

# Jeonghwan Lee

MECHANICAL ENGINEERING · REHABILITATION ENGINEERING · ROBOTICS

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## Education.

### The University of Texas at Austin

Austin, TX

PH.D. CANDIDATE IN MECHANICAL ENGINEERING

Sept 2017 - present

Graduate Research Assistant / Advisor: Dr. James Sulzer

### Seoul National University

Seoul, South Korea

M.S. IN MECHANICAL ENGINEERING

Feb 2017

Graduate Research Assistant / Advisor: Dr. Kunwoo Lee

### Hanyang University

Seoul, South Korea

B.S. IN MECHANICAL ENGINEERING

Feb 2013

## Professional Appointments / Employment.

### System Validation Engineer

Austin, TX

HARMONIC BIONICS, INC.

Summer 2018 & 2019

- Developed an EtherCAT based DAQ systems and motor driver
- Conducted quality control on the developed electro-mechanical systems

### Research Assistant

Seoul, South Korea

KOREA INSTITUTE OF SCIENCE AND TECHNOLOGY

Mar 2017 - July 2017

- Developed a 3D integrated surgical simulator for orbital reconstructive surgery

### Research Assistant

Houston, TX

THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT HOUSTON

Sept 2014 - Feb 2016

- Developed a minimally invasive surgical robot system for brain and fetal surgery

## Publications.

### Kinematic comparison of single degree-of-freedom robotic gait trainers

LEE, J., LI, L., SHIN, S.Y., DESHPANDE, A., SULZER, J.

2021

Mechanism and Machine Theory, 159, p.104258..

### Practical bending-angle calculation for an automated surgical plate bending apparatus

PARK, S. M., LEE, J., PARK, S., LEE, J. W., PARK, M., KIM, Y., AND NOH, G.

2020

Journal of Mechanical Science and Technology, 34(5), 2101-2109.

### A novel approach to predicting human ingress motion using an artificial neural network.

KIM, Y., CHOI, E.S., SEO, J., CHOI, W.S., LEE, J., AND LEE, K.

2019

Journal of biomechanics, 84, pp.27-35.

### A Novel Noninvasive Patient-Specific Navigation Method for Orbital Reconstructive Surgery: A Phantom Study Using Patient Data.

LEE, J., MEKURIA, K., SON, T.G., JEONG, W.S., CHOI, J.W., AND KIM, Y.

2019

Plastic and reconstructive surgery, 143(3), pp.602e-612e.

### **Three-dimensional orbital wall modeling using paranasal sinus segmentation.**

KIM, H., SON, T.G., LEE, J., KIM, H.A., CHO, H., JEONG, W.S., CHOI, J.W., AND KIM, Y.

2019

Journal of Cranio-Maxillofacial Surgery, 47(6), pp.959-967.

### **A novel motorized bending apparatus for surgical plates.**

PARK, S., LEE, J., PARK, S.M., NOH, G., LEE, J.W., PARK, M.S., AND KIM, Y.

2019

Journal of Mechanical Science and Technology, 33(8), pp.3743-3748.

## **Refereed Conference Papers.**

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### **Sensitivity comparison of inertial to optical motion capture during gait: implications for tracking recovery.**

LEE, J., SHIN, S.Y., GHORPADE, G., AKBAS, T. AND SULZER, J.

2019

In 2019 IEEE 16th International Conference on Rehabilitation Robotics (ICORR) (pp. 139-144). IEEE.

## **Conference Presentations.**

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\*oral presentation/ \*\*poster presentation

### **Sensitivity comparison of inertial to optical motion capture during gait: implications for tracking recovery\*\***

*Toronto, Canada*

LEE, J., SHIN, S.Y., GHORPADE, G., AKBAS, T. AND SULZER, J.

*June 24-28, 2019*

In 2019 IEEE 16th International Conference on Rehabilitation Robotics (ICORR)

### **Computational Model to Steer Super Elastic Needle for an MRI Guided Breast Intervention Robot\***

*Barcelona, Spain*

LEE, J., PARK, S.B., LEE, K. AND JO, Y.H.

*June 20-24, 2017*

Computer Assisted Radiology and Surgery (CARS) 31st International Congress and Exhibition

### **Efficient registration methods between 2D X-ray and 3D CT data of different parts of human skeleton\***

*Jeju, South Korea*

WOO, S., LEE, J., KIM, Y. AND LEE, K.

*Oct 26-28, 2016*

Asian Conference on Design and Digital Engineering (ACDDE) 2016

## **Research Project Experience.**

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### **Optimize hip-knee exoskeletal assistance for post-stroke individuals**

THE UNIVERSITY OF TEXAS AT AUSTIN, AUSTIN, TX

*Fall 2020 - Present*

- Design a hip-knee exoskeleton device
- Develop a musculoskeletal simulation frameworks to optimize exoskeletal assistance while avoiding a spastic response

### **Characterization of a stiff-knee gait (SKG) after neurological impairment**

THE UNIVERSITY OF TEXAS AT AUSTIN, AUSTIN, TX

*Fall 2020 - Present*

- Characterize a stiff-knee gait (SKG) by machine learning

### **Development an affordable, individual-specific robotic gait trainer for people with neurological injury**

THE UNIVERSITY OF TEXAS AT AUSTIN, AUSTIN, TX

*Sept 2017 - Spring 2019*

- Developed an affordable robotic gait trainer by 1DOF linkage mechanism
- Developed and evaluated mechanism synthesis methodology

### Development of an 3D integrated system for cranio-maxillofacial surgery

KOREA INSTITUTE OF SCIENCE AND TECHNOLOGY, SEOUL, SOUTH KOREA

Mar 2017 - July 2017

- Evaluated a 3D integrated surgical tool navigation method for orbital reconstructive surgery
- Developed 3D orbital wall modeling method by paranasal sinus segmentation
- Designed a motorized mandibular reconstruction plate bender machine

### Development of an MR image-guided breast needle intervention robot system

NATIONAL CANCER CENTER, GYEONGGI-DO, SOUTH KOREA

Mar 2016 - Feb 2017

- Developed a localization method of a flexible breast intervention needle by MR image-guided robot

### Development of the human ingress/egress motion simulator by using a parametric human model to estimate damages on a vehicle interior material

HYUNDAI MOTOR COMPANY, GYEONGGI-DO, SOUTH KOREA

Mar 2016 - Feb 2017

- Developed neural network based dynamic motion generation algorithm for vehicle ingress and egress motion
- Designed the vehicle mock-up

### Development of a minimally invasive surgical robot system for brain and fetal surgery

THE UNIVERSITY OF TEXAS HEALTH SCIENCE CENTER AT HOUSTON, HOUSTON, TX

Sept 2014 - Feb 2016

- Designed a surgical end-effector of the robot system
- Designed a modular manipulator unit

### Development of 2D X-ray image to 3D CT image registration for surgical navigation system

HYUNDAI HEAVY INDUSTRY, GYEONGGI-DO, SOUTH KOREA

Sept 2013 - Aug 2014

- Developed 2D and 3D medical image registration method for robotic TKA surgery
- Developed C-arm X-ray equipment calibration method

## Teaching Experience.

### Introduction to Robot Modeling and Control (ME397)

TEACHING ASSISTANT, (DR. JAMES SULZER), THE UNIVERSITY OF TEXAS AT AUSTIN

Austin, TX

Spring 2021

### Mechatronics (ME340)

TEACHING ASSISTANT, (DR. FARSHID ALAMBEIGI), THE UNIVERSITY OF TEXAS AT AUSTIN

Austin, TX

Fall 2019

### Mechatronics Laboratory (ME140L)

TEACHING ASSISTANT, (DR. GLENN MASADA & DR. THOMAS CONNOLLY), THE UNIVERSITY OF TEXAS AT AUSTIN

Austin, TX

Fall 2018, Spring 2019, and Spring 2020

### Freshman Introduction to Research in Engineering (FIRE) program

GRADUATE STUDENT MENTOR, THE UNIVERSITY OF TEXAS AT AUSTIN

Austin, TX

Fall 2018 and Fall 2019

## Patents.

2017    **Automatic bending apparatus for surgical plate**, Application No: K09263

South Korea

## Honors / Awards / Fellowships.

2014    **GenDepot Poster Award**, Korean-American Scientists and Engineers Association

Houston, TX

2014    **Participation Award (4th place)**, CAD/CAM Software Contest

Seoul, South Korea

2014    **Merit-based Scholarship**, Seoul National University

Seoul, South Korea

2014    **Brain Korea 21 Plus**, Seoul National University

Seoul, South Korea

2011    **Academic Scholarship**, Hanyang University

Seoul, South Korea

## Technical Skills.

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**Programming** C/C++, C#, Python, MATLAB, Mathematica, ROS, R Statistics

**Design Tools** Solidworks, SolidEDGE, EAGLE

**Engineering Tools** OpenSim, Simulink, LabView

**Languages** English, Korean

## Extracurricular Activity.

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### Military Service

REPUBLIC OF KOREA AIR FORCE

- Sergeant
- Administrative Clerk

*South Korea*

*Sept 2006 - Nov 2008*