

# Chan-Eui Song

**Research Interest:** Solving robotics problems based on optimal mechanism design.

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## EDUCATION

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**Seoul National University (SNU)**, Seoul, Korea

*Mar 2018 - Jun 2025 (Expected)*

Left for Mandatory Military Service, Aug 2019 - Mar 2021

Overall GPA: 4.02/4.3

Fulfilled graduation requirements, left for Industrial Experience and Research, Jan 2024 - Present

Upper GPA: 4.24/4.3

- B.S. in Mechanical Engineering (ME, Major)

ME Major GPA: 4.14/4.3

- B.S. in Mathematics (Math, Double Major)

Math Major GPA: 4.16/4.3

**RWTH Aachen University (RWTH)**, Aachen, Germany

*Apr 2023 - Sep 2023*

- Exchange Student at Faculty of Mechanical Engineering.

GPA: 1.0/5.0

- Studied Nonlinear control & Estimation methods, participated on a research project.

(equivalent to 4.0/4.0 CGPA)

**Gyeonggi Science High School for the Gifted**, Suwon, Korea

*Mar 2015 - Feb 2018*

- High school for the gifted in science and mathematics, 1 year Accelerated Admission via Exam.
- Conducted three research projects, including analyzing the movement of a cylinder with liquid.

## RESEARCH EXPERIENCES

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**IDEAOcean**, Seoul, Republic of Korea

Advisor: Prof. Yoon Young Kim (Distinguished professor from Department of Mechanical Engineering, SNU)

*Sep 2023 - Present*

- Developed automatic synthesis methodology in a constrained space for 1-DOF linkage mechanisms using the Spring Block Model (SBM). [1]
- Created 3D automatic synthesis methodology for 1-DOF linkage mechanisms incorporating revolute, prismatic, and spherical joints, developing the Joint-element-connected rigid Block Model (JBM). [2]
- Contributed to the development of METHEUS, an autonomous mechanism design software, by creating linkage mechanism data, which led to winning the **CES 2024 Innovation Award**.
- Designed **3 novel linkage mechanisms** for PBV hood hinge, PBV sliding door, and sports car rear wing, preparing patents.
- Early member of a lab-based startup, focusing on the autonomous mechanism design using SBM and JBM models.

**Transformative ARchitecture Lab**, Department of Mechanical Engineering, SNU

Advisor: Prof. Jin-Kyu Yang

*Sep 2023 - Dec 2023*

- Developed a physics simulator for an origami robot with five Miura-Ori unit cells using the Pybullet library.
- Studied Miura-Origami structure and implemented python code for solving 1-DOF origami configuration.
- Explored the application of reinforcement learning-based control for origami robots.

**UnRAVeL Group**, Institute for Data Science in Mechanical Engineering, RWTH

*Apr 2023 - Aug 2023*

- Evaluated the calculation speed of Model Predictive Controller(MPC) on an STM32H723 microcontroller.
- Implemented C++ code for a QP solver and tested its performance on an embedded system to control a cart-pole pendulum.

**Innovative Design and Integrated Manufacturing Lab**, Department of Mechanical Engineering, SNU

Advisor: Prof. Sung-Hoon Ahn

*Jul 2022 - Aug 2022*

- Proposed new algorithm for image processing and controlled robot using ROS.
- Generated datasets for applying meta-learning to 6R robot, automizing robot task generation in assembly process.

**Simulation-driven Structure Design Lab**, Department of Mechanical Engineering, SNU

Advisor: Prof. Do-Nyun Kim

*Mar 2022 - Dec 2022*

- Analyzed beam deformation using the Deep Energy Method with various neural networks, comparing results with FEM.
- Implemented Physics-Informed Neural Networks (PINN) by applying Neural ODEs to the deep energy method; submitted as a graduation thesis.
- Enhanced understanding of machine learning theory and its applications in mechanics.

**Interactive & Networked Robotics Lab**, Department of Mechanical Engineering, SNU

Advisor: Prof. Dongjun Lee

*Jan 2022 - Feb 2022*

- Collaborated with Hyundai Steel to control a hot wind tunnel using Model Predictive Control (MPC).
- Studied control theory, applied parameter estimation to MPC, and implemented Q-learning using MATLAB.

**Mathematics Undergraduate Research Thesis**, Department of Mathematics, SNU

Advisor: Prof. Dano Kim

*Sep 2022 - Dec 2022*

- Submitted graduation thesis on reviewing the Gauss-Bonnet Theorem.

## PUBLICATIONS AND MANUSCRIPTS

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†: 1st author, \*: corresponding author

- [1] **C. Song<sup>†</sup>**, J. Kim, and Y.Y. Kim\*, “Automatic Synthesis of 1-DOF Linkage Mechanism in a Constrained Space”, Expected submission in 2024 at *Journal of Mechanical Design*.
- [2] **C. Song<sup>†</sup>**, J. Kim, J. Kim, J. Jang, Y. Han, E. Park and Y.Y. Kim\*, “A Novel Rear-wing Mechanism Synthesized by a Systematic Design Process Employing Topology Optimization”, Expected submission in 2025 at *Mechanism and Machine Theory*. (Manuscript submission is scheduled for 2025 due to Hyundai Motors’ project completion and internal conference schedule.)

## WORKING EXPERIENCES

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**IDeAOcean** | Researcher

*Sep 2023 – Present*

**Samsung Electronics** | Intern

*Jan 2023 – Feb 2023*

- 3D Modeling/Simulation for automation process of detaching cap from compressor using FANUC robot.
- Implemented deep learning based on ResNet56 model to investigate vision based tactile sensor DIGIT.

## SELECTED AWARDS & HONORS

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**Academic Merit Scholarship**, \$11,700 | College of Engineering, SNU

*2018 - 2023*

**Student Abroad Program Scholarship**, \$5,000 | Office of International Affairs, SNU

*Feb 2023*

**Contributed to IDeAOcean’s CES 2024 Innovation Award** | Consumer Technology Association

*Jan 2024*

**Excellence Award, Mechatronics Contest**, \$1,200 | SNU

*Dec 2023*

**2nd Place, Futsal Competition**, \$150 | College of Engineering, SNU

*Nov 2022*

**2nd Place, Excellence Book Review Contest**, \$150 | Faculty of Liberal Education, SNU

*Feb 2022*

**Grand Prize, Korean Mathematics Competition** | Korean Society of Mathematical Education

*Feb 2017*

**Gold Prize, Korean Mathematics Competition** | Korean Society of Mathematical Education

*Jul 2017*

## LEADERSHIP & ACTIVITIES

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**STEM** (SNU Engineers Honor Society) | College of Engineering, SNU

*Sep 2021 - Present*

Graduated as an Honors Member for exceptional contributions as HR/PR Director and Chairman of SRT 2022.

- **Chairman, Student Round Table (SRT)**: Hosted and organized a successful four-day international conference uniting 50 delegates from 4 Asian countries. Led academic sessions and facilitated cultural exchanges.
- **Speaker, Tech Square Academic Seminar**: Presented on power systems regarding environmental regulations (May 2022) and Social Policy on Technology (Nov 2022).
- **Speaker, Vision Exhibition**: Presented on automatic linkage mechanism design methodology (SBM) to over 100 freshmen and sophomores (Feb 2024).
- **Major Snapshot**: Authored three articles introducing major courses in the ME department, achieving a top-ranked Google search result for the keyword ‘Mechanics’ in Korean with over 10,000 views.
- **Bi-Weekly Academic Seminars**: Regularly discussed recent engineering issues in various fields.

**SENS** (Engineering Education volunteer club) | College of Engineering, SNU

*Mar 2018 - Jul 2019*

- **Executive Roles**: Operated the club as Daily Engineering class chair & vice-president.
- **Gong-Dream Camp**: Hosted 4-day mentoring camp for 120 students 2 times, planned and operated startup contest.
- **Education volunteer work**: Participated in 87.5 hours of engineering education volunteering such as introducing engineer majors or daily engineering class. Demonstrated a strong commitment to education and a passion for teaching.

**Republic of Korea Air Force**, Mandatory Military Service | Republic of Korea

*Aug 2019 - May 2021*

## TEACHING EXPERIENCES

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**Undergraduate Tutor, Calculus** | College of Engineering, SNU

*Jan 2022 - Feb 2022*

**Private Tutor, Mathematics/Physics** | in total 8 students

*Jan 2018 - Feb 2023*

## SKILLS & LANGUAGES

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- **Languages**: Korean (Native), English (Fluent, TOEFL 109), German (Elementary)
- **Programming**: MATLAB/Python (Advanced), C/R (Experienced)
- **Automatic Mechanism Design**: SBM, JBM (Advanced), 3D JBM (Self-Developed)
- **Control Systems**: MPC, Embedded Systems
- **Machine Learning**: Deep Learning (Pytorch, PINN), Meta-learning, Q-learning
- **Robotics**: ROS, Simulation (Pybullet)
- **3D Modeling/Fabrication**: Solidworks (Advanced), 3D Printing/Raspberry Pi/Arduino (Experienced)