

MYUNGIN LEE

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Research Interests

Multi-modal Instrument Design using Signal Processing and Machine Learning

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

Education

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

September 2017 – Expected at June 2023

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

- "Blind Estimation of Reverberation Time on Multi-Channel Microphone using Deep Neural Network"

March 2015 – February 2017

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

March 2008 – February 2015

Work Experience

Nokia Bell Labs. Experiments in Art & Technology (E.A.T.)

Summer Internship

June 2020 – August 2020

Republic of Korea Air Force, 3rd Training Wing Group

Central administrative clerk (Mandatory military service)

January 2010 – February 2012

Teaching Experience

Teaching Associate (UCSB)

Fall 2022. MUS 109IA - Direct Digital Synthesis - Processing and Composition

(Instructor: Myungin Lee)

Spring 2022. MUS 109IA - Direct Digital Synthesis - Processing and Composition

(Instructor: Myungin Lee)

Teaching Assistant (UCSB)

Winter 2021. MAT240B - Digital Audio Programming: The Series

(Instructor: Dr. Karl Yerkes)

Fall 2020. MAT 240C - Digital Audio Programming: The Series

(Instructor: Dr. Karl Yerkes)

Spring 2020. MAT 276IA - Direct Digital Synthesis - Processing and Composition

(Instructor: Prof. JoAnn Kuchera-Morin)

Spring 2019. MAT 276IA - Direct Digital Synthesis - Processing and Composition

(Instructor: Prof. JoAnn Kuchera-Morin)

Spring 2019. MAT 240A - Digital Audio Programming: The Series

(Instructor: Dr. Karl Yerkes)

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

- **Sensorium (World Ocean project)**

- A work of art and of science that sets out to synthesize the survival problems that the world ocean faces in our emerging heat shocked future.

- Inspired by the late Eco-Art Pioneer, Emeritus Professor Newton Harrison (UCSD) & Research Professor (UCSC) and conceived by the Center for the Study of the Force Majeure, based at the University of California, Santa Cruz.

- Premiere in Getty's Pacific Standard Time 2024 exhibition

- **SARS-CoV-2 virus data simulation**

- Collaboration with bio-scientists at Johannes Kepler University, Linz, Austria.

- Developed real-time audio-visual simulation based on atomic force microscope data (AFM) and virus behavior for the art installation. Premiered in Ars Electronica Festival 2022.

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

- Developed gesture-based smartphone 3D interface using signal processing and machine learning (*NIME2021*).

- Developed Newtonian physics-based audiovisual & gestural instruments for multiple users

- Developed audiovisual & gestural granular synthesizer (*ACM SIGGRAPH SPARK 2022*)

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● 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
- Collaboration with computational material scientists at the UC Santa Barbara
- Participating in the development and maintenance of the system (<https://github.com/AlloSphere-Research-Group/tinc>)

● 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 in the development and maintenance 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 study]

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 networks.
- Developed an estimation algorithm for dereverberation and acoustic model.
- Contributed to distributive research with *LG electronics*.

● 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 to distributive research with *Samsung electronics*.

● Crosstalk cancellation

- Reproduce 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 in 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.

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Reviewing Experience

- *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.

Invited Talk

- December 2022, ACM SIGGRAPH Digital Art Community SPARKS: New Media Architecture(s): A Speculative Vision of Change in the Arts, Design, & Sciences, Online.
 - January 2020, AR Interaction/Interface for CS291A Future User Interfaces. UCSB, Santa Barbara, USA
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Performance and Exhibitions

- September 2022, Exhibition, "*Coexistence with the SARS-CoV-2 virus*," Ars Electronica Festival, Linz, Austria
 - May 2022, Audiovisual Concert, "*AlloLib Audiovisual Concert*," SYMADES 2022, the California NanoSystems Institute, UCSB, Santa Barbara, USA
 - 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 & Fellowships

- Graduate Student Researcher in the AlloSphere Research Group 2019 – 2023
- National Science Foundation Grant No. 2004693: 2021 – 2022
 - *Elements: Cyber-infrastructure for Interactive Computation and Display of Materials Datasets*
- *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
- 2nd Award in the Department of Electronic Engineering's Graduation Competition 2014
 - Adaptive multi-channel audio spatialization