Introduction to Programming II
Final project submission [002]

List the modifications and extension that you have made to the template file (400 words).
For each extension your answer should include:

- **What is the function of the extension?**
- **How does the code fit into the templates design?**
- **How have you structured the extension's code?**

In the previous phase, I had integrated three extensions for the Music Visualizer: Ridge Plots, Circular Wave Pattern and Music Bars. To improve on this project, I introduced fireworks to the Circular Wave Pattern extension, changed the Ridge Plots extension to be 3-dimensional, allowed users to change the audio and improved the GUI of the visualisation. These tasks challenged me to use concepts taught outside of Coursera videos and do extensive research to successfully complete them.

For the Circular Wave Pattern extension, fireworks beat detection and a HSB colour scheme was introduced. This function of the extension is to allows users visualise the waveform and beats detected in the audio. Initially, the Circular Wave Pattern extension was simply three pulsating rings that synchronises with the music. Subsequently, by detecting the beat of the music, I incorporated a rhythmic firework pattern that "explodes" randomly onscreen. This was applied from week 13's lecture as the fireworks is added whenever a beat is detected. I applied the HSB dynamic colour scheme which allowed the visualisation to stand out against the black background.

Secondly, I converted the Ridge plots extension from 2-dimensional lines to 3-dimensional points that resemble the Star Wars title crawl. The function of the extension is to create a perspective based visualisation, resembling ridge plots using points, based on the music. This extension generates and displays a series of graphical plots, based on audio waveform data. Applying a perspective effect gives a 3-dimensional illusion that was achieved by altering the plots' z-coordinates. To prevent the accumulation of plots onto the screen, the older waves were removed from the canvas upon reaching a boundary. Following the Circular Wave Pattern's HSB colour scheme, I implemented it to the Ridge Plots as well to make it visually appealing.

Lastly, viewers were given the option to change the music and observe changes reflected on the extensions. The GUI was also improved for users to have a pleasant experience. Supporting multiple sounds required me to refactor various controls. Previously, the extensions only responded to one audio controlled by playback. I improvised the respective js files to be inclusive of other audios. The varying sounds show how different factors affect the extensions. I also changed the GUI to be two different dropdown menus: one to change audio and another to change between extensions. Changing the font was the cherry on top as it complemented the project's theme.

Overall, the code follows an object-oriented structure where each visualization and component is encapsulated within its own module. This modular approach makes the code more organized, and allows for easy extension or modification of individual.

Describe how effective your plan was in completing your project (250 words).
Your answer should include:

- **How well did you stick to your schedule?**
- **Did you divide up the task and the time effectively?**
- **Did you have an unexpected difficulties or challenges?**

The effectiveness of the plan in completing the project can be described as highly successful. The project adhered closely to the planned schedule and tasks were divided meticulously. Facing unexpected difficulties and challenges allowed me to challenge myself and think deeper about the implementation.

I could stick to my schedule really well as planning my time and milestones allowed me to narrow my focus and allowed the project to progress steadily with minor hiccups. The weeks were surely enough for me to focus on the required tasks and plan. Each task was divided into sub tasks allowing me to complete the project with ease as I conquered little tasks at a time while also having time for testing and debugging my code. This allowed me to focus on one area of expertise at a time and even improve on components I had previously not planned such as the Ridge Plots. In times I was faced with unexpected challenges, I allocated extra time to solve the problem faced and researched on the problem. Breaking these complex issues into smaller, more manageable components facilitated targeted problem-solving. Having extra time allocated for testing and user feedback allowed me to improve on the project and have a satisfactory end product.

In conclusion, the project plan demonstrated high efficiency and adaptability, effectively navigating unforeseen difficulties. The ability to adhere to the schedule, combined with a strategic approach to task division and a commitment to improvement, ensured a successful project outcome.

Evaluate the process of completing the project and how effective the final product is. (250 words)
Your answer should include:
<u>Self-evaluation of the process of completing the project.</u>

- **You may find it helpful to reflect on your plan and think about what you might do differently next time.**

<u>Have you performed any system testing or user testing on your application?</u>

- **What errors did you uncover?**
- **How did users respond to the application?**
- **How would you rectify these in a future version of the application?**

Completing this project has been both challenging and rewarding. While I'm proud of the final product and the effectiveness of my overall plan, there were valuable lessons that I learnt.

One area where I excelled was in time management and adhering to my schedule. Setting clear milestones and allocating specific timelines for each task allowed for a structured and efficient workflow. However, I did underestimate the complexity of certain challenges, especially when implementing concepts outside the scope of the lectures. For example, making the Ridge Plots extension 3-dimensional was a cool concept I had thought of. However, implementing this was strenuous and took more time than I had initially planned.

In retrospect, breaking down some of the larger tasks into smaller sub-tasks might have been beneficial. Regarding testing, users responded positively to the application's functionality and design but pointed out usability issues, such as unclear instructions. Previously, users were not made aware that they had to click the spacebar to reveal the menu. In a future version of the

application, I rectified these issues by improving the user interface and ensuring all instructions are concise and user-friendly where I used drop-down menus.

In summary, the completion of this project was a learning experience. It highlighted the importance of accurate time estimation, thorough research, and effective problem-solving. The final product is a testament to the effectiveness of the planning process, but there are always areas for improvement in future iterations.

List any external sources that you have actively utilised in your project.
Your answer should include:

- **any code you have used from external sources verbatim**
- **any code where you have taken inspiration from although adapted and refined for the project (such as pseudocode algorithms or code pens)**
- **any online help forums you have taken code from (i.e. StackOverflow or library documentation)**
- **any third-party libraries you have used.**

You do not need to include everything you have read or that has helped you. Only where you have used or adapted code that appears in your project.
This can be a revised version the answer you provided for the midterm.
There is no word limit for this answer.

1. Code an Audio Visualizer in p5js by Colorful Coding: https://youtu.be/uk96O7N1Yo0
2. Git Hub music visualizer: https://github.com/Ronik22/Audio-Visualizer
3. p5js reference for dropdown menu: https://p5js.org/reference/#/p5/createSelect
4. How to style 3D shapes in a 2D plane: https://github.com/vincentntang/canvas-vanishing-points