Keywoong Bae

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#4-411, Dept. of Industrial and Management Engineering, POSTECH

https://kwoongbae.github.io

Research interest

My research interests include **Finance** and **AI**.

- **Finance, especially Insurance & Risk Management:** J1, P1
- **AI, especially Deep Learning:** C1, C2, C3, W1

Education

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

Publications

C: Conference, **J**: Journal, **W**: Workshop, **P**: Preprint

- **[P1]** Keywoong Bae, Kwangmin Jung, Linfeng Zhang, "Systemic cyber risk and insurance regulatory capital", manuscript in preparation.
- **[J1]** Kwangmin Jung, Keywoong Bae, "A Classificaiton and Statistical Analysis on Systemic Cyber Risks", *Korean Journal of Insurance **(KJI)***, Accepted.
- **[W1]** 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]
- **[C3]** 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]
- **[C2]** 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]
- **[C1]** 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, 21 Feb 2025.
- Presented the work on "A Classification and Statistical Analysis on Systemic Cyber Risks," Korea Insurance Winter Conference, Cheonan, South Korea, 21 Feb 2025.

Experience

- **Informatics and Deep Learning Lab.** — Incheon, Republic of Korea
  Undergraduate Intern (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 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 developer on the Web Application team managing Manufacturing Execution System (MES) Data and developing report programs.

Projects

- **Valuation on Cyber Insurance Companies**

  Project in 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 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.
  - Determined the optimal number of employees based on their types 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 in 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 stationality and conducted the predictive performance across different models (e.g., Moving Average, SARIMA, RNN, LSTM, and GRU).

- **Cyber risks caused by Natural Catastrophes**

  Project in 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 Langauge Model (LLM) to extract relevant samples.
  - Estimated distributions for frequency and severity using Goodess-of-fit (GoF) test and performed factor analysis through Generalized Linear Models (GLM).

- **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 in 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 in 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 Marin Insurance), 2023.