

# HAO WU

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## Education

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### Carnegie Mellon University

Pittsburgh, PA, USA

Master of Science in Music & Technology

2023-Present

Current Grade: 4.0

Core Coursework: Digital Signal Processing, Advanced Digital Signal Processing, Machine Learning for Signal Processing, Computer System, Computer Music

Teaching:

- 18-290: Signals and Systems, Spring 2024 & Fall 2024, CMU  
Teaching Assistant, Hold Office Hours, Lead Recitation Sessions, Grade Homework

### Foshan University

Foshan, China

Bachelor of Engineering

6/2011

Electrical and Information Engineering

Awards:

- First Prize in Electronic Design Competition (School) 11/2009
- Excellent Student Cadre Award 2008-2009
- Academic Excellence Award 2007-2008

Extracurricular:

- Vice President of Guitar Association of School 2008-2009

## Research Experience

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- Master's Thesis Research 8/2024 – Present  
**Optimizing Automated Guitar Tablature Transcription by Prioritizing Expressive Techniques**  
Advisors: Professor Thomas Sullivan, Professor Richard Stern  
This research explores novel methods for improving guitar tablature transcription by emphasizing musical expression over mechanical efficiency. While traditional approaches often prioritize minimizing finger movement and hand repositioning, this study aims to refine transcription algorithms by integrating guitar-specific playing techniques. The goal is to create transcriptions that better reflect the musical nuances of the guitar, balancing playability with a more authentic and expressive representation of the music.
- Auditory Lab and Spatial Experiences Lab, CMU 5/2024 – 7/2024  
Research Assistant, Advisors: Professor Daniel Rosenberg, Professor Laurie Heller  
**The effect of motion on the integration of hearing, vision, and knowledge**  
Implemented a DOA algorithm using two microphones to evaluate the results of auditory perception experiments and calibrate the localization performance of the Wave Field Synthesis (WFS) speaker array system. Participated in a perceptual experiment to measure the angle at which localization becomes indistinguishable. Maintained a Max project for controlling the WFS system and interacting with a motion tracking system.

- Guangzhou Rantion Technology Ltd., Algorithm Team 04/2021 - 05/2023  
Audio Algorithm Engineer  
**Guitar Chord Recognition Algorithm**  
Designed a real-time guitar chord recognition algorithm using traditional DSP techniques, with a correction module based on music theory. Participated in non-real-time music chord recognition research, which uses machine learning techniques. Both algorithms are preliminary research tasks for potential future products of the company.

## **Work Experience**

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**Guangzhou Rantion Technology Ltd.** 04/2021 - 05/2023  
**Audio Algorithm Engineer** Guangzhou, China

Responsible for research and development of audio processing algorithms  
Accountable for building software testing platforms and audio frameworks  
Mentor other colleague engineers not familiar with instruments or music.

- Designed a real-time guitar chord recognition algorithm. Participated in non-real-time music chord recognition research based on ML method. Created desktop applications to demonstrate both algorithms.
- Developed Guitar Tuner algorithm and framework for the Donner Music app (Published on App Store).
- Participated in develop guitar effects for the Donner Arena2000 Guitar Multi-Effects Processor (available for sale) and independently developed a wireless control mobile app, ArenaControl (Published on App Store).
- Independently developed a real-time testing and visualization platform based on the JUCE framework, enabling the research team to perform A/B tests and visualize waveforms with customizable tags.
- Developed a cross-platform audio data routing and handling framework, called FUSION, for other application development teams in the company to use, easing their efforts in the low-level audio data management.
- Created a metronome audio framework for the Donner Music app (Published on App Store)

**Foshan Yunlian Technology Ltd.** 10/2017 - 04/2021  
**Senior iOS Developer**

Led a team of three in developing iOS apps for the company.

- Developed and maintained two apps: Lianhe Meeting (a multi-party video conferencing app) and Yidingdong (an instant messaging app), both published on the App Store.
- Designed the architecture for message routing, transformation, and persistence modules across all apps.
- Designed and implemented the network module, converting the requesting event into an object-oriented style, which improved the customizability and reusability of the network requests and reduced debugging time.
- Introduced the Swift and SwiftUI into the development process, increasing the development efficiency and speed.

**Guangdong Lingnanpass CO., Ltd.** 06/2016 - 10/2017  
**iOS Developer**

Responsible for cross-company universal SDK development and iOS app development for the city's public transportation system.

- Designed and developed a universal transportation card recharge SDK for cooperating companies, enabling their intelligent wearable devices to wirelessly recharge the transportation card. The SDK is compatible with future cooperating companies as well.
- Developed the official iOS app designed by the Guangdong Province Public Transportation Department, facilitating virtual transportation card management directly from users' cellphones.

**Guangzhou Niuyun Technology Ltd.**

05/2015 - 06/2016

**iOS Developer**

Responsible for the development and maintenance of a multi-party video conferencing app.

- Independently developed the Huixiang iOS app from the ground up.

**YAL Solution (startup)**

09/2014 - 02/2015

**Co-Founder**

My partner and I aimed to support underground bands and music enthusiasts by developing a rhythm mobile game to enhance the exposure of their music. During this project, I taught myself application development, initiated the program, and took responsibility for both technical implementation and creative direction.

**89 Instrument (startup)**

09/2011 - 07/2014

**Co-Founder**

Offer offline guitar courses.

Offer song mixing service for local bands and individuals.

Selling guitar-related products on the Internet.

**Music Experience**

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Over 15 years of guitar-playing experience

Released two albums with the band I played in from 2011 to 2019

Performed in over 60 live shows

Wrote a dozen songs for the band I played in before

Mixed the song demos and created live performance control DAW programs for the band

Taught guitar on weekends as part-time job at several musical institutions from 2011 to 2018

**Skills**

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**Programming Languages:** C, C++, Objective-C, Swift, Python, Nyquist

**Tools:** MATLAB/Octave, JUCE, PyTorch, VS Code, Xcode, Logic Pro, Protools, Max8, Latex

**Music Skills:** Guitar performance, Composition, Arrangement, Audio Mixing, Midi music editing,

**Languages:** Mandarin (native), English (proficient)