Jatin Chowdhury
Audio Signal Processing Engineer

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Education

Stanford University, Center for Computer Research in Music and Acoustics *Palo Alto, CA*
M.A. in Music, Science, and Technology *Sept. 2018 - June 2020*
- Denning Family Fellowship for the 2018-2019 academic year.
- Relevant Coursework: Physical Audio Signal Processing, Time Frequency Audio Signal Processing, Machine Learning, Digital Instrument Design, Spatial Audio, Music Recording.

University of Southern California *Los Angeles, CA*
B.S. in Electrical Engineering *Aug. 2014 - May 2018*
- USC Presidential Scholarship for outstanding academic achievement.
- Completed Minors in Physics and Music Recording.
- USC Renaissance Scholar certificate for excelling academically while pursuing separate fields of study.
- Relevant Coursework: Signal Processing, Circuit Design, Digital Logic, Electromagnetics, Software Design.

Experience

Persp3ctive VR *Los Angeles, CA*
Software/DSP Engineer *June 2019 - PRESENT*
- Developed and implemented audio effects for use in a VR audio production environment including:
    - Lowpass and highpass filters with smoothly varying cutoff frequency and rolloff rate.
    - EQ filters for a parametric EQ including bell, notch, and shelf filter shapes.
    - Dynamic range compression, including virtual analog models of an optical compressor circuit, an analog level detector circuit, and an output transformer.
- Implemented the audio effects as an audio plugin with a fully featured UI.
- Built DSP framework for integrating effects made by other engineers into the plugin.
- Implemented OSC communication for sharing parameters and metering data with VR headset.
- Developed unit testing framework to make overall software more robust.
- Built software installers for Windows platform using Inno Setup.

Audioworks Technologies *Toronto, ON*
Software Engineer *July 2018 - Dec. 2018*
- Member of of the SoundsUnite developement team: building a digital audioworkstation (DAW) using JUCE/C++.
- Developed and implemented DSP features for the application including panning algorithms, level detection, and "smart" track exporting.
- Developed UX features for the application.
- Developed file management features for the application, including integrating the file management system with the SoundsUnite web store.
- Presented work to engineering team, managers, and investors.

McGill Space Institute *Montreal, QC*
Research Trainee *May 2017 - Aug. 2017*
- Recipient of an Undergraduate Student Research Award from the National Sciences and Engineering Research Council of Canada.
- Member of the CHIME/FRB Working Group: building a software pipeline to detect Fast Radio Bursts (FRBs).
- CHIME is a telescope in British Columbia; has detected more FRBs in the Northern Hemisphere than any other telescope to date.
- Developed a "Flux Estimator" module for the CHIME/FRB software pipeline: Use incoming data from the telescope to estimate the intrinsic brightnes of the astrophsyical source.
- Contributed to science and unit testing frameworks for the CHIME/FRB software pipeline.
- Presented work for CHIME/FRB Working Group and CHIME/FRB Pipeline Gamma Release.

USC Viterbi Academic Resources Center *Los Angeles, CA*
Engineering Tutor *Aug. 2018 - May 2018*
- Tutored undergraduate engineering students in math, physics, and electrical engineering classes.
- Served as a tutor for the university chapter of the Society of Hispanic Professional Engineers.
- Trained new tutors in interacting with students and presenting material in a clear, concise, and cohesive manner.

KXSC Radio *Los Angeles, CA*
DISC JOCKEY, JAZZ DIRECTOR *Jan. 2015 - May 2018*
- On-air host and disc jockey for live jazz radio program "Jam Sessions".
- Co-host of live radio talk-show programs "Squaminous Science Hour", and "TeXulous Talk Show".
- KXSC Jazz Director tasked with researching, reviewing, and organizing jazz music for the station library.

iD Technology Camps *Denver, CO*
INSTRUCTOR *May 2015 - Aug. 2016*
- Taught students age 12-17 programming in C++ and Arduino.
- Taught students age 6-12 in building simple robots using LEGO Mindstorm kits.

Skills

Programming Languages	C/C++, Python, MATLAB, Faust, LaTex, Javascript
Frameworks	JUCE API, VST SDK, AAX SDK, Web Audio API, Arduino
Tools	Linux CLI, Visual Studio, Git, Travis CI, Inno Setup

Publications & Presentations

Real-Time Physical Modelling for Analog Tape Machines *Sept. 2019*
PROCEEDINGS OF THE 22ND INTERNATIONAL CONFERENCE ON DIGITAL AUDIO *Birmingham, UK*
EFFECTS (DAFX-19)
- Presented at the DAFx-2019 conference.
- Available on the DAFx Archives: `http://www.dafx.de/paper-archive/2019/DAFx2019_paper_3.pdf`.

The CHIME Fast Radio Burst Project: System Overview *Aug. 2018*
THE ASTROPHYSICAL JOURNAL *Vol. 836, No. 1*
- Co-authored with the CHIME/FRB Collaboration
- Available on the arXiv: `https://arxiv.org/abs/1803.11235`.

Exploring Real-Time DSP Systems for Mixing and Performance *Apr. 2019*
CCRMA DSP SEMINAR *Stanford, CA*
- Presented overview of previous research and projects to an audience of peers, professors, and the public.
- Discussed topics including real-time timbral conversion, methods of integrating "imperfection" into audio DSP systems, and designing user interfaces for DSP systems as an extension of the DSP systems themselves.

Cassettes - An Online Audio Editor *Dec. 2019*
WEB AUDIO CONFERENCE 2019 *Trondheim, Norway*
- Poster session and demonstration by project leader Xingxing Yang at WAC-2019.
- Presented an online audio editor built with the Web Audio API and Audio Worklet.

Web Audio Module (WAM) Distortion *Mar. 2019*
CCRMA OPEN HOUSE *Stanford, CA*
- Presented a distortion effect originally made in C++, then ported to Web Audio using the Emscripten toolchain.

Research

Complex Nonlinearities
LEAD RESEARCHER *Aug. 2019 - PRESENT*
- Built frameworks for developing complex nonlinear audio signal processors, largely independent of analog signal processing concepts.
- Developed a series of open-source plugins to demonstrate the nonlinear frameworks: `https://github.com/jatinchowdhury18/ComplexNonlinearities`.
- Published a series of articles explaining nonlinear signal processing techniques for a non-technical audience: `https://medium.com/@jatinchowdhury18/complex-nonlinearities-episode-0-why-4ad9b3eed60f`.

Bad Circuit Modelling
LEAD RESEARCHER *Nov. 2019 - PRESENT*
- Researched methods for virtual analog circuit modelling to account for imperfections that exist in real-world circuits.
- Developed simulations and real-time circuit-modelling systems that accurately model the aging and component tolerances of resistors and capacitors.
- Ongoing documentation of the project can be found on GitHub: `https://github.com/jatinchowdhury18/Bad-Circuit-Modelling`.

Analog Tape Modelling
LEAD RESEARCHER *Jan. 2019 - Apr. 2019*
- Researched and developed a physical model of an analog, reel-to-reel tape machine.
- Modelled the nonlinear process of analog tape recording using the Jiles-Atherton model for magnetic hysteresis.
- Modelled other effects created by analog tape machines, including flutter, playhead loss effects, and biasing effects.
- Developed an open-source audio plugin implementing the analog tape model as a real-time system. Source code and documentation are available on GitHub: `https://github.com/jatinchowdhury18/AnalogTapeModel`.

Non-Uniform Perfect Reconstruction Filterbanks
LEAD RESEARCHER *Mar. 2019 - Jun. 2019*
- Researched and developed a method for real-time filterbank analysis and synthesis, with perfect magnitude reconstruction and linear phase reconstruction.
- Implemented the filterbank in digital audio effect plugins including a Graphic Equalizer and real-time Noise-Supressor.
- Ongoing documentation can found on GitHub: `https://github.com/jatinchowdhury18/NUPR-Filterbanks`.

notGuitar
Los Angeles, CA
RESEARCH PARTNER *Jan. 2018 - May 2018*
- notGuitar is real-time timbral conversion system designed to process a guitar input signal to sound like a saxophone.
- notGuitar was implemented using a Texas Instruments DSK6713 DSP board in May 2018.
- Documentation for the project can be found on GitHub: `https://github.com/jatinchowdhury18/notGuitar`.

Projects

audio-dspy
PROGRAMMER *Oct. 2019 - PRESENT*
- Created a Python package for audio signal processing.
- Currently includes tools for filter design, impulse response manipulation, modal modelling, and nonlinear processing.
- Ongoing development and documentation can be found on GitHub: `https://github.com/jatinchowdhury18/audio_dspy`.

NewMixer
CREATOR *Dec. 2018 - PRESENT*
- A unique digital audio workstation designed to break away from the traditional "virtual console" user interface.
- Individual audio sources are visualized as sound sources in a room; the user can arrange the sources to create a mix with stereo width, and reverberative depth.
- NewMixer is currently a fully functional mixing tool, supporting saving, exporting, automation, plugin hosting and more.
- Documentation of NewMixer can be found on GitHub: `https://github.com/jatinchowdhury18/NewMixer`.

Chowdhury DSP
FOUNDER, ENGINEER *June 2018 - PRESENT*
- Developed audio plugins including:
    - CHOW: A maximally truculent distortion effect.
    - How Much Spaghetti: A dynamic matrix of stereo delay effects.
    - Chowdhury Distortion: A "crunchy" distortion effect with adjustable stereo imperfection.
- Chowdhury DSP is currently collaborating with Tracktion to release plugins through the "Tracktion Presents" program.

Destroy All Circuits
DSP ENGINEER *June 2019 - PRESENT*
- Developed DSP models for various effects and characteristics of vintage synthesizers, tape machines, and effects.
- DSP methods include recording and manipulating impulse reponses, circuit modelling, and physical modelling.

The SGUM (Squaminous Geometrically Uncanny Matrix)
Stanford, CA
CREATOR *Mar. 2019*
- The SGUM is an expressive standalone drum machine, comprised of nine velocity-sensitive drum pads, with programmable samples and configurations.
- Designed and built from the SGUM from scratch, including drum pads, circuitry, frame, etc.
- Programmed firmware for the SGUM, which runs on a Teensy 3.6 microcontroller with an audio shield and uses embedded Faust processing.
- The entire process was completed in two weeks, and for less than $100 USD.
- Documentation for the SGUM can be found on YouTube: `https://www.youtube.com/watch?v=NOcPRS4LxpQ`.

Cassettes: A Web Audio Digital Audio Workstation

Stanford, CA

CONTRIBUTOR

June 2019 - PRESENT

- Developed digital audio effects using the Web Audio API and Audio Worklet.
- Effects include:
  - Delay: Stereo, Ping-Pong
  - Harmonic: Soft-Clipping Distortion, Aural Exciter
  - Modulation: Chorus, Flanger
  - Dynamics: Limiter, Gate

NoLava Recording Studios

Los Angeles, CA

CO-FOUNDER, AUDIO ENGINEER, TECHNICAL ADVISOR

Aug. 2017 - July 2018

- Recorded, mixed, and mastered for artists of various styles including acoustic, electronic, rock, country, and punk.
- Installed, repaired, and maintained speakers, microphones, keyboards, amplifiers, and other musical equipment.