

# MYUNGIN LEE

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## Research Interests

### Multi-modal Instrument Design using Signal Processing and Machine Learning

A researcher designing multi-modal instrument based on scientific theory, composition, signal processing & machine learning, and gestural interface. Skills: C/C++, Python, MATLAB with proficiency for research

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## Education

### University of California, Santa Barbara, Ph.D. Candidate, Media Arts and Technology, United States

September 2017 – Expected at December 2022

### Hanyang University, M.Sc. in Electronics and Computer Engineering, Seoul, Korea

March 2015 – February 2017

### Hanyang University, B.Sc. in Electronics and Computer Engineering, Seoul, Korea

March 2008 – February 2015

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## Work Experience

### Nokia Bell Labs. Experiments in Art & Technology (E.A.T.), New Jersey, United States

June 2020 – August 2020

Summer Internship

### Republic of Korea Air Force, 3<sup>rd</sup> Training Wing Group, Korea

January 2010 – February 2012

Central administrative clerk (Mandatory military service)

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## Research Experience

### Graduate Student Researcher [Ph.D. Candidate]

September 2017 – Present

#### AlloSphere Research Group in Media Arts and Technology, University of California, Santa Barbara, US

- Advisor: Prof. JoAnn Kuchera-Morin, Prof. Curtis Roads, & Prof. Misha Sra

- **A Multi-modal, multi-User interactive instrument in 3D space using the smartphone for gesture control:**

- Developing real-time audio-visual instruments for composition using scientific theories: Gravity and Quantum physics.
- Developed gesture-based smartphone 3D interface using signal processing and machine learning.

- **TINC (Toolkit for Interactive Computation)**

- The Toolkit for Interactive Computation (TINC) provides a set of C++ and python classes to assist in the interactive exploration of large datasets by managing parameter spaces, interactive computation and caching of data (<https://github.com/AlloSphere-Research-Group/tinc>)

- Collaborating with simulation material scientists in UCSB

- *National Science Foundation Grant No. 2004693:*

- Elements: Cyber-infrastructure for Interactive Computation and Display of Materials Datasets*

- **The AlloSphere & AlloLib:**

The *AlloSphere* is a three-story full-surround, multimodal, immersive facility in the Media Arts and Technology at the University of California, Santa Barbara to represent large and complex data, including immersive visualization, sonification, and interactivity. *AlloLib* is a cross-platform suite of C++ components for building interactive multimedia tools and applications.

- Participating the development of the system (<https://github.com/AlloSphere-Research-Group/allolib>)

- **Music source conducting based on gestural control using machine learning:**

Music interaction with gesture recognition of conducting gestures using controllers with gestural sensors

- Developed and performed machine learning and signal processing based music interaction system

### Graduate Student Researcher [Master's]

March 2015 – February 2017

#### Acoustic, Speech Signal Processing and Machine Learning Lab., Hanyang University, Seoul, Korea

- Website: <https://dsp.hanyang.ac.kr> - Advisor: Prof. Joon-Hyuk Chang

- **Reverberation time estimation using machine learning:**

Obtaining room acoustic information from sound sources received by microphones.

- Conducted an study with single & multi-channel based algorithm using deep neural network.
- Developed an estimation algorithm for dereverberation and acoustic model.
- Contributed distributive research with *LG electronics*.

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## ● Machine learning

- Performed experiments on the application of various machine learning techniques with *Pytorch*, *Tensorflow*, *Python*, *Kaldi*, and *MATLAB*
- Applications: reverberation time estimation, acoustic models, jointly trained neural network, bandwidth expansion, and gesture interpretation.
- Contributed distributive research with *Samsung electronics*.

## ● Crosstalk cancellation: Reproducing audio to utilize binaural audio signals with two loudspeakers by offsetting the crosstalk components

- Developed crosstalk cancellation algorithms based on HRTF with low sensitivity.
- Exclusively participated a national project; Information Technology Research Centre: Center for Ultra Realistic Audio Technologies (*ITRC: CURAT*)

## ● Multi-channel audio spatialization: Synthesis of audio signals with directivity using multiple loudspeakers.

- Developed an adaptive multi-channel audio spatialization algorithm (*MATLAB*)

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## Publications & Patents

### Publications

- **Myungin Lee**, "Entangled: A Multi-Modal, Multi-User Interactive Instrument in Virtual 3D Space Using the Smartphone for Gesture Control," *New Interfaces for Musical Expression (NIME'21)*, Jun., 2021.
- **Myungin Lee**, "A Multi-User Interactive Instrument in the 3D Space Using the Gesture of Smartphones," *Korea Electro-Acoustic Music Society's Annual Conference (KEAMSAC)*, Oct., 2019
- **Myungin Lee**, "Deep neural network based music source conducting system," *International Computer Music Conference (ICMC)*, Aug., 2018.
- **Myungin Lee**, Joon-Hyuk Chang, "Deep neural network based blind estimation of reverberation time based on multi-channel microphones," *Acta Acustica united with Acustica*, May, 2018.
- **Myungin Lee**, Joon-Hyuk Chang, "Blind Estimation of Reverberation Time on Multi-Channel Microphone using Deep Neural Network," Master's thesis, Feb, 2017.
- **Myungin Lee**, Joon-Hyuk Chang, "Blind Estimation of Reverberation Time using Deep Neural Network," *IEEE International Conference on Network Infrastructure and Digital Content (IC-NIDC)*, Sep., 2016.
- Jeehye Lee, **Myungin Lee**, Joon-Hyuk Chang, "Ensemble of Jointly Trained Deep Neural Network-Based Acoustic Models for Reverberant Speech Recognition," *arXiv:1608.04983*, 2016.

### Reviewer for international conferences

- International Computer Music Conference (*ICMC*) 2019

### Patents

- Multichannel Microphone-based Reverberation Time Estimation Method and Device which use Deep Neural Network Technical Field, US Patent: US10854218B2, 2017.
- Multi-Channel Microphone based Reverberation Time Estimation using Deep Neural Network, Korea Patent: KR101871604B1, 2016.

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## Teaching Experience

### - University of California Santa Barbara, USA

- Teaching Assistant, MAT240B Digital Audio Programming Winter 2021
- Teaching Assistant, MAT240C Digital Audio Programming Fall 2021
- Teaching Assistant, MUS 209IA & MAT 276IA - Direct Digital Synthesis - Processing and Composition Spring 2020
- Teaching Assistant, MUS 209IA & MAT 276IA - Direct Digital Synthesis - Processing and Composition Spring 2019
- Teaching Assistant, MAT240A Digital Audio Programming Spring 2019

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## Performance and Exhibitions

- June 2019, Art installation, "A Multi-User Interactive Instrument in the 3D Space Using the Gesture of Smartphones," the MAT 2019 End of Year Show: MADE [at] UCSB, the California NanoSystems Institute, UCSB, Santa Barbara, USA
  - April 2019, CREATE Ensemble Performance, "Ballet Mécanique (2019)," at Lotte Lehmann Concert Hall, UCSB, Santa Barbara, USA
  - August 2018, Art installation, "Deep neural network based music source conducting system," International Computer Music Conference (ICMC), Daegu, Korea.
  - June 2018, Art installation, "Deep neural network based music source conducting system," the MAT 2018 End of Year Show: Invisible Machine, the California NanoSystems Institute, UCSB, Santa Barbara, USA
  - June 2018, CREATE Ensemble Performance, "Loading (2018)," at SBCAST, Santa Barbara, USA
  - May 2018, CREATE Ensemble Performance, "Loading (2018)," at Lotte Lehmann Concert Hall, UCSB, Santa Barbara, USA
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## Awards & Grants

- National Science Foundation Grant No. 2004693:
  - Elements: Cyber-infrastructure for Interactive Computation and Display of Materials Datasets 2021 –
- Graduate Student Researcher in the AlloSphere Research Group 2018 –
- *Signal Intelligence Research Center (SIRC)* Fellowship, Defense Acquisition Program Administration 2015 – 2016
  - A study on technique of distinguishing voice for voice recovery
- *Brain Korea 21 Plus (BK 21 Plus)* Scholarship, National Research Foundation of Korea 2015 - 2016
- *Advanced Research Center Program* Fellowship, National Research Foundation of Korea 2015 - 2016
  - Development of Core Technologies for High-Performance Speech Processing in Future Wearable Devices
- *Nano-Material Technology Development Program* Fellowship, National Research Foundation of Korea 2015 - 2016
  - Development of signal processing technique based on Biomimetic tactile sensor for texture perception
- Gold Award in the Department of Electronic Engineering's Graduation Competition 2014
  - Adaptive multi-channel audio spatialization