Christodoulos Benetatos

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Google Scholar

Education

PhD — **University of Rochester**, Electrical and Computer Engineering — Sept 2018 – present
- Deep Learning, Computer Audition, Interactive Systems

B.Sc/M.Sc — **National Technical University of Athens**, Electrical and Computer Engineering — Sept 2011 – Dec 2017
- Natural Language Processing, Signal Processing, Electronics Design

Experience

University of Rochester, AIR Lab, Research Assistant — Rochester, NY — Sept 2018 – present
- Conducted research at the intersection of deep learning and human-machine interaction, focusing on sequence generation, latent modeling, and reinforcement learning.
- Led multiple full-stack neural system prototypes, spanning from modeling frameworks (PyTorch) to real-time front-ends (Vue.js / JUCE / PyQT).

ByteDance Inc., Research Scientist Intern — Santa Clara, CA — June 2022 – Aug 2022
- Developed generative sequence models (VAE and Transformer variants) to improve structured musical outputs.
- Integrated models into an existing pipeline for symbolic music production.

Kwai Inc., Research Scientist Intern — Seattle, WA — Aug 2020 – Nov 2020
- Conducted multimodal modeling of dance videos focusing on visual beat tracking, audio-video alignment and real-time body gesture recognition.
- Delivered a real-time digital audio FX engine in C++ for iOS enabling real-time audio effects on user-generated content.

Metis Cyberspace Technology, Software Engineer — Athens, Greece — Jan 2018 – Aug 2018
- Built real-time networked graph analytics to monitor vessels in operation, assisting fault detection and performance stats across distributed fleets.

Research Projects

LLM Fine-Tuning for Playability-Aware Guitar Tablature Generation — 2025 – present
- Built a dataset of 1M prompt–response pairs, capturing ergonomic and playability constraints for guitar tablature assignment.
- Engineered prompt templates and ranking heuristics to guide LLMs toward generating human-playable tablature.
- Fine-tuned LLaMA models using LoRA for constraint-aware symbolic music generation.

HARP: Enabling DAWs to Access Remote Deep Learning Models — 2023 – present
- Lead developer in a distributed team of 6 across 2 universities, coordinating architecture and engineering.
- Developing a JUCE/C++ plugin enabling DAWs to integrate deep learning inference via hosted APIs (HuggingFace).

Score Reduction as a Reinforcement Learning Problem — 2023 – 2024
- Framed the task of score reduction as a combinatorial optimization problem and used Proximal Policy Optimization (PPO) to solve it.
- Designed novel heuristic and learned reward functions to balance playability and musicality constraints.

- Used a transformer-based RL agent that operates on a novel graph representation of musical scores.

Euterpe: Web Framework for Real-Time ML-Driven Music Agents 2021 – 2023

- Architected a framework enabling real-time deployment of ML-powered music agents in the browser, integrating Web Audio, MIDI streaming, and TensorFlow.js.
- Leveraged concurrency (Web Workers) and circular buffers for low-latency audio/MIDI communication.
- Lowered the barrier for researchers by providing pre-built pipelines and reusable components, allowing focus on core algorithm development.

Draw and listen! Sketch-Based Music Generation with Contour-Guided VAE 2020 – 2021

- Multimodal generative VAE where users sketch motion curves to shape the melodic contour of generated music output.
- Proposed a new melody disentanglement (contour, rhythm, context) and designed the VAE architecture to realize this structure.

BachDuet: LSTM-Based AI for Real-Time Human-Machine Counterpoint Improvisation 2019 – 2020

- Developed an LSTM-based AI improviser enabling real-time musical counterpoint in duet settings.
- Integrated frontend and model inference in a web-based app for interactive co-creation, engaging hundreds of participants.
- Conducted listening Turing tests showing BachDuet's duets were indistinguishable from those between music college students.

Publications/abstracts

Score Reduction for Guitar through Reinforcement Learning 2024
Christodoulos Benetatos, Zhiyao Duan
LBD at International Conference on Music Information Retrieval (ISMIR)

Euterpe: A Web Framework for Interactive Music Systems 2023
Yongyi Zang*, ***Christodoulos Benetatos***, Zhiyao Duan, (* equal contribution)
Journal of the Audio Engineering Society (JAES)

HARP: Bringing Deep Learning to the DAW with Hosted, Asynchronous, Remote Processing 2023
Hugo Flores Garcia, ***Christodoulos Benetatos***, et al.
NeurIPS workshop on Machine Learning for Creativity and Design

Draw and listen! A sketch-based system for music inpainting 2022
Christodoulos Benetatos, Zhiyao Duan
Transactions of the International Society for Music Information Retrieval (TISMIR)

Collagenet: Fusing arbitrary melody and accompaniment into a coherent song 2022
Abudukelimu Wuerkaixi, ***Christodoulos Benetatos***, Zhiyao Duan
International Conference on Music Information Retrieval (ISMIR)

BachDuet: A deep learning system for human-machine counterpoint improvisation 2020
Christodoulos Benetatos, Joseph VanderStel, Zhiyao Duan
New Interfaces for Musical Expression (NIME)

Skills

Programming Languages: Python, C++, JavaScript, Java, MATLAB, Bash

ML & Dev Frameworks: PyTorch, scikit-learn JUCE, PyQT, OpenCV

Web Tools: Vue.js, FastAPI, REST APIs, WebAudio

Languages: English (fluent), Greek (native)

Music Skills: Classical Guitar, Flute, Mandolin, Piano, Cajon, Sample Library Programming