The Center for New Music & Audio Technologies

2022 / 2023

Genevieve McEnerney Hall, 1750 Arch St, Berkeley, CA 94709

www.cnmat.berkeley.edu

CNMAT is dedicated to multidisciplinary research and the creative use of sound, linking the concert hall to the laboratory. We support a dynamic group of educational, performance and research programs focused on the creative interaction between new music and emerging technologies. CNMAT partners with the Department of Music and further collaborates with a number of affiliate departments, presenters, centers, and units on campus, including the Department of Art Practice, the Department of Theater, Dance, and Performance Studies, the Department of Film and Media, the Jacobs Institute for Design Innovation, the College of Environmental Design, the Arts Research Center, the Townsend Center for the Humanities, the Berkeley Institute of Design, the Berkeley Center for New Media, BAM/PFA, Cal Performances, and the Magnes Collection of Jewish Art and Life.

CNMAT continued in 2023-24 with a standing committment to foster inclusive and equitable acess for all individuals on our campus. We invite students and faculty from all departments to participate and we ensure that our many research groups are open and inviting to all. This year we successfully highlighted the presence and importance of women in music and technology with a number of special guest artists and researchers and paired with high-profile concert events.

FACULTY & STAFF

Director: Prof. Edmund Campion, Department of Music

Lead Researcher: Asst. Prof. Carmine-Emanuele Cella, Department of Music

Technical Director: Jeremy Wagner, PhD

Acting Associate Director: Jeremy Hunt, PhD

CNMAT USERS GROUP (CUG) OFFICERS

Graduate Assembly Student Group

President: Luke Dzwonczyk

Vice President: George Papajohn

GA Delegate: Matthew Monaco

Grant Committee: Eda Er, Sarah-Grace Graves, Mat Muntz, George Papajohn

Technical Coordinator: Nathan Corder

Publicity: Eda Er

† CNMAT USERS GROUP. Organized by students at CNMAT with support from the CNMAT staff and matching resources from CNMAT and student grants

∞ CNMAT DEIB (Diversity, Equity, Inclusion, Belonging). Initiative to promote and present underrepresented groups and individuals involved in creative computing and music

§ CNMAT/MUSIC DEPT. Organized and presented in collaboration with the Department of Music and/or other CNMAT Affiliates

PUBLIC LECTURES, WORKSHOPS, SEMINARS, DEMONSTRATIONS

2022-09-23 *Recent Creative Work*
Eric Raynaud (aka Fraction), Independent Media Artist

∞§ 2022-09-30 *Mugic Sensor*
Mari Kimura, Prof. of Music at UC Irvine

∞§ 2022-09-30 *Rasberry Pi*
Roberto Morales, Prof. of Music, University of Guanajuato

§ 2022-10-07 *Recent Creative Work*
Huck Hodge, Prof. of Music,University of Washington

∞§ 2022-10-14 *My Creative Practice*
Carol Robinson, Internationaly recognized composer and clarinetist

§ 2022-10-21 New Notational Strategies
John Aulich, Composer

∞§ 2022-10-28 *My Creative Practice*
Laetitia Sonami, Sound Artist, Performer and Researcher

2022-11-03 *Human / Expression / Emotion / Technology / Machine / Me*
Edmund Campion, Director, CNMAT

2022-11-04 *CNMAT Open Lab*

Carmine Cella, et al

∞ 2023-03-03 Ocular Scores
Linda Bouchard, Composer

2023-03-06 *ElectroMagnetically-Prepared Piano*
Per Bloland, Associate Professor of Music, Miami University

§ 2023-04-28 *Interactive Digital Musical Instrument Design 1995-2023*
Matt Wright, Technical Director, Center for Computer Research in Music and Acoustics

CNMAT PUBLIC CONCERTS & PERFORMANCES

†∞ 2022-08-31 Oded Geizhals in Concert
2022-09-23 Fraction in Concert
∞ 2022-09-30 Kimura & Morales in Concert
2022-10-07 Huck Hodge in Concert
∞ 2022-10-14 Carol Robinson in Concert
†∞ 2022-10-26 Kevin Lo & Córdova/Macacoa/Montufar/Rivero
†∞ 2022-11-05 SCOPE
†∞ 2022-11-18 Laetitia Sonami and Workshop Participants
∞ 2022-12-04 Sound Encounters III
∞§ 2023-02-04 Eco Ensemble at Hertz Hall
†∞ 2023-02-18 Exclusion Zone
∞ 2023-02-25 Annette Vande Gorne: Complete Haïkus
†∞§ 2023-03-25 Hinge in Concert
† 2023-04-15 Rumrill/Winston: A lecture/recital in the tradition of Li-ism
†∞§ 2023-04-23 Richard Worn Premieres 6 works for Bass and Electronics by UC Berkeley composers
2023-04-28 Matt Wright & John Schott in Concert
2023-05-05 UCB Symphony Orchestra Concert
†∞ 2023-05-07 Cicada
†∞§ CNMAT staff and faculty support numerous non-public student produced events in the main room at CNMAT throughout the year.

VISITING SCHOLARS & RESEARCHERS

Rachel Chen: UCB PhD canditate in Special Education—finished doctoral disseration
Hélène Papadopoulos: independent scholar and musician—research in musical applications of machine learning
John-Carlos Perea: Professor of American Indian Studies (SFSU)—visiting researcher, composer, and performer
Carol Robinson: composer and musician—residency, master classes, presentations
Laetitia Sonami: composer and musician—residency, master classes, presnetation, concert
Olivia Ting: artist-in-residence

GUEST COMPOSERS, MUSICIANS, ENSEMBLES

Hinge Ensemble: CUG residency & concert
Annette Vande Gorne: concert
Mari Kimura: residency & concert
Roberto Morales: residency & concert
Richard Worn: residency
Eric Raynaud: mini-residency and concert
John Aulich: mini-residency

CNMAT PARTNERSHIPS AND INSTITUTIONAL COLLABORATORS

Conservatoire National Supérieur de Musique et de Danse de Lyon (CNSMD)
Concert with UC Berkeley graduate students presented at Emprientes Festival in Lyon, France in January 2023
Sound Encounters with the San Francisco Contemporary Music Players (SFCMP) and CNMAT
Joint concert at the LAB in San Francisco showcasing CNMAT graduate students: Eda Er, Kevin Lo, and Aine Nakamura.
Université Côte d'Azur Educational Exchange (on-going MOU)

CNMAT RESEARCH & DEVELOPMENT / PROJECTS & PROTOTYPES

CNMAT MARGO – A Sensor Integration Platform for Motion Capture

Jeremy Wagner developed an inexpensive implementation of a small form-factor, 9 Degree of Freedom, OSC-native motion sensor with onboard sensor integration. The CNMAT MARGO combines a widely available Magnetic, Acceleration, Rotation and Gyroscopic sensor (LSM6DS3 + LIS3MDL) with an Espressif ESP32 WiFi and Bluetooth module to create a small, lightweight, wireless orientation and acceleration sensor suitable for use as a controller in musical performance. The implementation employs a Madgwick filter to estimate the sensor's orientation with respect to the earth frame and transmits this data over a tiny wireless access point to a host computer. The entire platform can be built for less than $25 from readily available components and the software has been made freely available online. Website: https://github.com/CNMAT/MARGO

Mounting Bracket for DAEX58FP Tactile Transducer

Jeremy Wagner engineered a number of devices for affixing tactile transducers to string instruments with zero-impact to material finishes and minimal input to tonal characteristics. Linked below is a design for affixing an inexpensive tactile transducer to the body of a cello or contrabass. https://www.thingiverse.com/thing:5417120

JW_Vindex~ Object for Max

Augmenting the CNMAT Spectral Toolkit, the tentatively named JW_Vindex~ object for Max is designed to make near-real-time resonant model estimates. JW_Vindex~ extracts the spectrum at a specified moment in an audio vector, identifies the strongest partials, refines the frequency estimates of these constituent partials, then estimates amplitude and decay coefficients for use in a recursive resonant filter model of the sound. The object should allow composers to build resonant models of given moments during a live performance. Those models can be stored, altered, interpolated, etc. to enable new timbral transforms in live performance. https://github.com/wagne342/jw_vindex

Speaker_Finder.maxpat

Jeremy Wagner developed a method for quickly and accurately measuring speaker positions via the analysis of acoustic impulses. A calibrated set of four microphones configured in a precisely measured non-coplanar arrangement is set at the center of the performance space. Broad-spectrum noise bursts are then captured to this microphone array from each speaker source. Correcting for DSP processing delays, the propagation delay is then derived from fast-autocorrelation of these signals and the exact acoustic centroid of each speaker is then calculated by trilateration and gradient descent. This method is currently implemented as a Max patch. A standalone custom Max object is currently in development.

CNMAT.live

CNMAT's ongoing efforts to enable performance and collaboration in virtual spaces instigated the launch a website called CNMAT.live, which is an instance of Mozilla Hubs. This platform allows users to connect, collaborate and interact in a live virtual environment from anywhere in the world using a convenient web interface. CNMAT.live is a customization of Mozilla Hubs running in the cloud under Amazon Web Services. As of this writing, users can log in, create an avatar and interact in real time in a virtual 3D environment. CNMAT hopes to extend the functionality of this platform by producing its own registered components that can function as virtual instruments, provide advanced visualization, and provide more advanced spatial audio in the Mozilla Hubs environment. https://cnmat.live

CNMAT Visual Metronomes

Jeremy Wagner produced a networked tool for coordinating performance that we are tentatively calling "CNMAT Visual Metronomes". This platform, originally intended as a simple visual metronome for live performance, is a server-client model for cueing individual actions within an ensemble of performers. The model features a server-side architecture that generates web-based visuals based on commands received from a network. The original intent was to provide a convenient solution for cueing performers from the context of a Max-patch using node.js, but by embracing a multi-threaded server model we are able to build up complex control structures and visuals from a network of users. This project has already served as the basis for several projects requiring complex network communication in a one-to-many, many-to-one or many-to-many configurations. Future work should allow this platform to host realtime-generated scores and precision time protocol. https://github.com/CNMAT/Visual_metronomes

JURIED PUBLICATIONS

2022: Carmine-Emanuele Cella, et al, *A three-dimensional timbre model via Peano curves,* Journal of Mathematics and Music

https://www.tandfonline.com/doi/abs/10.1080/17459737.2022.2058636

2022: Carmine-Emanuele Cella, et al, *Orchidea: a comprehensive framework for target- based computer-assisted dynamic orchestration,* Journal of New Music Research

https://www.tandfonline.com/doi/full/10.1080/09298215.2022.2150650

2023: Carmine-Emanuele Cella, et al, *A Framework for Modifying Orchestral Qualities in Computer-Aided Orchestration*, Computer Music Journal

https://direct.mit.edu/comj/article-abstract/45/4/57/114276/A-Framework-for-Modifying-Orchestral-Qualities-in?redirectedFrom=fulltext

2023: Carmine-Emanuele Cella, et al, *Dynamic Computer-Aided Orchestration in Practice with Orchidea,* Computer Music Journal

https://direct.mit.edu/comj/article-abstract/45/4/40/114725/Dynamic-Computer-Aided-Orchestration-in-Practice

MUSIC DEPARTMENT COURSES SUPPORTED BY CNMAT

Fall Term: MUS 107/207 (advanced projects in computer music), 108, 105
Spring Term: MUS 207, MUS 29 (370 students) MUS 158a MUS 158b, 57

CNMAT RESEARCH WORKING GROUPS

Extended Reality Working Group

Spatial Audio Working Group

DIY Sensor and Instrument Building Working Group

Machine Learning and Computer Assisted Composition Working Group

GRANTS AND FUNDING

Instructional Technology and Innovation Micro Grant: $50,000

CUG grants

NEA Grant pending

STAFF

Imran Sekalala: a recent undergraduate, worked as a part time engineer on CNMAT pedagogical software

FACILITIES

Rear Studio With the support of funds from Edmund Campion, we have updated the CNMAT rear studio to better support additional workflows. A new Mac Mini computer, isolation-rack cabinet were added to the existing setup, production software licenses were updated to current releases and the workstation was fitted with two new HD screens and a wall-mounted 4K display to support film scoring workflows.

Workshop In summer 2023 we completed major overhaul of our workshop space to better support graduate research projects. We have prioritized support for fabrication of custom microcontroller devices and wearable technologies. The space was completely reorganized, cataloged, and updated with new storage, lighting & seating.

APPOINTMENTS, POSITIONS, EMPLOYMENT FOR CNMAT AFFILIATED GRADUATES

John MacCallum — Cycling74

Kayla Cashetta — Assistant Professor, Berklee College of Music

Imran Sekalala — Berggruen Institute