Christian Steinmetz

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Education

2020 — 2024 **Queen Mary University of London**
PhD in Artificial Intelligence and Music within the Centre for Digital Music
Advisor: **Joshua D. Reiss**

2019 — 2020 **Universitat Pompeu Fabra** | GPA: 9.78/10.00
Master in Sound and Music Computing within the Music Technology Group
Advisor: **Joan Serrà**

2014 — 2019 **Clemson University** | GPA: 3.93/4.00
B.S. in Electrical Engineering with a concentration in Digital Signal Processing
B.A. in Production Studies in Performing Arts with a concentration in Audio Technology
Minor in Mathematical Sciences

Publications

2020 **Automatic multitrack mixing with a differentiable mixing console of neural audio effects**
Christian J. Steinmetz, Jordi Pons, Santiago Pascual, Joan Serrà
Under review for Proc. of the IEEE Int. Conf. on Acoustics, Speech, and Signal Processing (ICASSP)
[arXiv] [Code] [Demo]

Randomized overdrive neural networks
Christian J. Steinmetz, Joshua D. Reiss
Under review for NeurIPS 2020 Workshop on Machine Learning for Creativity and Design
[arXiv] [Code] [Demo]

Learning to mix using neural audio effects in the waveform domain
Christian J. Steinmetz
MSc Thesis, Music Technology Group, Universitat Pompeu Fabra, Barcelona
[Zenodo]

Experience

Jun 2020 - Now Research Intern | **Facebook Reality Labs**
• Working with Paul Calamia and Vamsi Krishna Ithapu on applications of deep learning
  for audio signal processing in the context of room acoustics

Jan - Jun 2020 Research Intern | **Dolby Laboratories**
• Advised by Joan Serrà on MSc thesis: Learning to mix using neural audio effects in the waveform domain
• Developed deep learning based automated multitrack mixing system with neural audio effects

Summer 2019 Audio Research Intern | **Bose Corporation**
• Researched the design of head-mounted microphone arrays to mimic the polar pattern of a pinna
• Collected and analyzed binaural measurements within the anechoic chamber and various vehicles
• Developed tools in MATLAB to design and evaluate microphone arrays and formally presented findings

Sum. 2017 & 18 Mixed Signal Audio Applications Engineer Intern | **Cirrus Logic**
• Designed and wrote Python library code for embedded hardware tool providing a high level interface
• Developed Django web app providing customers an accessible interface to embedded hardware tool
• Built automated Python test software suite integrating GPIB instruments and Audio Precision hardware

2016 - 2019 Chief Engineer | **WSBF-FM Clemson Radio Station**
• Maintained and repaired radio station equipment including 3kW FM transmitter and on-air broadcast studio
• Developed various automation tools with Python for RDS text updates, log backup, and playlisting

2017 - 2019 Audio Assistant | **Clemson University, Audio Technology**
• Maintained, diagnosed, and repaired recording studio equipment for multiple recording spaces
• Designed and installed Dolby Atmos multichannel spatial audio mixing system in recording studio

2015 - 2018 Live Sound Engineer | **WSBF-FM Clemson Radio Station**
• Developed technical plans, coordinated audio team, and oversaw sound reinforcement for live events
• Produced, recorded, and filmed over 70 on-air and on-location live music performances

Sum. 2014-16	Engineering Intern | **Vetronix Research Corporation**

- Developed LabVIEW software with GUI to automate miller plateau level matching for power MOSFETs
- Designed customer development board for body wearable sensor platform (design and PCB layout)

Projects

flowEQ — **Disentangled variational autoencoder for intelligent control of a five band parametric equalizer**
- Intelligent parametric equalizer plugin built using β-VAE with the SAFE-DB dataset (MATLAB + Keras)
- Gold Award at the 147th AES Convention MATLAB Student Plugin Competition

[Web] [Code] [Video] [Demo]

nverb — **Room impulse response synthesis for artificial reverberation with a spectral autoencoder**
- Plugin for generating interesting reverb effects by sampling from the latent space (MATLAB + Keras)
- Silver Award in the 145th AES Convention MATLAB Student Plugin Competition

[Web] [Code] [Video]

pymixconsole — **Headless multitrack mixing console in Python for programmatic mix generation**
- Block-based multitrack mixing console with advanced routing and set of accelerated audio effects
- Built with Python, NumPy, SciPy, Numba and available on PyPI as a package

[Code] [Colab]

pyloudnorm — **Open source library for perceptual loudness analysis and normalization**
- Flexible audio loudness meter with extensible implementation of ITU-R BS.1770-4 algorithm
- Built with Python, NumPy, SciPy, Travis CI and available on PyPI as a package

[Code] [Blogpost]

Granabular — **Real-time networked collaborative granular synthesis platform**
- Simple web-based granular synthesizer platform for collaborative performance
- Built with Pure Data, Python, HTML/CSS/JavaScript

[Code] [Report] [Blogpost]

PhaseAnalyzer **Real-time phase analysis utility for improving microphone placement**
- Real-time plugin built in C++ (with JUCE) using GCC-PHAT to measure phase alignment of microphones
- 1st at IEEE SoutheastCon Student Paper Competition and finalist in SDC at 143rd AES Convention

[Code] [Demo] [Blogpost]

makamviz — **Interactive website for visualizing Turkish makam music with self-similarity matrices**
- Exploring Turkish makam music through self-similarity for visualization and automatic segmentation
- Built with Python, NumPy, SciPy, HTML/CSS/JavaScript

[Code] [Web]

Cinuosity — **Build pseudorandom Spotify playlists with a 'weirdness' control for music discovery**
- Active website with over 20,000 unique playlists generated by users to date
- Built with Node.js, JavaScript, HTML, CSS, and Spotify API

[Code] [Web] [Blogpost]

Awards & Honors

Gold at AES MATLAB Student Plugin Competition	flowEQ	Fall 2019
Silver at AES MATLAB Student Plugin Competition	NeuralReverberator	Fall 2018
KEMET Electrical Engineering Senior Design Award	Autonomous air hockey robot	Fall 2018
1st at IEEE SoutheastCon Student Paper Competition	Phase analysis plugin	Spring 2018
Finalist at AES Student Design Competition	Phase analysis plugin	Fall 2017
Overall Student Media Contribution Award as Producer	WSBF Live Sessions	Spring 2017

Talks and Lectures

Invited talk at AES Symposium: Applications of Machine Learning in Audio	Fall 2020
Deep learning approaches to multitrack mixing [video]	
Speaker at Audio Programmer Meetup	Spring 2020
flowEQ: Using machine learning and MATLAB to build an intelligent EQ plugin [video]	

Invited talk at Dolby Labs, Barcelona   Fall 2019
Applications of machine learning for creative and assistive audio plugins   [slides]

Speaker at TEDx Clemson University   Spring 2019
How algorithms may help you discover your favorite song   [video]

Audio Tech Talk Series at Clemson University   Spring 2019
Seven lectures on engineering applications in audio technology   [slides]

Hackathons

First Place at r/ProgrammerHumor Hackathon for **findio**   Summer 2019
- Advanced Spotify catalog search with a search-by-image feature
- Built with Node.js, Typescript, HTML/CSS/JS, Bootstrap, and TensorFlow.js

Domain.com Award at CUhackit for **CUparkit**   Spring 2019
- Webapp for predicting campus parking lot availability with an LSTM
- Built with Angular, HTML/CSS/JS, Python, Keras, and Google Firebase

Best Cloud Based Hack at CUhackit for **auxCord**   Spring 2018
- Sync Spotify accounts to build tailored playlists with shared musical taste
- Built with Node.js, Typescript, HTML/CSS/JS, and Socket.io

Participant at HackGT 4: New Heights with **Recipe Revealer**   Fall 2018
- Using topic modeling to recommend recipes by ingredient similarity
- Built with Flask, Gensim, HTML/CSS/JS, and Bootstrap

Scholarships

UKRI Centre for Doctoral Training in Artificial Intelligence and Music	Fall 2020 to Spring 2024
Audio Engineering Society Genelec Ilpo Martikainen Audio Visionary Scholar	Fall 2019 to Spring 2020
Audio Engineering Society Mary Lea Simpson Memorial Scholarship	Fall 2018 to Spring 2019
Charles C. Kanapaux Scholarship	Fall 2015 to Spring 2019
Alan McCrary Johnstone Scholarship	Fall 2017 to Spring 2018
Cephus W Long Engineering Scholarship	Fall 2017 to Spring 2018
Carpenter Endowed Engineering Scholarship	Fall 2015 to Spring 2016
South Carolina LIFE STEM Enhancement Scholarship	Fall 2015 to Spring 2018
South Carolina LIFE Scholarship	Fall 2014 to Spring 2018
National Merit Corporate Scholarship	Fall 2014 to Fall 2018
Heritage Classic Foundation Scholarship	Fall 2014 to Spring 2018
Jeff Kanton Memorial Scholarship	Fall 2014
Richard R. Moore Scholarship	Fall 2014
Rotary Club of Hilton Head Island Scholarship	Fall 2014
Hilton Head Area Home Builders Association Scholarship	Fall 2014

Skills

Coding	Python, MATLAB, C/C++, JavaScript, HTML, CSS, R, Verilog, LabVIEW, LaTeX, Bash
Libraries	PyTorch, NumPy, SciPy, Matplotlib, Jupyter, scikit-learn, pandas, Keras, librosa, essentia, JUCE
Audio	Logic Pro, Pro Tools, Audition, Ableton Live, REAPER, SoX, FFmpeg, Pure Data