

# MYUNGIN LEE

◇ Santa Barbara, CA ◇ myunginlee@mat.ucsb.edu ◇ <http://www.myunginlee.com> ◇ +1-805-200-6440

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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

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## 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

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## Work Experience

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

Summer Internship

June 2020 – August 2020

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

Central administrative clerk (Mandatory military service)

January 2010 – February 2012

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## Teaching Experience

### Teaching

Fall 2022. MUS109IA+MUS209IA+MAT276IA: Direct Digital Synthesis - Processing and Composition (Instructor: Myungin Lee)

Winter 2022. MUS109IA+MUS209IA+MAT276IA: Direct Digital Synthesis - Processing and Composition (Instructor: Myungin Lee)

### Teaching Assistant

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)

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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

- **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 Pacific Standard Time (PST) 2024 exhibition by the Getty Foundation

- **Coexistence with the SARS-CoV-2 virus**

- 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 (up to 14 people)

- 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 (<https://github.com/AlloSphere-Research-Group/tinc>)
- Developed interactive Monte Carlo simulation and quantum computation
- Collaboration with computational material scientists at UC Santa Barbara

- **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 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.

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**Internship** [Ph.D. Summer Internship]

**June 2020 – August 2020**  
**Nokia Bell Labs, Murray Hill, New Jersey, US**

- **Experiments in Art & Technology (E.A.T.)**

Spatial-Acoustic parameter estimation research and implementation

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**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 a study with single & multi-channel-based algorithms using deep neural networks.
- Developed an estimation algorithm for dereverberation and acoustic models.
- 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:**

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 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.
- **Myungin Lee**, Joon-Hyuk Chang, "A study of room acoustics estimation using neural network," *Korea Speech Communication and Signal Processing*, The Acoustical Society of Korea, pp. 30, August, 2016.
- Tae-jun Park, Bong-Ki Lee, **Myungin Lee**, Joon-Hyuk Chang, "Integrated acoustic echo and background noise suppression based on data-driven method, *Korea Speech Communication and Signal Processing*, The Acoustical Society of Korea, Vol. 32, No. 1, pp. 145-146, August, 2015.
- Songkyu Park, Jihwan Park, **Myungin Lee**, Joon-Hyuk Chang, "A study of speech enhancement using microphone array structure," *Korea Speech Communication and Signal Processing*, The Acoustical Society of Korea, Vol. 32, No. 1, pp. 153-155, August, 2015.
- **Myungin Lee**, Jihwan Park, Songkyu Park, Joon-Hyuk Chang, "A study of crosstalk cancellation efficiency in reverberant environment," *Korea Speech Communication and Signal Processing*, The Acoustical Society of Korea, Vol. 32, No. 1, pp. 167-169, August, 2015.

### 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

- (Scheduled) August 2024, Exhibition, "Sensorium: The Voice of the World Ocean," PST 2024 Getty Biennale, Irvine, USA
- (Scheduled) June 2023, Audiovisual concert (Tech Support), Premiere of "Man in the Mangroves" by James Andy Moorer, AlloSphere, UCSB, Santa Barbara, USA
- (Ongoing) 2019 – 2023, Regular Demonstration, AlloSphere Contents (*Hydrogen-like atoms, Artificial Nature, Sensorium, Entangled, The Last Whisper, Musics of the Sphere*, etc.), AlloSphere, UCSB, Santa Barbara, USA
- February 2023, Exhibition, "Coexistence with the SARS-CoV-2 virus," Santa Barbara Center for Art, Science and Technology (SBCAST), Santa Barbara, USA
- October 2022, Spatial audio concert (Tech Support), Premiere of "Musics of the Sphere" by Dr. Robert Morris, AlloSphere, UCSB, Santa Barbara, USA
- September 2022, Exhibition, "Coexistence with the SARS-CoV-2 virus," Ars Electronica Festival, Linz, Austria
- May 2022, Audiovisual Concert (Direction), "AlloLib Audiovisual Concert," SYMADES 2022, the California NanoSystems Institute, UCSB, Santa Barbara, USA
- April 2022, 360 Video Exhibition, "Last Whispers" by Lena Herzog, AlloSphere, 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 Research Fellowship in the AlloSphere Research Group 2018 – 2023
- National Science Foundation Grant No. 2004693: 2021 – 2023
  - *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