

# Combining My Passions

By Jeremy Grifski

When I was applying to grad school, I was not sure what sort of research I wanted to do. After all, as far as I know, I was the first person in my family to pursue a PhD. As a result, I did not have any research experience, and I was not quite sure where to start.

To attract universities, I decided to talk about my primary interests which are music, education, and computer science. Of course, since I was applying to a computer science program, I had to get more specific. As a result, I chose to talk about my interests in game development which ties in nicely with graphics and data visualization.

Ultimately, I ended up using a few buzzwords like virtual reality and gamification which caught enough attention to get me in at The Ohio State University. Since then, I have only dabbled in research, so the remainder of this piece will cover some of my unpublished research projects. By the end, I will touch on some of my research hopes for the future.

## JuxtaMIDI

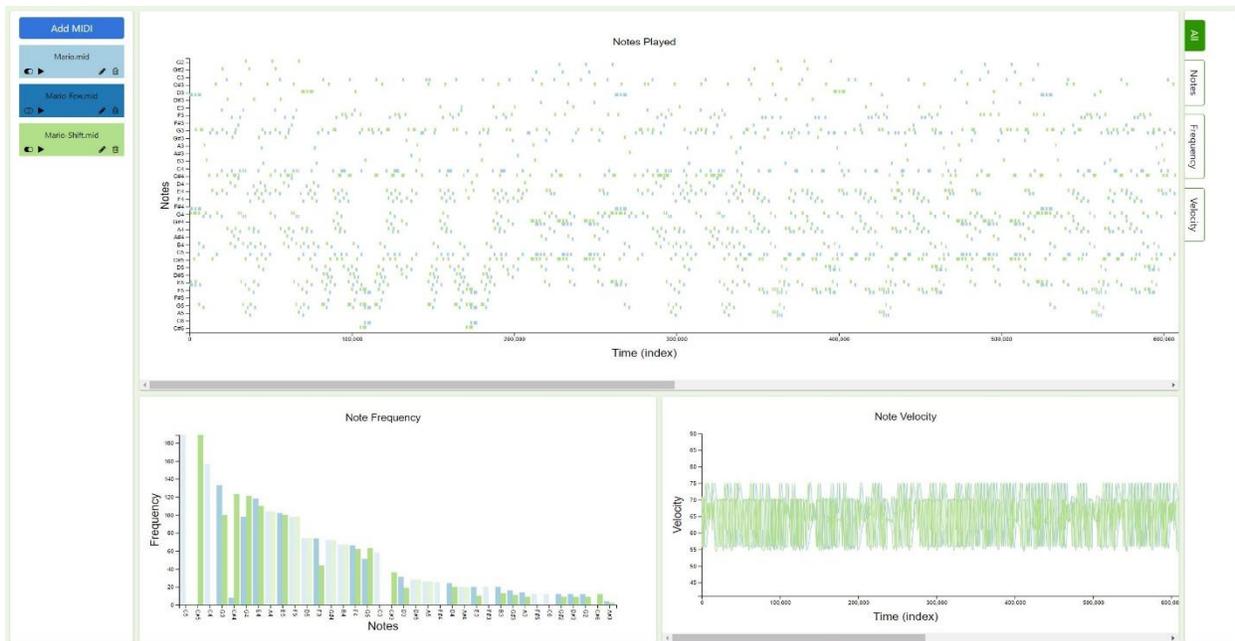


Figure 1: the JuxtaMIDI dashboard with three tracks.

During a data visualization course in Spring of 2019, I worked on a music data visualization tool called JuxtaMIDI. The goal of this project was to create a tool which could help a musician pinpoint their mistakes using MIDI recordings. As a result, the software was mostly targeted at pianists who could take advantage of the medium.

At a high level, JuxtaMIDI is a data visualization dashboard. To use it, the user provides a professional MIDI recording of a piece they want to practice (i.e. Ode to Joy). After uploading the piece, the dashboard will update to display three key segments of music:

- Notes played
- Note frequency
- Note velocity

Then, the user would upload one or more samples of their own playing which would display the results as seen in Figure 1. Ultimately, this dashboard would allow a user to isolate mistakes in their playing through various data visualization techniques (i.e. fading correct music segments, so mistakes shine through).

Overall, JuxtaMIDI seemed to work as expected, but there were a lot of ways we could have improved the tool. In general, we would have liked to do more complex data analysis to highlight regions in the music with the most egregious mistakes. That way, users could find those mistakes quickly. In addition, we wanted to be able to generate text recommendations, so a user would get feedback akin to a professional. Regardless, we felt the tool would have made a great addition to a musician's home practice routine.

## Future

Currently, I am looking to move out of the data visualization space and into the education space. Specifically, I want to improve my teaching through education-related research. For instance, I recently learned about the benefits of peer instruction, so I have included it in my teaching. Now, I want to take it a step further and give back to the education community through my own research.

At this time, I do not have any concrete research plans. However, I do have some specific interests. For example, I would love to focus on introductory computer science. To me, that seems like an area where we can do the most work to address problems with diversity, inclusion, and attrition. In addition, I'd love to find out where toxic tech culture originates, so we can begin to address it. Naturally, I think introductory computer science courses are a great place to start.

Overall, I hope to tackle the following research questions:

- How do we address attrition rates in computer science?
- How do we address toxic tech culture like gatekeeping and elitism?
- What teaching techniques can we use to promote inclusion?

Ultimately, my goal is to improve tech culture through computer science education.