

# CHANKYO KIM

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## Research Interests

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Planning and Control under Uncertainty, Learning for Human-Mobile System Interaction, Large-scale Optimization for Connected Systems

## Education

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**University of Michigan - Ann Arbor** *MI, USA* Sep. 2022 – Present

- M.S.c, Mechanical Engineering
- Overall GPA - 4.0/4.0

**Seoul National University (SNU)** *Seoul, Republic of Korea* Mar. 2015 – Aug. 2022

- Bachelor of Science, Dept. of Mechanical and Aerospace Engineering
- Interdisciplinary Major in Artificial Intelligence
- Overall GPA - 4.26/4.5, 3rd out of graduating students in the department

**Hansung Science High School** *Seoul, Republic of Korea* Mar. 2013 – Feb. 2015

- Early Graduation with Honors

## Research Experiences

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**Univeristy of Michigan - Ann Arbor** Jan. 2023 – Jun. 2023

Adviser : Prof. Ram Vasudevan

- Developing contact solver in the closed-loop constraint bipedal robot ("Digit").
- Developed new simulation environment and accurate closed-loop constrained robot model for accurate contact calculation (MuJoCo, Matlab to PyBullet)

**Bear Robotics Research Laboratory** March. 2022 – June. 2022

Adviser : Prof. John Ha

- Developed backend graph optimization algorithm for 2D/3D SLAM algorithm with BEV(Bird's Eye View) and LiDAR data to achieve more accurate mapping quality with less mapping effort.

**Visual Information Processing Laboratory, SNU** Aug. 2021 – March. 2022

Adviser : Prof. Joonseok Lee

- Developed modified few-shot learning algorithm of human pose estimation from collected human key point data.
- Generated human pose dataset for domain generalization in various viewpoints, resolution, and luminous intensity.

**Clean Energy and Heat Optimization Laboratory, SNU** Mar. 2021 – Aug. 2021

Advisor: Prof. Sangwook Park

- Designed a new power optimization method using large data set of power generation and management system.
- Wrote paper about optimization in intelligent renewable power

**Biorobotics Laboratory, SNU** Mar. 2020 – Sep. 2020

Advisor: Prof. Kyujin Cho, *Undergraduate Research Internship, UROP*

- Developed wearable master system with novel Tendon-clutching Mechanism and Model Predictive Control.

## Publications

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Published an academic book about basic perception, planning, control for undergraduate students led by PhD with support of MIT and Seoul National University

- **C. Kim**, et al., *Kang.H\**, Introduction of Python and Autonomous Robot System with MIT Race Car, *Hongreung Publishing Company*, 2022. [\[link\]](#)

- **C. Kim**, et al., *Kang.H\**, Introduction of Calculus and Artificial Intelligence wth Advanced Python, *Hongreung Publishing Company*, 2022. [\[link\]](#)
- J.H. Im, **C. Kim**, et al., *Kang.H\**, Introduction of Natural Language Processing and Data Analysis, *Hongreung Publishing Company*, 2022. [\[link\]](#)

Y. Choi, **C. Kim**, Y. Hwang, C. Park, *J.Lee\**, Domain generalization in a few human pose estimation data via meta-learning, Manuscript in preparation. [\[pdf\]](#)

Jung, D. H., **C.K. Kim**, Oh, K. H., Lee, D. H., Kim, M., Shin, J. H., *Son, J.E.\**, Analyses of CO2 Concentration and Balance in a Closed Production System for King Oyster Mushroom and Lettuce., *Horticultural Science and Technology*. [\[link\]](#)

## Projects

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### Noise Adaptive I-EKF Real-Time Semantic Bird's Eye View Mapping

- Train Noise Parameter Adapter in Invariant Extended Kalman Filter (I-EKF) for State Estimation / Use learned I-EKF state estimation with semantic bird's eye view mapping algorithm (MotionNet) to generate Global Bird's Eye View Map
- Advisor : Prof. Maani Ghaffari

### Predictive Trajectory Optimization in Vehicle-to-Vehicle (V2V) Connected Mobile Systems

- Propose advanced intelligent driver model and trajectory optimization in connected mobile systems
- Reduced energy consumption satisfying safety boundary in 4, 6 connected vehicle system
- Advisor : Prof. Gabor Orosz

### Investigation of Policy Optimization Reinforcement Learning Algorithm in Multi-agent Environment

- Designed 4 multi-agent game simulation and analyzed the impact of hyper parameter in PPO, TRPO and compared with Double DQN and Montle Carlo Tree Search model
- Advisor : Prof. Honglak Lee

## graduate courses

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Mobile Robotics	(grade : A)
Connected Vehicles	(grade : A)
Machine Learning CSE	(grade : A)
Mechanical System Modeling and Control	(grade : A+)
Convex Optimization	(grade : A)

## Books

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Full-donation project for next generation student with financial difficulty in South Korea (21 authors).

- **C. Kim**, et al., Why Engineering, *MegaStudy Books*, Jan. 2022. [\[link\]](#)

## Teaching Experiences

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Theory and Lab of IoT, AI, and Big Data, <i>Department of Computer Science</i> , SNU,	Fall. 2021
Advanced Physics, <i>Department of Physics &amp; Astronomy</i> , SNU, <b>Best Teach Award</b>	Fall. 2021
Physics, <i>Department of Physics &amp; Astronomy</i> , SNU	Fall. 2019

## Extra Curricular

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OUTTA (AI Education Foundation) | *Non-Profit Organization for AI education* Mar. 2020 – June. 2022

- Serve as Founder of AI Education Foundation for next generations
- Organize the “The 1st Autonomous Driving Mini Car Coding and Contest” (launched 2021, 2022, 2023)

SNU-XCORPS | *SNU research program* Spring – Fall. 2021

- Research program under National Research Foundation of Korea funded by the Korean government

STEM | *Honor Society of Seoul National University, College of Engineering* Mar. 2020 – June. 2021

- Serve as 10th Vice Chairman

- Research program under National Research Foundation of Korea funded by the Korean government

## Awards and Scholarships

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**Sinyang Eminence Scholarship**, Sinyang Foundation 2020 – 2022

- Full Tuition for Academic Excellence
- Full Tuition for Academic Excellence

**Certificate of Appreciation**, Dean of the College of Engineering, SNU July. 2021

- Acknowledgement of genuine efforts at the forefront of Robotics Education in Korea

**Undergraduate Research Fellowship**, Practical Problem Research Group, Korea July. 2021

- \$7,000/year research fellowship for promising undergraduate students

**2020 Human-Robot Interaction Robot Design Competition**, Seoul National University July. 2020

- The Grand Prize

**Samsung Humantech Paper Award**, Samsung Feb. 2014

- The Bronze Prize

**Korea Mathematical Olympiad**, Korean Mathematical Society 2011

- Silver Medal

**Korea Physics Olympiad**, The Korean Physical Society 2011

- Silver Medal

2021

## Technical Skills

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**Languages** : Python (Advanced) , Matlab (Advanced) , C++ , Solidworks

**Library and Platform (Advanced)** : PyTorch , Physic Engines (PyBullet , MuJoCo) , OpenAI Gym, ROS