INTRODUCTION TO THE DEPARTMENT OF INDUSTRIAL ENGINEERING

INTRODUCE

Under the vision of 'data science-based problem solving', the Department of Industrial Engineering (IE) at UNIST aims to cultivate highly skilled data scientists who can solve the decision-making problems faced by companies, industries, and society through engineering technologies. We research and teach the state-of-the-art methodologies related to optimization, artificial intelligence, data mining, process and systems engineering, and financial engineering to help decision making based on real-world data. Our department fosters the development of convergent talents with theoretical and practical knowledge for the 4th Industrial Revolution era, who will lead the nation's industry and economy with problem solving abilities and leaderships based on the scientific accuracy and the engineering efficiency.

GREETINGS

In preparation of the 4th Industrial Revolution, the Department of Industrial Engineering at UNIST is pursuing the excellence and innovation in Smart Convergence Technologies focusing on Artificial Intelligence and Big-Data Analytics.

We offer both undergraduate and graduate programs (BS, MS, Ph.D, Combined MS-Ph.D) with emphasis on Optimization, Financial Engineering, Blockchain-based Data Security, and Artificial Intelligence for industrial applications. In particular, we will focus on securing the key assets of Data Analytics for the future technology development with the industries and central/local governments.

We will exert every effort with splendid cooperation in this regard to strive for the excellence in convergence research and education toward the best IE program in the next decades, both nationally and globally.

Welcome aboard! You are the technology innovators, the leaders in the 4th industrial revolution, and the future of Industrial Engineering!

Head of Department Industrial Engineering
Namhun Kim

Industrial Intelligence Lab

RESEARCH INTERESTS
Industrial Artificial Intelligence (AI+X), Machine Learning / Deep Learning, Smart Manufacturing/Smart Factory, Social Network Analysis

Our research focuses on developing machine learning and/or social network analysis models for effective knowledge discovery from the real industry. The theoretical components of our research have direct relevance to various areas, including manufacturing (e.g., predictive maintenance, anomaly detection, additive manufacturing), safety management (e.g., car crash detection), and healthcare.

PROFESSOR **Sunghoon Lim**
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Financial Engineering Lab

RESEARCH INTERESTS
Financial Engineering, Financial Technologies (FinTech), Financial Data Analysis, Investment Management

We study quantitative approaches to financial planning of individuals and institutions. Most research topics can be categorized into three: (1) making optimal investment decisions using optimization and machine learning, (2) financial market modeling using machine learning techniques, and (3) investor data analysis using machine learning techniques. By developing advanced theories and practical technologies, we aim to make it possible for everyone to receive customized life-time financial planning services.

PROFESSOR **Yongjae Lee**
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Service Engineering & Knowledge Discovery Lab

RESEARCH INTERESTS
Service Engineering and Knowledge Discovery

We focus on developing data analytics methods to achieve learning tasks (i.e., knowledge discovery from data), such as representation, generation, prediction, and clustering. Based on such methods, we are also interested in solving real-world service problems with firms and governments (i.e., service engineering with data), including item recommendation, behavioral intervention, process monitoring, and service improvement.

PROFESSOR **Chiehyeon Lim**
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DEPARTMENT OF INDUSTRIAL ENGINEERING

We educate data science areas such as optimization, data mining processes, and system engineering to help you make decisions based on data.

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PROFESSOR & LABORATORY

Applied Optimization

RESEARCH INTERESTS
Optimization problems in the sharing economy, logistics and transportation sectors, and their effects on energy sustainability and environment Development of polynomial-time algorithms for solving optimization and network problems

The mission of the Applied Optimization Lab is to conduct high quality academic research while addressing real industrial and government problems. Research activities are focused on the use and development of advanced computer software to analyze and optimize performance measures of actual systems. The lab's faculty participants have a unique combination of expertise and experiences that allow them to address complex problems in logistics, transportation, and renewable energy systems, stochastic modeling and analysis of manufacturing systems, facility layout and location, and network design and optimization.

PROFESSOR **Sangjin Kweon**
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Learning Intelligent Machine Lab

RESEARCH INTERESTS
Stochastic Optimization, Reinforcement Learning, Causal Learning

Learning Intelligent Machine Lab focuses on Artificial Intelligence (AI) and its applications to industrial and scientific problems. Specifically, we pursue principled approaches to incomplete data problems in machine learning, including deep learning, via the view of statistics and mathematics. These topics are profoundly related to statistical learning, meta learning, and causal reasoning. Currently, I am working with the following research topics:
· Causal Learning / Machine Reasoning
· Statistical Learning
· Uncertainty Estimation
· Stochastic Optimization
· Planning / Reinforcement Learning
· Automated Machine Learning

PROFESSOR **Sungbin Lim**
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Stochastic Analysis in Machine Learning and Finance Lab

RESEARCH INTERESTS
Diffusion-based algorithms for nonconvex optimization. Stochastic optimization algorithm, financial engineering/mathematics

The research of Prof. Dong-Young Lim's lab is focused on stochastic optimization algorithms, nonconvex optimization, and their applications in finance and insurance. In particular, we are interested in quantitative risk management in financial markets, the development of efficient algorithms for large-scale nonconvex optimization, the study of theoretical properties of such algorithms. Some of our current research projects are
· Diffusion-based algorithms for nonconvex optimization and generative model,
· MCMC algorithms
· AI application in finance and insurance

PROFESSOR **Dong Young Lim**
Stochastic Analysis in Machine Learning and Finance Lab

Statistical Decision Making (SDM) Lab

RESEARCH INTERESTS
Sequential Decision Making, Bandit algorithms, Causal inference, Missing data analysis

Our research interests are focused on statistical approaches to the sequential decision problem. The multi-armed bandit (MAB) problem formulates the sequential decision problem in which a learner is sequentially faced with a set of available actions, chooses an action, and receives a random reward in response. In our lab, we integrate online learning and optimization techniques to develop algorithms that efficiently learn the reward model while maximizing the rewards. We also apply the developed algorithms to real tasks such as recommendation systems and mobile health apps. We also use causal inference to evaluate the performance of multi-armed bandit algorithms in a retrospective way.

PROFESSOR **Gi-soo Kim**
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Data Mining Lab

RESEARCH INTERESTS
Data Mining, Probabilistic and Statistical Learning, Machine Learning, Deep Learning, Predictive Analytics, Data Privacy and Security, Health Analytics, Chemometrics

We are pursuing to develop best algorithms, systems, and applications especially for predictive analysis and data privacy and security, which help solving important industrial and management problems and creating value.

PROFESSOR **Junghye Lee**
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Data Analytics Lab

RESEARCH INTERESTS
Business Analytics, Statistical Quality Control, Anomaly Detection, Data mining and machine learning, Design of experiments, Robust parameter design, Demand forecasting, Predictive analytics

Dr. Kim's research interests are in the broad areas of data science and business analytics. A major focus of his research is in developing novel statistical methods for solving complex engineering problems. He has several years of consulting experience in solving real business problems in industries.

PROFESSOR **Sungil Kim**
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Intelligent Enterprise Lab

RESEARCH INTERESTS
business process management, enterprise systems, ERP systems, process mining

This laboratory focuses on engineering of business intelligence tools for enterprise systems implementation and business process management. In enterprise systems, our focus is on the development of models and tools for managing ERP post-implementation changes and understand risk factors in ERP projects. In business process management, our focus is on the application of computational intelligence and data mining techniques to the analysis and optimisation of organisational business processes, using process event logs.

PROFESSOR **Marco Comuzzi**
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