Jeongmin Lee

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Ph.D., Robotics

My research focuses on developing intelligence for robotic manipulation involving contact interactions. During my Ph.D., I worked on theories of contact modeling and solvers for high-performance robotic simulators, as well as efficient algorithms for planning, estimation, and control related to contact dynamics. Currently, I am broadening my scope to explore the intersection of contact modeling, solvers, and machine learning. Additionally, I am actively involved in creating a software suite for robotic manipulation applications.

Education

Seoul National University | *Seoul, S. Korea* Mar. 2019 - Aug. 2024
- M.S.-Ph.D. in Mechanical Engineering

Seoul National University | *Seoul, S. Korea* Mar. 2015 - Feb. 2019
- B.S. in Mechanical and Aerospace Engineering

Experience

Senior Research Engineer, Holiday Robotics Mar. 2025 -
- Research on physics simulation and humanoid manipulation

Postdoctoral Researcher, SNU INRoL Sep. 2024 - Feb. 2025
- Mechanics & Control group leading

Graduate Research Assistant, SNU INRoL Mar. 2019 - Aug. 2024
- Advisor: Dongjun Lee
- Research on developing high performance robot simulation and contact manipulation

Research Intern, Korea Institute of Science and Technology (KIST) May 2018 - Dec. 2018
- Developed a Lidar localization algorithm based on CNN and ICP

Teaching Assistant
- Control System 1 (M2794.005300) Spring 2021
- Mechanical System Modeling and Control (M2794.013500) Spring 2020

Awards and Honors

RSS Pioneers 2025
- Title: Enhancing Physics Simulators for Reliable and Scalable Data Generation

Outstanding Doctoral Thesis Award (SNU, KSME)
- Title: Efficient and Scalable Methods for Contact Manipulation: From Simulation to Estimation and Planning

Runner-up Award of the Embracing Contacts Workshop in ICRA 2023
- A differentiable geometry & optimization algorithm for state estimation during contact

Best Manipulation Paper Award Finalist in ICRA 2021
- Flexible cable simulation algorithm and sim-to-real verification

Outstanding BS Thesis Presentation Award
- Localization based on Lidar image using CNN and ICP

Publications

Journal Articles
- **Jeongmin Lee**, Minji Lee, Sunkyung Park, Jinhee Yun, and Dongjun Lee, Variations of Augmented Lagrangian for Robotic Multi-Contact Simulation, IEEE Transactions on Robotics 2025.
- **Jeongmin Lee**, Minji Lee, and Dongjun Lee, Large-Dimensional Multibody Dynamics Simulation using Contact Nodalization and Diagonalization, IEEE Transactions on Robotics 2022.
- Jeongseob Lee, Doyoon Kong, Hojun Cha, **Jeongmin Lee**, Dongseok Ryu, Hocheol Shin, Dongjun Lee, Wrench Control of Dual-Arm Robot on Flexible Base with Supporting Contact Surface, IEEE Transactions on Robotics (Accepted).

Conference Proceedings

- Sunkyung Park, **Jeongmin Lee** and Dongjun Lee, Shape Abstraction via Marching Differentiable Support Functions, CVPR 2025 (Highlight).
- **Jeongmin Lee**, Minji Lee, Sunkyung Park and Dongjun Lee, Efficient Gradient-Based Inference for Manipulation Planning in Contact Factor Graphs, IEEE ICRA 2025.
- Minji Lee, **Jeongmin Lee**, and Dongjun Lee, Narrow Passage Path Planning using Collision Constraint Interpolation, IEEE ICRA 2025.
- Harim Ji, Hyunsu Kim, **Jeongmin Lee**, Somang Lee, Seoki An, Jinuk Heo, Youngseon Lee, Yongseok Lee, and Dongjun Lee, GPU-Accelerated Subsytem-Based ADMM for Large-Scale Interactive Simulation, IEEE ICRA 2025.
- Seoki An, Somang Lee, **Jeongmin Lee**, Sunkyung Park, Dongjun Lee, Collision Detection between Smooth Convex Bodies via Riemannian Optimization Framework, IEEE/RSJ IROS 2024.
- **Jeongmin Lee***, Minji Lee*, and Dongjun Lee, Uncertain Pose Estimation during Contact Tasks using Differentiable Contact Features, RSS 2023.
- **Jeongmin Lee**, Minji Lee, and Dongjun Lee, Modular and Parallelizable Multibody Physics Simulation via Subsystem-Based ADMM, IEEE ICRA 2023.
- Minji Lee, **Jeongmin Lee**, and Dongjun Lee. Differentiable Dynamics Simulation Using Invariant Contact Mapping and Damped Contact Force, IEEE ICRA 2023.
- Minji Lee, **Jeongmin Lee**, Jaemin Yoon, and Dongjun Lee, Real-Time Physically-Accurate Simulation of Robotic Snap Connection Process, IEEE/RSJ IROS 2021.
- **Jeongmin Lee**, Minji Lee, Jaemin Yoon, and Dongjun Lee, A Parallelized Iterative Algorithm for Real-Time Simulation of Long Flexible Cable Manipulation, IEEE ICRA 2021. **(Best Manipulation Paper Award Finalist)**

Under Review/In Preparation

- **Jeongmin Lee**, Minji Lee, and Dongjun Lee, Differentiable Support Functions: Theory and Application to Contact State Estimation during Manipulation, In Preparation.

Workshops

- Minji Lee*, **Jeongmin Lee***, and Dongjun Lee, Assembly Path Planning via Variable Lifting and Physics Simulation, Robot Assembly Workshop in RSS 2023
- **Jeongmin Lee***, Minji Lee*, and Dongjun Lee, A Differentiable Formulation for Uncertain Pose Estimation during Contact, Embracing Contacts Workshop in ICRA 2023. **(Runner-up Award)**
- Minji Lee, **Jeongmin Lee**, and Dongjun Lee, Interactive Real-time Simulation of Robotic Snap Connection Process, Representing and Manipulating Deformable Objects in ICRA 2021.

Government and Industrial Projects

Development of a Digital Twin Platform for Precision Assembly Tasks Apr. 2024 -

- Ministry of Trade, Industry and Energy (MOTIE)
- Developing precise geometric and physical models and solvers for contact interactions

Virtual Environment and Contact Manipulation Module for Nuclear Power Plants Mar. 2022 -

- Ministry of Science and ICT (MSIT)
- Developing motion planning algorithms through contact for different emergency tasks

Autonomous Dish Placing Framework using Robot Manipulator Jan. 2022 - Oct. 2022

- Samsung Research
- Designed dish motion planning and state estimation module utilizing sensor data

High Speed & Accurate Simulator for Robot Manipulation Jan. 2020 - Dec. 2021

- Ministry of Trade, Industry and Energy (MOTIE)
- Developed contact solver and sim-to-real framework of deformable object manipulation

Development of Remote Control Technology for Nuclear Power Plant Maintenance Jan. 2019 - Dec. 2019

- Ministry of Trade, Industry and Energy (MOTIE)
- Implemented on-board state estimation module for a dual-arm robot working at heights

Activities

Consumer Electronics Show(CES) | *Las Vegas, USA* Jan. 2022

- Developed and exhibited a virtual environment platform integrated with haptic glove and physics simulation (Link)

Skills

Programming	C/C++, MATLAB, Python
Tools	Simulation(MuJoCo, Bullet, Isaac Sim), Optimization(NLopt, Ipopt, Knitro, Gurobi), Robotics(ROS, Drake), Learning(Tensorflow, Stable Baselines), OpenGL, Solidworks, LaTeX
Robots	Franka Panda, KUKA iiwa