# NOLAN LEM

#### www.nolanlem.com

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Education	
Post Doctoral FellowAChalmers Institute of Technology, Gothenburg, SEDepartment of Applied Acoustics	pril-present 2023
<b>Ph.D. Computer-Based Music Theory and Acoustics</b> Stanford University, Stanford, CA Dissertation: "Synchronous Sound: Strategies for Collective Sound Generation and Diffusion"	December 2022
M.F.A Sound Art Columbia University, New York, NY	May 2015
<b>B.S. Electrical &amp; Computer Engineering</b> University of Kansas, Lawrence, KS	May 2013
B.M. Studio Music and Jazz Saxophone University of Miami, Miami, FL	May 2008

#### Selected Exhibitions and Performances

2025	"Babbling	Brook".	Commission.	Zagreb	Biennalle.	Zagreb,	Croatia
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2025 TBA. Installation. Galleri Box. Gothenburg, Sweden.

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
- 2012 "Mutatis Mutandis" Hall Center for the Humanities. Lawrence, KS. USA

# Publications and Conference History

please see https://www.nolanlem.com/research.html for links to documents	
"Exploring the Emergence of Beat Induction using a 'Swarm of Onsets' Generative Model". The Neuroscience and Music Conference . Helsinki, Finland 20	.ces 924
"Individual differences of limitation to extract beat from Kuramoto coupled oscillators: Transition from beat-based tapping to frequent tapping with weaker coupling". PLOS ONE 20	923
"Introducing the Collective Rhythms Toolkit" Sound and Music Computing Conference. Stockholm, SE 20	923
"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 20	922
"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 20	921
"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 20	921
"Menagerie: exploring the audio-visual rhythms of violence through data, triggers, and swarms" Proceedings of the Sound and Music Computing Conference (SMC). Torino, Italy 20	5 020
"Art and AI: 'Engine Errors / self-portrait'" International Conference on Computational Creativity (ICCC). Coimbra, Portugal	920
"Extracting beat from a crowd of loosely coupled, concurrent periodic stimuli" Acoustical Society of America (ASA). San Diego, CA 20	a 919
"Extracting beat from a crowd of loosely coupled, concurrent periodic stimuli" The Predictive Brain Conference. Marseilles, France 20	919
"Kuroscillator: A Max-MSP Object for Sound Synthesis using Coupled-Oscillator Networks". 14th International Symposium on Computer Music Multidisciplinary Research. Marseilles, France 20	919
"Sound in Multiples: Synchrony and Interaction Design using Coupled-Oscillator Networks". Sound and MultiComputing Conference (SMC). Málaga, Spain. 20	ısic 919
"Art and AI". Artificial Intelligence (AI) Salon. Computer Science Department. Stanford, CA. 20	919
Keynote Speaker. Symposium on Art and Technology. UTEC (Universidad Tecnológica del Uruguay). Montevideo, Uruguay 20	919
'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. 20	918
'SeismoDome: Sonic and visual representation of earthquakes and seismic waves in the planetarium'. American Geophysical Union. New Orleans, LA. 20	917
"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. 20	917
"Head Tracking Binaural Localization System for Horizontal Sound Source Detection". Center for Computer Research in Music and Acoustics (CCRMA) Salon. Stanford, CA. 20	r 916
"Velcro as a sensory interface and erotic material". 'Politics of the Machine: Art and After' Conference. Copenhagen, Denmark 20	017

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

#### Music Signal Processing, Stanford University

The course presented fundamental elements of digital audio signal processing, such as sinusoids, spectra, the Discrete Fourier Transform (DFT), digital filters, z transforms, transfer-function analysis, and basic Fourier analysis in the discrete-time case. Matlab is used for in-class demonstrations and homework/lab assignments.

#### Music, Mind, and Human Behavior, Stanford University

An introductory exploration of the question of why music is a pervasive and fundamental aspect of human existence. The class introduced aspects of music perception and cognition as well as anthropological and cultural considerations.

#### Fundamentals of Computer-Generated Sound, Stanford University

Assisted students in basic digital signal processing for sound synthesis, multi-channel spatialization, and physical modelling and helped students carry out individual projects in computer-generated sound. Programming included ChuCK, javascript, and Web Audio API.

#### Neuroplasticity in Musical Gaming, Stanford University

Using virtual, augmented, and mixed-reality paradigms for design and programming, this course examined how psychoacoustics, cognition, and neuroscience of sound affects our experience of computer-mediated spaces. Assisted students in carrying out game-based projects in a variety of programming languages using Oculus Rifts, Vives, and consumer-based EEG hardware. Programming included Unity (C), javascript, and Processing environments.

#### Psychophysics and Music Cognition, Stanford University

Integrating perception, psychoacoustics, cognition, and neuroscience of music, this course taught undergraduate and graduate students the fundamentals of conducting experimental psychoacoustic studies with a focus on previous research in the field.

#### Physical Interaction Design for Music, Stanford University

Co-taught course in physical computing in sound-related applications. Assisted students developing and implementing sensor and hardware-based designs for their individual projects which included work with arduinos, max/msp, and Processing.

# Sound: Physics and Perception, Columbia University

Co-taught studio course related to psychoacoustics, wave propagation, biological sound, physiology of hearing, and electronic sound production. Designed and carried out experiments demonstrating sonic principles.

2018

2017

2017

2018

Colored in Italian ital

#### 2016

2014

2016

# AWARDS - GRANTS - FELLOWSHIPS

Statens Værksteder for Kunst, Artist Residency, Copenhagen, Denmark.	Winter 2021
Fulbright Scholarship, Denmark Sound and Music Computing - Aalborg University Copend	nagen. 2020
POWSOLO Sound Art Award: Best Artistic Discovery, Amsterdam, Netherlands	2020
European Art-Science-Technology Network For Digital Creation, Residency, Copenhag	gen. 2020
MATA Festival Commission, New York City, NY	2020
Bemis Center for Contemporary Art, Artist Residency, Omaha, NE.	Summer 2020
GRAME (centre national de création musicale), Research Residency, Lyon, France. Win	nter 2019, 2020
2019 FETA Prize in Sound Art, Miami, FL. USA	2019
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, Copen-	nagen. 2019
Musée des arts et métiers. Artist Residency, Paris, France.	Summer 2018
Europe Center Grant, Stanford University. Stanford, CA	2018
Cité Internationale des Arts, Artist Residency, Paris, France.	2017
Finalist, FETA Prize in Sound Art, Miami, FL.	2017
<b>IRCAM</b> , Research Residency - Music Representation Team, Paris, France	Summer 2017
3rd Place, Engine Room International Sound Arts Competition, London, UK.	2017
MassMoCA, Arts Residency, North Adams, MA.	Summer 2016
New Music USA: QuBit, SOUNDART2016, New York City, NY	2016
<b>PIONEER WORKS</b> , Artist Residency, Brooklyn, NYC.	Summer 2015
Finalist, FETA Prize in Sound Art, Miami, FL	2015
Signal Culture, Artist Residency, Owego, NY	Summer 2014
National Science Foundation (NSF), Seismic Sound Lab at Lamont-Doherty Observatory. University. New York, NY.	Columbia <i>2014</i>

#### WORKSHOPS AND SEMINARS

Audible Machinery: Distributed Systems Approaches to Research, Design, and Sound-basedArt, Mechanical Engineering Department - MIT. Cambridge2023

Topics: audible machinery and manufacturing, synchronous and distributed systems approaches, behavioral research in 'swarm perception'

Kinetic Sound Art: Interfacing sound and motion using human computer interfaces, Ljubljana, Slovenia. LJUDMILA 2020

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...

Sound Arts Workshop, Stanford University

Summer 2019

Week-long intensive workshop that focuses on hands-on approaches to working with sound as mediated by kinetic, light, and moving imagery.

# Composing for the Swarm: Analysis, control, and production of interactive, sonic systems, *Columbia University*

Topics: Dynamical systems approaches to creating, aggregating, and compositing sound, swarm theory, numerical simulation and modelling, sonification, etc...

# 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

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 ap Created open-source Python Library to acquire, render, and sonify earthquake data.	plications.
Sonification Researcher	2011-2012
Center for the Remote Sensing of Ice Sheets (CReSIS). EECS Department, University of Kans	sas
Developed sonification paradigms for rendering climate and glaciological data into sound an primarily in C++ and Max/MSP.	ıd image
MTV: Audio Intern, News and Documentaries	2007
Developed web application for distributing song playlists to viewers. Edited music that was News and Documentary programs for MTV.	selected for
Conference Reviewer	
"Sound and Music Computing (SMC) Conference".	2019-present
"New Interfaces for Musical Expression (NIME) Conference".	2020-present
TECHNICAL SKILLS	
Creative Coding: Arduino, Processing, Max/MSP/Jitter, Supercollider, CHuCK, RTCmix	
$Programming:$ Python, Matlab, C/C++, Ruby, Shell, SQL, git, Faust ${\rm IAT}_{\rm E}{\rm X}$	
Web: HTML/CSS, JQuery, Django, PHP, Javascript, WebAudioAPI	
3D Modeling Design: Eagle, RHINO, Blender, FUSION360	

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)