

NOLAN LEM  
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## EDUCATION

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- Ph.D. in Computer-Based Music Theory and Acoustics** *December 2022*  
*Stanford University, Stanford, CA*  
Dissertation: “Synchronous Sound: Strategies for Collective Sound Generation and Diffusion”
- Postdoctoral Faculty**, Institute for Culture, Cognition, and Computation - Interacting Minds Group *2026 - present*  
*Aalborg University, Aalborg, DE*
- Postdoctoral Research Fellow**, Department of Applied Acoustics *2023 - 2025*  
*Chalmers Institute of Technology, Gothenburg, SE*
- M.F.A. in Sound Art** *May 2015*  
*Columbia University, New York, NY*
- B.S. in Electrical & Computer Engineering** *May 2013*  
*University of Kansas, Lawrence, KS*
- B.M. in Studio Music and Jazz Saxophone** *May 2008*  
*University of Miami, Miami, FL*

## SELECTED EXHIBITIONS AND PERFORMANCES

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- 2025 *Third Stream*. Installation. Galleri Box. Gothenburg, Sweden.
- 2025 “*Babbling Brook*”. Commission. Zagreb Biennale and SPOR Festival. Zagreb, Croatia and Aarhus, Denmark
- 2024 “*Double Blind*”. Installation. Goethe Institute. Stockholm, Sweden.
- 2024 “*Fugue State*”. Sculpture. Oven På Kunstgalleri. Copenhagen, Denmark.
- 2024 “*En Masse*”. Installation. Volvofoajén Konstgalleri. Gothenburg, Sweden.
- 2023 “*Lost - Far From Home*” Group Exhibition. Riises Landsted. Copenhagen, Denmark.
- 2022 “*Surface Song*” Solo Exhibition. Eks Rummet Gallery. Copenhagen, Denmark.
- 2021 “*Autonomous Sense Object*”. London Fetish Film Festival, London, UK.
- 2020 “*In Praise of Idleness*” Solo Exhibition. Galerija Alkatraz, Ljubljana, Slovenia.
- 2020 “*Engine Errors / Self-portrait*” ICCC. Coimbra, Portugal
- 2019 “*Menagerie*” Solo Exhibition. Danish National Museum of Music. Copenhagen, Denmark.
- 2019 “*Tout ce qu'on a construit*” Group show. Vermont Studio Center. Johnson, Vermont.
- 2019 “*Kuramoto Cycles*” *Sound Happenings* Group show. Cantor Arts Museum, Stanford, CA. USA
- 2018 “*Scratch*” / “*Noise Ordinance*” *Escuchar*. Group show. Museum of Modern Art Buenos Aires (MAMBA), Buenos Aires, Argentina.
- 2018 “*Tentacule*” / “*Activation*” *Bruire*. Two person show. LHOSTE ART CONTEMPORAIN, Arles, France
- 2017 “*INVISIBLE CHOIRS*” Solo Exhibition. Pro Arts Gallery, Oakland, California. USA
- 2017 “*Autonomous Sense Object*” Group Exhibition. Morley Gallery, London, UK.
- 2016 “*Neural Ordinance*” PIONEER WORKS, Brooklyn, NYC. USA
- 2016 “*BANDSWIDTH*” *home*. Group show. Pro Arts Gallery, Oakland, CA. USA
- 2016 “*HiveForm*” *Flux Art Fair*. Group show. Harlem, NYC. USA
- 2015 “*Hivemind*” *Amplitudes*. Group show. PIONEER WORKS. Brooklyn, NYC. Permanent Collection
- 2014 “*Dice Roll*” / “*Push-pull*” Group show. Wallach Gallery. New York, NYC. USA
- 2014 “*Seismodome*” Hayden Planetarium at the American Museum of Natural History. New York, NYC.
- 2012 “*Metabach encapsulate no.2*” *Cryptograph: An Exhibition for Alan Turing* Group Show, Spencer Museum of Art. Lawrence, KS.
- 2012 “*Mutatis Mutandis*” *New Interfaces for Musical Expression Conference*. Ann Arbor, MI. USA

## PUBLICATIONS AND CONFERENCE HISTORY

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Please see [www.nolanlem.com/research.html](http://www.nolanlem.com/research.html) for links to documents

- “Exploring the Emergence of Beat Induction using a ‘Swarm of Onsets’ Generative Model”*. The Neurosciences and Music Conference, Helsinki, Finland 2024
- “Individual differences of limitation to extract beat from Kuramoto coupled oscillators: Transition from beat-based tapping to frequent tapping with weaker coupling”*. PLOS ONE 2023
- “Introducing the Collective Rhythms Toolkit”*. Sound and Music Computing Conference, Stockholm, SE 2023
- “Constructive Accumulation: A Look at Self-Organizing Strategies for Aggregating Temporal Events along the Rhythm Timbre Continuum”*. Sound and Music Computing Conference, Saint Etienne, France 2022
- “Beat Perception in the Swarm: a look at tapping synchronization strategies using coupled metronomes”*. Neurosciences and Music VII: Connecting Music across the Lifespan, Aarhus, Denmark 2021
- “Extracting Beat from a crowd of coupled metronomes: effects of coupling strength and timbre on tapping synchronization”*. Intl. Conference on Music Perception and Cognition, Sheffield, UK 2021
- “Menagerie: exploring the audio-visual rhythms of violence through data, triggers, and swarms”*. Proceedings of the Sound and Music Computing Conference (SMC), Torino, Italy 2020
- “Art and AI: ‘Engine Errors / self-portrait’”*. International Conference on Computational Creativity (ICCC), Coimbra, Portugal 2020
- “Extracting beat from a crowd of loosely coupled, concurrent periodic stimuli”*. Acoustical Society of America (ASA), San Diego, CA 2019
- “Extracting beat from a crowd of loosely coupled, concurrent periodic stimuli”*. The Predictive Brain Conference, Marseilles, France 2019
- “Kuroscillator: A Max-MSP Object for Sound Synthesis using Coupled-Oscillator Networks”*. 14th International Symposium on Computer Music Multidisciplinary Research, Marseilles, France 2019
- “Sound in Multiples: Synchrony and Interaction Design using Coupled-Oscillator Networks”*. Sound and Music Computing Conference (SMC), Málaga, Spain 2019
- “Art and AI”*. Artificial Intelligence (AI) Salon, Computer Science Department, Stanford, CA 2019
- Keynote Speaker*. Symposium on Art and Technology, UTEC (Universidad Tecnológica del Uruguay), Montevideo, Uruguay 2019
- ‘An Adaptive Model of Pulse in Jazz Percussion: Rhythmic Generation in Quasi-periodic Musical Contexts using Sequence-to-Sequence Learning’*. Stanford Computer Science Department, Stanford, CA 2018
- ‘SeismoDome: Sonic and visual representation of earthquakes and seismic waves in the planetarium’*. American Geophysical Union, New Orleans, LA 2017
- “A Generative Model of Pulse Percept: Analyzing Performances of Jazz Drumming using Dynamic Beat Tracking and Recurrent Neural Networks”*. Stanford Deep Learning Seminar, Stanford, CA 2017
- “Head Tracking Binaural Localization System for Horizontal Sound Source Detection”*. Center for Computer Research in Music and Acoustics (CCRMA) Salon, Stanford, CA 2016
- “Velcro as a sensory interface and erotic material”*. ‘Politics of the Machine: Art and After’ Conference, Copenhagen, Denmark 2017
- “Swarm Theory and Sonic Emergence: Swarm and Drone”*. DorkBot Conference, Columbia University, NYC, NY 2014
- “Mutatis Mutandis: Sonification of Ice-Core Data”*. New Interfaces for Musical Expression (NIME) Conference, University of Michigan, Ann Arbor, MI 2011
- “Sound in Data: Perceiving Climate Change”*. Keynote Speaker, Undergraduate Research Symposium, University of Kansas, Lawrence, KS 2010
- “On Notational Interfaces for Free Jazz”*. Maynooth Music Composition, Maynooth, Ireland 2009
- “International Association of Jazz Educators (IAJE)”*. Representative, Lucerne, Switzerland 2008

## TEACHING EXPERIENCE

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- Introduction to Acoustics and Psychoacoustics**, *Aalborg University* 2026
- Taught introductory course covering the fundamentals of sound physics, digital audio formats and MIDI, human auditory perception and the physiology of hearing, room acoustics, and the physics of sound and music. The course provided students with an interdisciplinary foundation spanning physical acoustics, psychoacoustics, and digital audio technology.
- Music Signal Processing**, *Stanford University* 2018
- Taught fundamentals of digital audio signal processing, including sinusoids, spectra, Discrete Fourier Transform (DFT), digital filters, z transforms, transfer-function analysis, and basic Fourier analysis.
  - Conducted in-class demonstrations using Matlab.
  - Assigned and evaluated homework and lab assignments focused on digital signal processing concepts.
- Music, Mind, and Human Behavior**, *Stanford University* 2018
- Conducted an introductory exploration of why music is a pervasive and fundamental aspect of human existence.
  - Introduced aspects of music perception and cognition, as well as anthropological and cultural considerations.
- Fundamentals of Computer-Generated Sound**, *Stanford University* 2017
- Assisted students in basic digital signal processing for sound synthesis, multi-channel spatialization, and physical modeling.
  - Guided students in individual projects in computer-generated sound using ChuCK, JavaScript, and Web Audio API.
- Neuroplasticity in Musical Gaming**, *Stanford University* 2017
- Explored virtual, augmented, and mixed-reality paradigms for design and programming.
  - Examined how psychoacoustics, cognition, and neuroscience of sound affect experiences in computer-mediated spaces.
  - Assisted students in game-based projects using programming languages such as Unity (C#), JavaScript, and Processing, with hardware including Oculus Rifts, Vive, and consumer-based EEG devices.
- Psychophysics and Music Cognition**, *Stanford University* 2016
- Integrated perception, psychoacoustics, cognition, and neuroscience of music.
  - Taught fundamentals of conducting experimental psychoacoustic studies with a focus on existing research.
- Physical Interaction Design for Music**, *Stanford University* 2016
- Co-taught course in physical computing for sound-related applications.
  - Assisted students in developing and implementing sensor and hardware-based designs using Arduinos, Max/MSP, and Processing.
- Sound: Physics and Perception**, *Columbia University* 2014
- Co-taught studio course related to psychoacoustics, wave propagation, biological sound, physiology of hearing, and electronic sound production.
  - Designed and conducted experiments demonstrating sonic principles.

## AWARDS, GRANTS, AND RESIDENCIES

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- Statens Værksteder for Kunst**, Artist Residency, Copenhagen, Denmark. 2021
- Fulbright Scholarship, Denmark**, Sound and Music Computing - Aalborg University Copenhagen. 2020
- GRAME (centre national de création musicale)**, Research Residency, Lyon, France. 2019, 2020
- Vermont Studio Center**, Full Fellowship, Johnson, VT. 2019
- Mellon Dissertation Fellowship**, Stanford University. Stanford, CA. 2019
- European Art-Science Technology Network for Digital Creation Grant**, AAU, Copenhagen. 2019

<b>2019 FETA Prize in Sound Art</b> , Miami, FL, USA.	2019
<b>European Art-Science Technology Network For Digital Creation</b> , Residency, Copenhagen.	2020
<b>POWSOLO Sound Art Award: Best Artistic Discovery</b> , Amsterdam, Netherlands.	2020
<b>Bemis Center for Contemporary Art</b> , Artist Residency, Omaha, NE.	2020
<b>MATA Festival Commission</b> , New York City, NY.	2020
<b>Musée des arts et métiers</b> , Artist Residency, Paris, France.	2018
<b>Europe Center Grant</b> , Stanford University. Stanford, CA.	2018
<b>Cité Internationale des Arts</b> , Artist Residency, Paris, France.	2017
<b>Finalist, FETA Prize in Sound Art</b> , Miami, FL.	2017
<b>IRCAM</b> , Research Residency - Music Representation Team, Paris, France.	2017
<b>3rd Place, Engine Room International Sound Arts Competition</b> , London, UK.	2017
<b>MassMoCA</b> , Arts Residency, North Adams, MA.	2016
<b>New Music USA: QuBit, SOUNDART2016</b> , New York City, NY.	2016
<b>PIONEER WORKS</b> , Artist Residency, Brooklyn, NYC.	2015
<b>Finalist, FETA Prize in Sound Art</b> , Miami, FL.	2015
<b>Signal Culture</b> , Artist Residency, Owego, NY.	2014
<b>National Science Foundation (NSF)</b> , Seismic Sound Lab at Lamont-Doherty Observatory, Columbia University, New York, NY.	2014

## WORKSHOPS AND SEMINARS

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<b>Sound in Materials, Materials in Systems, Systems in Sound – Danish Sound Art Lab</b> , <i>Struer, Denmark</i> <i>March 2025</i>	
<i>Topics: raspberry pi, physical computing, motor operation, motion design, Python programming</i>	
<b>Interfacing Sound and Motion with Raspberry Pi – Columbia University, NYC</b>	<i>Nov 2024</i>
<i>Topics: raspberry pi, physical computing, motor operation, motion design, Python programming</i>	
<b>Audible Machinery: Distributed Systems Approaches to Research, Design, and Sound-based Art</b> , <i>Mechanical Engineering Department - MIT, Cambridge</i>	<i>2023</i>
<i>Topics: Audible machinery and manufacturing, synchronous and distributed systems approaches, behavioral research in ‘swarm perception’.</i>	
<b>Kinetic Sound Art: Interfacing sound and motion using human computer interfaces</b> , <i>Ljubljana, Slovenia</i> , <i>LJUDMILA</i>	<i>2020</i>
<i>Topics: Basic principles of acoustic sound, robotics, mechanical motion and motor control using Arduino, messaging between Processing/Max/MSP/SuperCollider to Arduino, material characteristics and fabrication methods, etc.</i>	
<b>Sound Arts Workshop</b> , <i>Stanford University</i>	<i>Summer 2019</i>
Week-long intensive workshop that focuses on hands-on approaches to working with sound as mediated by kinetic, light, and moving imagery.	
<b>Composing for the Swarm: Analysis, control, and production of interactive, sonic systems</b> , <i>Columbia University</i>	
<i>Topics: Dynamical systems approaches to creating, aggregating, and composing sound, swarm theory, numerical simulation and modelling, sonification, etc.</i>	

## Exploring the interdisciplinary domains of auditory perception and sonic art,

*Topics:* Basic psychoacoustics of human hearing, fundamentals of auditory system, contemporary art and perception, design strategies, etc.

## WORK EXPERIENCE

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### Sound Researcher

2013-2017

*Seismic Sound Lab - Geophysics and Seismology, Lamont-Doherty Earth Observatory*

- Developed computer programs to sonify and visualize seismological data in multichannel applications.
- Created open-source Python library to acquire, render, and sonify earthquake data.

### Sonification Researcher

2011-2012

*Center for the Remote Sensing of Ice Sheets (CReSIS), EECS Department, University of Kansas*

- Developed sonification paradigms for rendering climate and glaciological data into sound and image.
- Primarily used C++ and Max/MSP for implementation.

### MTV: Audio Intern, News and Documentaries

2007

- Developed web application for distributing song playlists to viewers.
- Edited music selected for News and Documentary programs.

## CONFERENCE REVIEWER

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*“Linux Audio Conference (LAC)”*

2021-present

*“Sound and Music Computing (SMC) Conference”*

2019-present

*“New Interfaces for Musical Expression (NIME) Conference”*

2020-present

## TECHNICAL SKILLS

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**Creative Coding:** Arduino, Processing, Max/MSP/Jitter, SuperCollider, CHuCK, RTCmix

**Programming:** Python, Matlab, C/C++, Ruby, Shell, SQL, Git, Faust, L<sup>A</sup>T<sub>E</sub>X

**Web:** HTML/CSS, JQuery, Django, PHP, JavaScript, WebAudioAPI

**3D Modeling and Design:** Eagle, Rhino, Blender, Fusion 360

**Experience with:** VHDL, Assembly

**Relevant Coursework:** Deep Learning for Audio, Audio Signal Processing, Perceptual Audio Coding, Spatial Audio, Psychoacoustics

**Languages:** English (native), French (fluent), Swedish (basic), Danish (basic)