Seyeon Lee

Applied Mathematician

Skills

Numerical Analysis

Data Analysis

Graph Neural Network

Topological Data Analysis

Autonomous Driving

ROS2

C++

PyTorch

Python

Matlab

Education

Mathematical Sciences (Ph.D.)

03/2015 - 08/2021

Ulsan National Institute of Science and Technology, South Korea

Advisor: Bongsoo Jang

Doctoral dissertation: "Numerical Methods and Applications of Fractional Differential Equations involving Singular and Non-singular Kernels".

Mathematics (B.S.)

03/2011 - 02/2015

Kwangwoon University, South Korea

Employment history

LAMP Postdoctoral Researcher
Department of Mathematics
Chungbuk National University

11/2024 - Present

Senior Engineer
Autonomous Driving Team
Seoul Dynamics

05/2024 - 10/2024

- Research and development of autonomous driving algorithms
- Optimization of algorithms for real-world automotive applications
- Development of software solutions for autonomous systems

Postdoctoral Researcher
Innovation Center for Industrial Mathematics
National Institute for Mathematical Sciences

01/2022 - 2024/01

- Industrial Mathematics
- Numerical methods for solving FDEs and its applications
- Graph Neural Network
- Machine learning for solving PDEs

Postdoctoral Researcher
Department of Mathematical Sciences
Ulsan National Institute of Science and Technology

09/2021 - 01/2022

- Numerical methods for solving FDEs and its applications

Research Interests

- Numerical Methods and Applications of Fractional Differential Equations
- Graph neural networks
- Machine learning for solving PDEs
- Industrial Mathematics

Current Research

- Resonance Amplitude characteristics in the fractional driven-damped oscillator

Contact

✉ seyeonlee0218@gmail.com

Publications

- Lee, Seyeon, Hyunju Kim, & Bongsoo Jang. "A Novel Numerical Method for Solving Nonlinear Fractional-Order Differential Equations and Its Applications." Fractal and Fractional 8.1 (2024): 65.

- Myunghyun Jung, Seyeon Lee, Minjung Gim, Hyungjo Kim, & Jaeho Lee. (2022). *"IMPROVING GLOBAL SUPPLY CHAIN RISK IDENTIFICATION USING RCF"*. In: *J. Korean Soc. Ind. Appl. Math.*, Vol 26.4, 280-295.

- H. A. A. El-Saka, Ibrahim Obaya, Seyeon Lee & Bongsoo Jang. (2022). *"Fractional model for Middle East respiratory syndrome coronavirus on a complex heterogeneous network"*. In: *Scientific Reports*, 12.1: 1-19.

- Seyeon Lee, Junseo Lee, Hyunju Kim & Bongsoo Jang. (2021). *"A fast and high-order numerical method for nonlinear fractional-order differential equations with non-singular kernel"*. In: *Applied Numerical Mathematics*, 163: 57-76.

- Hyunju Kim, Keon Ho Kim, Seyeon Lee & Bongsoo Jang. (2020). *"New explicit and accelerated techniques for solving fractional order differential equations"*. In: *Applied Mathematics and Computation*, 379: 125228.

- H. A. A. El-Saka, Seyeon Lee & Bongsoo Jang. (2019). *"Dynamic analysis of fractional-order predator–prey biological economic system with Holling type II functional response"*. In: *Nonlinear dynamics*, 96.1, 407-416.

Invited Talks

- Mar. 2024, Journey to Mathematics Major and Applied Mathematics, Mathematics Department Preview, Kwangwoon University

- Jan. 2024, Taking on Kaggle Challenges, MathAI, Gangwon Regional Innovation Platform University Education Innovation Headquarters, National Research Foundation of Korea, Ministry of Education

- Nov. 2023, Introduction to National Institute for Mathematical Sciences and Problem-Solving Case Studies, Kwangwoon University Mathematics Department Homecoming Day

- Sep. 2023, Introduction to Industrial Mathematics Innovation Center and Problem-Solving Case Studies, UNIST Department of Mathematical Sciences Homecoming Day

- Sep. 2023, Creating and Utilizing Scatter Plots with Python Libraries, Ajou University

- Jul. 2023, Isogeometric Analysis with Graph Neural Networks for Solving PDEs, Mathematical Sciences BRL Seminar, UNIST

- Apr. 2023, Data Preprocessing and Data Visualization, 2nd KSIAM-NIMS AI Math Academy, Kyungpook National University

- Mar. 2023, Advanced Methods for Identifying Supply Chain Risk Items: Data Preprocessing and Methodology, Ajou University

- Mar. 2023, Introduction to Topological Data Analysis Using Python, Kyungpook National University

- Jan. 2023, Introduction to GNN and Application of GNNs to Solving PDEs in Both Forward and Inverse Problems, Applied and Computational Mathematics Workshop, KENTECH

- Oct. 2022, Introduction to Graph Neural Networks, Kyungpook National University

- May 2022, Node Embedding: Shallow Embedding and GNN, UNIST

Presentations

- Nov. 2020, *Agent Based Mathematical Modeling and Control Policy for COVID-19 in Korea*, 2020 KSIAM Annual Meeting

- Jul. 2020, *Slow Passage Through Resonance in the Fractional Order Driven Damped Oscillator*, 2020 SIAM/CAIMS HAPPENING VIRTUALLY: 2nd Joint Annual Meeting

- Jul. 2019, *Fast Predictor-Corrector method for solving Caputo and Atangana-Baleanu fractional differential equations*, 9th International Congress on Industrial and Applied Mathematics, Valencia, Spain

- Jul. 2018, *Slow passage through resonance in fractional order system*, International Conference of Honam-Youngnam Mathematical Societies, Seogwipo, South Korea

- Jan. 2017, *Direct Predictor-Corrector Approach for Solving Nonlinear Differential Equation of Fractional Order*, Winter CMA Workshop in Charlotte: Fractional Systems and Domain Decomposition

- Jul. 2016, *NEWS? NEWS! (News headline analysis via network theory and machine learning)*, NIMS-SKKU MDA-TDA Summer School

- Aug. 2015 *Busan street network analysis with Gephi*, CMA Summer Workshop : Mathematical Bigdata Analysis

Technical Advisor

- Dec. 2023, Graph Neural Networks and Epidemic Modeling Integration, and Data Visualization Techniques, Kyungpook National University
  - Introduction to Graph Neural Network Fundamentals and Implementation, and Review of Epidemic Model Application Papers
  - Data visualization: Large-scale scatter plot visualization and map-based visualization

- Apr. 2022, Keyword analysis for advanced planning in mathematics, Korean Mathematical Society
  - Extraction of key keywords through Exploratory Data Analysis (EDA)
  - Generation, analysis, and visualization of keyword graphs for major fields

Experiences

- Jul. 2023, *European Study Group with Industry 171*, ECMI, ICMS & Maxwell Institute
  - Forecasting model for Harmful Algal Blooms in South Africa - Abagold

- May 2023, *2023 Industrial Mathematics Problem-Solving Workshop*, KSIAM & NIMS
  - Development of classification methods for mental illness patient groups, Dong-A University Medical Center

- Sep. 2022, *Workshop on Medical and Industrial Mathematics Problem-Solving Using AI Convergence Technology*, NIMS
  - Prediction of Parkinson's disease based on gait data, Department of Nuclear Medicine, Dong-A University Hospital

- 2019, *NIMS Industrial Mathematics Problem-Solving Workshop*, NIMS (summer, winter)
  - Predicting the erosion level of atomic oxygen on low-orbit satellite components, Korea Aerospace Research Institute

– Development of personal health status prediction model using basic medical data, SCT Co., Ltd.

- 2018, *NIMS Industrial Mathematics Problem-Solving Workshop*, *NIMS* (summer, winter)

    – Development of a model for the relationship between power consumption prediction and power generation, Jeju Provincial Government

    – Improvement of similar document detection system using natural language processing algorithms, Euclid Soft Co., Ltd.

Awards

- Sep. 2024, *Grand prize*, *BigBird: 3D CCTV-based Traffic Control Data Generation Solution*, 2024 Gyeonggi Startup Competition Finals: Change and Opportunity: Pre-startup League, Gyunggido Business & Science Accelerator

- Nov. 2018, *Grand prize*, *Recommendation and value prediction model for apartments via clustering of Seoul apartments*, NIMS Expert training for Industrial mathematics

- Jul. 2016, *Excellence award*, *NEWS? NEWS!*, NIMS-SKKU MDA-TDA Summer School

Teaching Assistants

- 2021, Dynamical Systems

- 2017, Methods of Applied Mathematics, Ordinary Differential Equations

- Spring 2017, Ordinary Differential Equations

- 2016, Abstract algebra 2, Set theory

- Spring 2016, Set theory

- 2015, Numerical Analysis, Introduction to analysis I

- Spring 2015, Introduction to analysis I

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