Nolan Lem

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Education

Post Doctoral Fellow *April-present 2023*
Chalmers Institute of Technology, Gothenburg, SE
Department of Applied Acoustics

Ph.D. Computer-Based Music Theory and Acoustics *December 2022*
Stanford University, Stanford, CA
Dissertation: "Synchronous Sound: Strategies for Collective Sound Generation and Diffusion"

M.F.A Sound Art *May 2015*
Columbia University, New York, NY

B.S. Electrical & Computer Engineering *May 2013*
University of Kansas, Lawrence, KS

B.M. Studio Music and Jazz Saxophone *May 2008*
University of Miami, Miami, FL

Teaching Experience

Music Signal Processing, *Stanford University* *2018*

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* *2018*

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* *2017*

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* *2017*

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 ina 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* *2016*

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* *2016*

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* *2014*

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.

AWARDS - GRANTS - FELLOWSHIPS

Statens Værksteder for Kunst, Artist Residency, Copenhagen, Denmark. *Winter 2021*

Fulbright Scholarship, Denmark Sound and Music Computing - Aalborg University Copenhagen. *2020*

POWSOLO Sound Art Award: Best Artistic Discovery, Amsterdam, Netherlands *2020*

European Art-Science-Technology Technology Network For Digital Creation (EASTN-DC), Artist Residency *Copenhagen, Denmark 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 *Winter 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, Copenhagen. *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*

IRCAM, 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*

PIONEER WORKS, 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 at Columbia University. New York City, *2014*

Selected Exhibitions

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" Video. 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.

2017 "Autonomous Sense Object" *Magnitudes* Group Exhibition. Art345 Gallery, Harlem, NYC. USA

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.

2014 "Under the Viaduct" *Public Art Installation* River Side Park. Harlem, NYC. USA

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

"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". International 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*

WORKSHOPS AND SEMINARS

Audible Machinery: Distributed Systems Approaches to Research, Design, and Sound-based Art, *Mechanical Engineering Department - MIT. Cambridge*   *2023*

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 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 in C++ and Max/MSP.

MTV: Audio Intern, News and Documentaries   *2007*

> Developed web application for distributing song playlists to viewers. Edited music that was selected for News and Documentary programs for MTV.

CONFERENCE REVIEWER

"Sound and Music Computing (SMC) Conference".   *2019-2023*

"New Interfaces for Musical Expression (NIME) Conference".   *2020-2023*

TECHNICAL SKILLS

Creative Coding: Arduino, Processing, Max/MSP/Jitter, Supercollider, CHuCK, RTCmix, Faust

Programming: Python, Matlab, C/C++, Ruby, Shell, SQL, git, LaTeX

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)