

# MICHAEL SEOKYOUNG HAN

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## HIGHLIGHT

A highly multidisciplinary Ph.D. candidate with a strong background in Mechanical Engineering, specializing in robotics. Have a comprehensive understanding of the overall development process with over 10 years of diverse experiences in designing and implementing robotic systems. From intense model-based systems to data-driven machine learning models, have various experiences in the system realization. Eager to take on new challenges and explore innovative concepts making the world better tomorrow.

## EDUCATION

### *Ph.D. Candidate in Mechanical Engineering*

University of Louisville, Louisville, KY, USA

Jan. 2021 - Spring 2024(Exp)

Research Focus : **Soft robotics, Biomimetic system development, Kinematics and dynamics, Human-robot interaction, Manipulation control, Sensor system, Signal processing**

### *M.S. in Mechatronics*

Gwangju Institute of Science and Technology(GIST), Gwangju, Korea

Aug. 2015

Research Focus : Control systems, Robotics

Thesis Title : Development of a Tensegrity Robot and Feedforward Control via Iterative Learning Control Algorithm

### *B.S. in Mechanical and Automotive Engineering*

Kookmin University, Seoul, Korea

Aug. 2013

## AWARDS AND HONORS

**Winner Prize, Hackerthon Pitch Competition**, \$1500, Humana Foundation, USA 2023  
Application for providing correlation between dog's behavior and heart rate

**NSF LaunchIt I-Corp Innovation Award**, \$1600, NSF, USA 2023  
Smart device for dogs

**Graduate Student Travel Award**, University of Louisville, USA 2023, 2021  
IEEE ROBOSOFT, MRS(Materials Research Society) meetings

**Winner Prize, Mechatronics Capstone Project**, GIST, Korea 2014  
Anti-collision system for automobile doors

**Winner Prize, International Micro-Robot Competition**, Japan 2012

**Scholarship, Autonomous Vehicle Robot Competition**, \$1500, Samsung, Korea 2011

**Grade Scholarship Award**, Kookmin University, Korea 2012

## PROFESSIONAL EXPERIENCE

### *Ph.D. Candidate, Research Assistant*

Jan. 2021 - Present

University of Louisville, KY, USA

Funded by NSF

Advisor : Dr. Cindy K. Harnett

- Devised **soft tactile sensor**, which can detect lateral as well as normal force
- Designed **adaptive grasping controller** with an own-developed **optoelectronic soft tactile sensor**

- Constructing **highly-anthropomorphic robotic manipulator** system

*Robotics R&D Engineer*

Aug. 2016 - Apr. 2019

University of Texas Health Science Center(UTHealth), Houston

Spun-off ColubrisMX.Inc, Series A(2017, \$16M), Currently EndoQuest Robotics

Supervisor : Dr. Dongsuk Sin

- Constructed an **automated calibration system** based on a learning control method for verification surgical apparatuses assembly.
- Developed control strategies for **tendon-driven minimally invasive surgical robot** systems. Especially, kinematics of the articulated robot structures and motion validation were the main focus.
- Researched how to bridge a gap between the system model and real hardware to make **high accuracy motion**, which has to do with controlling undesirable movement of robot such as hysteresis, friction, etc.

*Research Associate*

Aug. 2015 - Jul. 2016

Gwangju Institute of Science and Technology(GIST) Funded by Korea Atomic Energy Research Institute

Advisor : Dr. Hyosung Ahn

- Conducted research to identify dynamics of a **tensegrity robot** to maintain its stable posture and make consistent locomotion
- Designed **iterative learning controller** generating improved movement after repetitive motion study

*Research Intern*

Jan. 2012 - Aug. 2013

Kookmin University

- Led an undergraduate team developing an autonomous vehicle robot(**sensor fusion, SLAM algorithm**)

## PUBLICATIONS

### Journal Articles

1. (*Under review*) **Michael S. Han**, Cindy K. Harnett, "Journey from Human Hands to Robot Hands", Bioinspiration & Biomimetics, 2023
2. **Michael S. Han**, Cindy K. Harnett, "Soft, All-Polymer Optoelectronic Tactile Sensor for Stick-Slip Detection", Advanced Materials Technologies, 2022
3. Yoon, S., Cheon, S.Y., Park, S., Lee, D., Lee, Y., **Han, S.**, Kim, M. and Koo, H., "Recent advances in optical imaging through deep tissue: imaging probes and techniques", Biomaterials Research, 2022
4. S. Jin, **S. Han**, "Gain optimization of kinematic control for wire-driven surgical robot with layered joint structure considering actuation velocity bound", The Journal of Korea Robotics Society, 2020
5. S. Jin, S. Lee, J. Lee, **S. Han**, "Kinematic Model and Real-Time Path Generator for a Wire-Driven Surgical Robot Arm with Articulated Joint Structure", Applied Sciences, 2019

### Peer-Reviewed Conference Publications

1. (*Under review*) **Michael S. Han**, J-T. Lin, Cindy K. Harnett, "A Bio-Inspired Robotic Finger Driven and Shape-Sensed by Soft Optical Tendons", RoboSoft IEEE, 2024, San Diego
2. (*Under review*) Paul Bupe, Jr., Yuhao Jiang, J-T. Lin, Tram Nguyen, **Michael S. Han**, Daniel M. Aukes, C. K. Harnett, "Embedded Optical Waveguide Sensors for Dynamic Behavior Monitoring in Twisted-Beam Structures", RoboSoft IEEE, 2024, San Diego
3. Christopher J. Kimmer, **Michael S. Han**, Cindy K. Harnett, "Strained Elastic Surfaces with Adjustable-Modulus Edges (SESAMEs) for Soft Robotic Actuation", ICRA IEEE, 2023, London
4. **Michael S. Han**, Dan O. Popa, Cindy K. Harnett, "Anti-Slipping Adaptive Grasping Control with a Novel Optoelectronic Soft Sensor", RoboSoft IEEE, 2023, Singapore
5. **S. Han**, K. Jeong, H. Ahn, "Iterative Learning Control for Trajectory Tracking of Tensegrity Robot", Control Automation Robotics & Vision on IEEE, 2014

### Conference Extended Abstracts and Posters

1. **Michael S. Han**, “Measurement of Lateral Force and Slipping Based on Optical Fiber Mechanism”, Materials Research Society, 2021 Fall

### Patents

1. (*pending*) **Michael S. Han**, Cindy K. Harnett, “Optoelectronic Soft Tactile Sensor for a Stick-Slip Control”, US Patent Application No.18/220,443, Filed Jul. 2023
2. **S. Han**, T. JANG, D. Kim, H. KIM, J. LEE, K. Nam, Y. Park, D. Shin, “End effector and end effector drive apparatus”, AU2020210173B2, application date Jun. 2017
3. T. JANG, D. Kim, H. KIM, J. LEE, K. Nam, Y. Park, D. Shin, **S. Han**, “Surgical apparatus”, EP3799822A1, application date Dec. 2017

### PROFESSIONAL SKILLS

Matlab, Simulink, Python, NI Labview, Solidworks, 3D Printing, Comsol, C/C++, Github, ROS