Key Learnings:

Throughout this project, I explored using biofeedback data, specifically GSR data (galvanic skin response), to create an interactive music system designed for my personal use to calm down! My initial research showed that GSR sensors were a more affordable and viable option for real-time stress detection compared to HRV measurement tools, which is what I originally planned on using instead. In the end, I am very happy with all of the new things that I have learned and implemented to make this project a success! (I also definitely plan on developing this project further, possibly by figuring out how to link it up with my streaming playlists as well instead of the music tracks I made to accompany it in Ableton Live).

Technical Learnings:

- Hardware & Data…
    - Connected a Grove GSR sensor to a Raspberry Pi using a Grove Base Hat
    - Used PuTTY to run the necessary code for retrieving live data
    - Established a range-based classification system for stress levels
- Software & System Integration
    - Developed an API to retrieve live data into Max4Live.. And later on VSCode
    - Initially attempted to map stress levels to musical elements in Max/MSP, with early experiments including facial expression-based triggers
    - Encountered major inconsistencies in Max when processing rapid data streams from the sensor
    - Pivoted to using Python for more reliable control of Ableton Live, which resolved the technical issues
- Creative & Conceptual Development
    - Experimented with dynamic musical mapping, transitioning between chaotic and calm compositions based on stress levels
    - Considered integrating external audio sources (Spotify API) but focused on core functionality first
    - Learned the importance of flexibility in problem-solving, ultimately shifting from Max to Python for stability

This process significantly expanded my technical skills, troubleshooting abilities, and confidence in working with biofeedback and live music systems. Now, with the system running reliably, I'm excited to finalize the musical aspects and present the results!

Retrospective Submissions:

27 November 2024

Dear Klaus,

First of all, I wanted to let you know that I will be unable to attend today's class after all (I am actually writing this from the airport!)

Regardless, for my first project report: I have explored ways to use biofeedback data, particularly GSR (galvanic skin response) and heart rate, to create an interactive musical system. After researching available devices, I determined that GSR sensors offer an affordable and viable option for real-time stress detection, compared to HRV measurement tools.

The idea is to map the GSR data to dynamic musical elements, transitioning from chaotic to calm compositions based on the user's stress levels. Additionally, I am investigating how to (potentially) incorporate external audio sources like Spotify into the project, using tools such as the Spotify API and Max/MSP for real-time manipulation. This could involve "glitching out" a chosen song in response to stress levels, similar to neurofeedback platforms like Myndlift but adapted for music.

I am currently focusing on designing the mapping process and testing GSR data integration with Max with data sets that I found on Kaggle.

Thank you for your guidance so far, and I appreciate your understanding.

With gratitude,

Caitlin

10 December 2024

Dear Klaus,

I hope you're doing well! I sincerely apologize for missing this retrospective...I should definitely have made sure to add it to my calendar. To avoid this happening in the future, would you happen to have a full list of retrospective due dates? Or are they simply due every other Thursday? That way, I can mark my calendar and ensure I stay on track! :)

Regarding the actual retrospective: I've managed to link live facial expression data to trigger a "calm" or "stressed" jingle (a marimba playing either a pentatonic scale or a more chaotic pattern). I know it's not quite the same thing as the end goal of the project, but as we mentioned, anything to get started is a step forward! It's very basic at the moment, but I think it's a promising start, and it's been a great confidence boost for my tech skills.

Once again, I'm truly sorry for submitting this late. Thank you for your understanding, and I hope you have a wonderful day!

With much gratitude,

Caitlin

7 January 2025

Dear Klaus,

I hope 2025 has started off wonderfully for you! I'm writing to submit my second retrospective (due January 7th) a bit early to ensure I don't forget this time around :)

I'm happy to report that I've been VERY busy (but a good busy) over the last few weeks..my GSR sensor finally arrived! This is my first time working with a Raspberry Pi, so I've spent quite a bit of time learning how to use this fascinating (and embarrassingly highly confusing) little device and connect it to my sensor.

Here's what I've done:

- I connected the Raspberry Pi to something called a Grove Base Hat, which allows me to connect the Grove GSR sensor to the Raspberry Pi.
- After assembling the hardware, I then tackled the (EVEN BIGGER!) challenge of retrieving live data. This involved a lot of trial and error with instructions provided by the Grove GSR sensor for using something called PuTTY to establish and run the necessary code (which was listed on their website). It was tricky, but it works now!
- Then I was able to set up an API for Max4Live to retrieve live data from the sensor, which currently gives me values ranging from approximately 200 to 580.

From what I've learned, these values indicate stress responses:

- Lower values (around 200) correspond to high stress or panic.
- Higher values (450+) suggest a calm state.

Next, I worked on integrating this live data into Max. I accomplished this using the MaxURL object along with dict and js objects. My goal now is to sort these values into three distinct ranges:

- Under 300 = you need to calm down
- 300–450 = okay
- Over 450 = mega chill

Initially, I tried using a select object to handle this, but it didn't work as expected (but I'm almost positive it should so I'm going to keep trying there). Figuring out a solution to this will be my focus moving forward!!!

Thank you for your guidance as always, and I look forward to seeing you in class next week.

Wishing you a wonderful week ahead!

With gratitude,

Caitlin

21 January 2025

Dear Klaus,

I hope this email finds you well! I don't have much of an update since our last class, apart from the unfortunate news that I'm now extremely sick. The main challenge I'm currently facing is finalizing the Max patch to control Ableton. I'm hoping that by the weekend, I'll feel well enough to focus on it and resolve the issues once and for all.

Yesterday, I revisited the Max patch, but it's still behaving unpredictably and causing a lot of frustration. While I managed to clean up the patch significantly, it remains unreliable!! It works sometimes, and other times it doesn't (what??)

Strangely, restarting it seems to fix the issue temporarily without any changes being made. This inconsistency makes it difficult to trust the patch for our final presentation in class. I plan to take a deeper dive into troubleshooting this weekend when I'm feeling better and can approach it with a clearer head (and can see straight again!).

I also want to apologize for forgetting to submit this retrospective earlier. Your message in the WhatsApp group chat reminded me, so thank you for that! Although I already had it in my calendar, I didn't receive a notification for some reason. I've ensured that won't happen again!!

Thank you so much for your understanding, and I'll be sure to keep you updated on my progress with the patch. Wishing you a great day!

With gratitude,

Caitlin

4 February 2025

Dear Klaus,

I hope you're doing well! Before I begin my retrospective, I took one last look at the class submission requirements (thanks a lot for putting that in the WhatsApp group!) In addition to the document containing all retrospectives, a "learning journal" is also mentioned as a requirement. I've asked some classmates about this, but I haven't received a clear answer. Is the learning journal a separate submission from the retrospective document? If so, what format should it follow? I'd appreciate any clarification!

Regarding my retrospective, I've spent the past weeks iterating on various Max patches to control Live based on data from the server I set up for my GSR sensor. However, all iterations exhibited unexpected behavior, and completely illogical (I was losing my head!) Based on others experiencing similar issues with these types of projects, I suspect that Max struggles to process the rapid data influx from my GSR sensor, leading to these issues.

At one point, I was completely and totally devastated and thought I'd have to change my project entirely after all this effort. However, after venting about my "crisis" with a colleague at work, they suggested controlling Max with code instead (thank goodness for the development team!), as it wasn't actually necessary to use Max because I didn't even need it for sound.

A quick Google search led me to some Python code that, with minor adjustments (also thank goodness for ChatGPT!!), I could implement almost immediately in VS Code and communicate properly with Ableton.

Now, everything is working as expected, and I’m just putting the finishing touches on the music itself (finally, something I actually am familiar with)! I’m excited to share the final result with you and the class next week, as it’s (finally!) running reliably.

Looking forward to your response!

With gratitude,

Caitlin