

Hyeongwon Kang

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RESEARCH INTERESTS

Time Series Anomaly Detection, Time Series Forecasting, Time Series Reasoning, Multimodal AI, Smart Manufacturing AI

EDUCATION

Korea University, College of Engineering

Seoul, Republic of Korea

Integrated M.S./Ph.D., Department of Industrial and Management Engineering

Mar.2021 - Present

- **Advisor:** Prof. Pilsung Kang
- **GPA:** 4.38 / 4.5

Incheon National University, College of Engineering

Incheon, Republic of Korea

B.S., Department of Industrial and Management Engineering

Mar.2014 - Feb.2020

- **Interdisciplinary Program:** Artificial Intelligence Software
- **Advisor:** Prof. Kwanho Kim
- **GPA (Overall):** 4.31/4.5, **GPA (Major):** 4.38/4.5
- Summa Cum Laude, ranked 1st in the department and 2nd in the college

WORK EXPERIENCE

Korea Electronics Technology Institute

SeongNam, Republic of Korea

Researcher

Feb.2020 - Feb.2021

- Data Analysis and Software development, Intelligence Integrated Software Research Center
- Developed anomaly detection and forecasting models for connected vehicles
- **Technical Skills:** Python with PyTorch, NumPy, Matplotlib, Pandas, Scikit-learn, Ubuntu Linux, Linux tools, Docker, Apt, Scripting, Git
- **Soft Skills:** Teamwork, Time Management, Communication, Presentation skills

PUBLICATIONS

JOURNAL ARTICLES

Granularity Fusion Transformer: Learning multi-granularity patterns for time-series forecasting

Jinwoo Park, **Hyeongwon Kang**, Seunghun Han, Pilsung Kang
Knowledge-Based Systems (2025) p. 113644

Transformer-based multivariate time series anomaly detection using inter-variable attention mechanism

Hyeongwon Kang, Pilsung Kang
Knowledge-Based Systems 290 (2024) p. 111507

Training-free retrieval-based log anomaly detection with pre-trained language model considering token-level information

Gunho No, Yukyung Lee, **Hyeongwon Kang**, Pilsung Kang
Engineering Applications of Artificial Intelligence 133 (2024) p. 108613

Time-series anomaly detection with stacked Transformer representations and 1D convolutional network

Jina Kim*, **Hyeongwon Kang***, Pilsung Kang
Engineering Applications of Artificial Intelligence 120 (2023) p. 105964

Deep Reinforcement Learning-Based Scheduler on Parallel Dedicated Machine Scheduling Problem towards Minimizing Total Tardiness

Donghun Lee, **Hyeongwon Kang**, Dongjin Lee, Jeonwoo Lee, Kwanho Kim
Sustainability 15.4 (2023) p. 2920

Deep Learning-Based Multi-Horizon Forecasting for Automated Material Handling System Throughput in Semiconductor Fab

Jungwoo Choi, **Hyeongwon Kang**, Jeongseob Kim, Heejeong Choi, Yunseung Lee, Pilsung Kang
IEEE Transactions on Semiconductor Manufacturing 36.1 (2022) pp. 113–129

Building an integrated framework for Korean document summarization and speech synthesis

Takyoung Kim, Jina Kim, **Hyeongwon Kang**, Subin Kim, Pilsung Kang
Journal of the Korean Society of Industrial Engineers 48.1 (2022) pp. 80–90

UNDER REVIEW

COMET: Codebook-based Online-adaptive Multi-scale Embedding for Time-series Anomaly Detection

Jinwoo Park, **Hyeongwon Kang**, Seunghun Han, Pilsung Kang
International Conference on Machine Learning, Under Review; arXiv preprint available (2026)

Active Learning for Multivariate Time Series Anomaly Detection

Seunghun Han, **Hyeongwon Kang**, Jinwoo Park, Pilsung Kang

Forecasting Anomaly Precursors with Uncertainty-Aware Time-series Ensembles

Hyeongwon Kang, Jinwoo Park, Seunghun Han, Pilsung Kang

IEEE Transactions on Neural Networks and Learning Systems, Under Review; arXiv preprint available (2025)

WORK IN PROGRESS

Detecting Time Series Anomalies Like an Expert: A Multi-Agent LLM Framework with Specialized Analyzers

Hyeongwon Kang, Jeongseob Kim, Jinwoo Park, Pilsung Kang

Manuscript in preparation (2026)

* = Both authors contributed equally to this work.

PROJECTS

Development of an agile equipment/process quality anomaly detection and quality visualization model

Granted by SAMSUNG Electronics

Seoul National University

Apr.2025 - Feb.2026

- Define methodologies for analyzing and preprocessing equipment operation and processing data
- Design and build quality anomaly detection and quantification algorithms

Development of laser welding integrated monitoring differentiation technology

Granted by LG Electronics

Seoul National University

Jun.2025 - Nov.2025

- Developing a multimodal anomaly detection model combining time series and image data in laser welding processes
- Developed an XAI module to explain anomalies in laser welding using video and time series data

Development of field worker-friendly innovative AI agents for autonomous manufacturing

Granted by IITP

Seoul National University

Apr.2025 - Dec.2025

- Developing AI agents that can collaborate with workers in autonomous manufacturing environments
- Build an AI agent platform that integrates monitoring, prediction, and control functions using multimodal data and orchestrates them

Development of an Initial AI Model for Equipment Health Monitoring and Feasibility Testing, and a Study on

Granted by KOGAS

Trends for Establishing a Multimodal AI Roadmap

Seoul National University

Sep.2024 - Aug.2025

- Facility health monitoring AI initial model development and usability testing
- Research trends to build a roadmap for leveraging multimodal AI in facility operations

Time-series anomaly detection for laser welding nondestructive testing systems

Granted by LG Electronics

Korea University

Apr.2023 - Dec.2023

- Developed technology to prevent mass rejects in battery welding through real-time automatic detection of defects/process anomalies
- Validate model fit and deploy models for field application

Error-free information infrastructure autonomous control technology based on modeling & optimization

Granted by KETI

Korea University

Jul.2021 - Dec.2024

- ML/DL-based anomaly detection - develop predictive and causal models
- Developed feature data augmentation models using GAN & VAE generation models

Multi-Modal Learning model for heterogeneous data

Granted by LG Innotek

Korea University

Apr.2023 - Feb.2024

- Predicting AA process performance using Multi-Modal Learning from time series and tabular data
- Build a framework for exploring methodologies for analyzing diverse multimodal data

Fake News Detection Dataset Construction Project - Development of Fake News Detection Model

Granted by NIA

Korea University

May.2022 - Dec.2022

- Developed algorithms to detect "title and body mismatch" and "body domain mismatch" based on Korean fake news
- Presented baseline algorithm performance for the development of a fake news detection model

AI-based Semiconductor Process Data Semi-Supervised Anomaly Detection

Granted by RTM

Korea University

Mar.2021 - Jun.2021

- Building anomaly detection models based on semi-supervised methodologies
- Generate an Anomaly Score distribution and extract Pseudo Normal data with an anomaly detection model

Development of manufacturing big data collection and analytics general purpose platform

Granted by Keit

Korea Electronics Technology Institute

Feb.2020 - Dec.2020

- Developing software to collect, preprocess, and analyze big data from multi-product manufacturing processes
- Implemented analysis functions linked to sensing information for advanced analysis of process data

Development on the bigdata analysis technology and business service for connected vehicles

Granted by Keit

Korea Electronics Technology Institute

Feb.2020 - Dec.2020

- Developed anomaly detection models using dashcam footage, sensor data, and unsupervised learning techniques
- Built LSTM-based forecasting and accident detection pipeline using object tracking and ego-trajectory analysis

Scheduler based on the DQN that considers the following tasks to minimize tardiness

Granted by VMS Solutions

Incheon National University

Mar.2019 - Sep.2019

- Applied DQN & DDQN to the field of scheduling to propose scheduling techniques that consider setup and machine-specific job type constraints
- Proposed DQN-based optimization scheduling framework

AWARDS & HONORS

2025	Grand Prize , 2025 Summer Conference of the Korea Data Mining Society	Gangwon
2022	Grand Prize , 1st Dissertation Research Plan Idea Contest	Seoul
2020	College of Engineering President's Award , Incheon National University	Incheon
2019	Student Honors , Incheon National University	Incheon
2019	Bronze , Korean Institute of Industrial Engineers Fall Meeting, Collegiate Project Competition	Seoul
2019	Gold , Engineering Portfolio Competition	Incheon
2019	Excellence , Industry Capstone Design Competition	Incheon
-	Merit-based Scholarship , (50% Tuition), 2.5 years	Incheon

PRESENTATIONS

Research on Interpretable Time Series Anomaly Detection Technology Using Multi-Agent-Based Large

Language Models

KDMS 2025

Hyeongwon Kang, Jeongseob Kim, Jinwoo Park, Pilsung Kang

VTT: Transformer-based multivariate time series anomaly detection with inter-variable attention mechanisms

KDMS 2024

Hyeongwon Kang, Pilsung Kang

Predicting anomalies with uncertainty in time series forecasting ensemble models

KDMS 2024

Hyeongwon Kang, Jinwoo Park, Seunghun Han, Pilsung Kang

Predicting anomalies with uncertainty in time series forecasting ensemble models

KIIE 2024

Hyeongwon Kang, Jinwoo Park, Seunghun Han, Pilsung Kang

Transformer-based multivariate time series anomaly detection with cross-variable attention mechanisms

KIIE 2022

Hyeongwon Kang, Euisuk Chung, Kyoungchan Park, Pilsung Kang

Deep learning-based semiconductor logistics return system multi-point throughput capacity prediction study

KIIE 2022

Jungwoo Choi, Hyeongwon Kang, Jeongseob Kim, Pilsung Kang

Building an integrated framework for Korean document summarization and speech synthesis

KIIE 2021

Takyoung Kim, Jina Kim, Hyeongwon Kang, Subin Kim, Pilsung Kang

INVITED TALKS

Large Language Models for Time Series Anomaly Detection

Korea Electronics Technology Institute(KETI), Artificial Intelligence Convergence Security Research Lab

Sep.2025

Transformer-based Multivariate Time Series Anomaly Detection using Inter-Variable Attention Mechanism

Electronics and Telecommunications Research Institute(ETRI), AI Convergence Security Lab

Apr.2025

Unified Training of Universal Time Series Forecasting Transformers

Korea Electronics Technology Institute(KETI), Artificial Intelligence Convergence Security Research Lab

Jan.2025

Transformer-based Multivariate Time Series Anomaly Detection using Inter-Variable Attention Mechanism

SKT Market Top AI, Global Knowledge

Jun.2024

Developing time series data-driven methodologies

Korea University Data Science Society, Korea University

Nov.2022

TEACHING EXPERIENCES

PROGRAMMING INSTRUCTOR

LG Electronics Digital transformation Intensive Course

2025

- Deep learning-based time series analysis, Transformer-based time series data analysis, Semi-Supervised Learning

LG Energy Solution DX Expert Course

2024

- Deep Auto-Encoder, Transformer/Vision Transformer/Time-series Transformer, Deep learning for time series data analysis

LG Electronics Digital transformation Intensive Course

2024

- Transformer-based time series data representation learning, Visualize time series data, Select Variables and Collapse Dimensions Lecture

SK Hynix Developing a Data Center Storage Fail Prediction Model Course

2023

- Time series Anomaly Detection Lecture

LG Energy Solution DX Expert Course

2023

- Deep learning for time series data analysis, Select Variables and Collapse Dimensions Lecture

TEACHING ASSISTANT

LG Energy Solution DX Expert Course

2022

- Python Basic, Anomaly Detection, Select Variables and Collapse Dimensions Lecture

LG Innnotek Machine Learning Course

2022

- Python Basic, Artificial Neural Network Basic, DNN, CNN Lecture

HYUNDAI STEEL Data Analytics Course

2021

- Anomaly Detection Lecture

SK Hynix Data Analytics Course

2021

- Anomaly Detection Lecture

PROJECT ASSISTANT

Fast Campus Advanced Data Analytics Semi-professional Course

2022

SK Hynix Data Analytics Course

2021

TECHNICAL SKILLS

Research Areas Time Series Analysis, Anomaly Detection, Forecasting, Multimodal Learning, LLM-based Agents, Explainable AI

Programming Python, R, C/C++, SQL

Frameworks & Libraries PyTorch, TensorFlow, Keras, Scikit-learn, Pandas, NumPy, LangChain, LangGraph

Miscellaneous Linux, Shell Scripting, Git, Docker, LaTeX

References available upon request.