**

Internship course at SL Solution

Aug. 2020

- Developed a responsive web application to store and visualize the location data of COVID-19 confirmed cases. [\[Github\]](#)
- Used the web development tools, including Spring Boot, MariaDB, and T-Map API.

- **Effective Concert Entrance System Development.**

Project on Database Course (IEN-2008)

Mar. 2020 - Jun. 2020

- Developed a virtual system on concert entry system with an optimization of time savings using Microsoft Access. [\[Github\]](#)

- **MES Web Application Maintenance Project.**

Internship course at UDMTEK

Dec. 2019 - Feb. 2020

- Developed a web application for Manufacturing Execution System (MES) services.
- Implemented the MVC pattern using web development frameworks (e.g., Angular, Spring Boot, and PostgreSQL).

REVIEWS

- **Competition Reviewer:** The 2nd Nation-wide Data Science Competition for Risk Management, co-hosted by POSTECH X SFMI (Samsung Fire and Marine Insurance), 2023.

SKILLS

- **Language:** Korean (Native), English (Advanced).
- **Programming:** Python, R, C++ (Advanced), Java, JavaScript, SQL (Intermediate).
- **AI Framework:** TensorFlow, PyTorch, Scikit-Learn (Advanced).