Chan-Eui Song

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Research Interest

- Mechanism Design: Mechanism design automation, Applications in Robots with locomotive & low-DOF robots
- Optimization: Control systems, AI-driven mechanical engineering, Optimization theory

Education

Seoul National University (SNU), Seoul, Korea *Mar 2018 - Jun 2025*
- B.S. in Mechanical Engineering, Mathematical Sciences (Double Major)
- GPA: 4.02/4.3 (overall) | 4.15/4.3 (major) | 4.24/4.3 (upper)
- Left for Military Service (Aug 2019 - Mar 2021), Research & Industrial Experience (Jan 2024 - *Present*)

RWTH Aachen University (RWTH), Aachen, Germany *Apr 2023 - Sep 2023*
- Exchange Student in Mechanical Engineering. GPA: 1.0/5.0 (equivalent to 4.0/4.0 CGPA).

Gyeonggi Science High School for the gifted, Suwon, Korea *Mar 2015 - Feb 2018*
- 1 year Accelerated admission through competitive exam on science and mathematics.

Publications and Manuscripts

†: 1st author, *: corresponding author

[1] **C. Song**†, J. Kim, and Y.Y. Kim*, *"Automatic Synthesis of Linkage Mechanism Using SBM (Designed for Real World Constraints: Details to be disclosed upon acceptance)"*, Expected submission in 2024 at *Journal of Mechanical Design*.

[2] **C. Song**†, J. Kim and Y.Y. Kim*, *"A Novel Mechanism Synthesized Using the 3D JBM Model and Topology Optimization"*, Expected submission in 2025 at *Mechanism and Machine Theory*.
(Submission delayed to 2025 due to NDA with Hyundai Motors)

Research & Industrial Experiences

IDeAOcean, Seoul, Republic of Korea
Advisor: Prof. Yoon Young Kim (Department of Mechanical Engineering, SNU) *Sep 2023 - Present*
- Developed a synthesis method using the Spring Block Model (SBM) for 1-DOF mechanisms under real-world constraints. Journal submission in preparation. [1]
- Extended the Joint-element Block Model (JBM) from 2D to 3D, advancing automatic mechanism design beyond previous 2D limits. Journal submission planned for 2025, delayed due to NDA. [2]
- Contributed to METHEUS(AI-driven mechanism design solution) development, won the CES Innovation Award.
- Designed 3 novel linkage mechanisms for automotive applications with Hyundai Motors, patents pending.

Transformative ARchitecture Lab, Department of Mechanical Engineering, SNU
Advisor: Prof. Jin-Kyu Yang *Sep 2023 - Dec 2023*
- Developed origami robot simulator using Pybullet and studied Miura-Ori structure.
- Implemented a 1-DOF configuration solver and explored the possibility of applying reinforcement learning control.

UnRAVeL Group, Institute for Data Science in Mechanical Engineering, RWTH *Apr 2023 - Aug 2023*
- Evaluated MPC performance on STM32H723 by implementing a C++ solver for cart-pole control.

Samsung Electronics, Suwon, Republic of Korea *Jan 2023 – Feb 2023*
- 3D Modeling/Simulation for automation process of detaching cap from compressor using FANUC robot.
- Implemented deep learning using ResNet56 to investigate the DIGIT vision-based tactile sensor.

Innovative Design and Integrated Manufacturing Lab, Department of Mechanical Engineering, SNU
Advisor: Prof. Sung-Hoon Ahn *Jul 2022 - Aug 2022*

- Proposed new image processing algorithm and controlled robot using ROS.
- Generated datasets for 6R robot meta-learning, automating the generation of human manufacturing tasks.

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, comparing results with FEM.
- Implemented Physics-Informed Neural Networks (PINN) for beam deformation analysis, Submitted graduation thesis.

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).
- 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 the Gauss-Bonnet Theorem.

Selected Awards & Honors

Contributed to IDeAOcean's CES 2024 Innovation Award | Consumer Technology Association *Jan 2024*
Academic Merit Scholarship, $11,700 | College of Engineering, SNU *2018 - 2023*
Excellence Award, Mechatronics Contest, $1,200 | SNU *Dec 2023*
Grand Prize, Korean Mathematics Competition | Korean Society of Mathematical Education *Feb 2017*

Leadership & Activities

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 a 4-day international conference with 50 delegates from 4 countries. Led academic sessions and cultural exchanges.
- Tech Square Academic Seminar: Presented on power systems and social policy on technology.
- Bi-Weekly Academic Seminars: Discussed engineering topics with peers regularly.

SENS (Engineering Education volunteer club) | College of Engineering, SNU *Mar 2018 - Jul 2019*

- Led the club by taking executive roles as daily-engineering class chair and vice-president.
- Completed 87.5 hours of engineering education volunteering, including hosting 4-day mentoring camp twice.

Republic of Korea Air Force, Mandatory Military Service | Republic of Korea *Aug 2019 - May 2021*

Teaching Experiences

Undergraduate Tutor, Calculus | College of Engineering, SNU *Jan 2022 - Feb 2022*
Private Tutor, Mathematics/Physics | in total 8 students *Jan 2018 - Feb 2023*
STEM Vision Exhibition, Autonomous Mechanism Design | 100 SNU students *Feb 2024*
STEM Major Snapshot, 3 articles on Mechanical Engineering | over 22,000 views

Skills & Languages

- **Languages**: Korean (Native), English (Fluent, TOEFL 109), German (Elementary)
- **Programming**: MATLAB/Python (Advanced), C/R (Experienced)
- **Technical Expertise**: Automatic Mechanism Design, MPC, Pytorch, CAD, ROS, 3D Printing, Arduino