

## **Project Details**

### **“Pōwehi”**

#### **Game Flow:**

**Introduction Page:** Users begin with an introduction page that includes game instructions and an overview of the James Webb Space Telescope, including its functions and basic information.

**Game Mechanics:** The game starts with a timer and consists of 12 stunning Webb images. Players navigate through space by scrolling from one image to another, with informative content about the upcoming image appearing as they scroll.

**Guided Experience:** A character named Sun assists users by clarifying complex terminology, enhancing their understanding of the information presented.

**Atmospheric Sound Design:** While traversing empty space, players are immersed in eerie space music. As they approach each image, they experience music generated by our unique code, further enriching the gameplay.

**Quiz Element:** Upon reaching each image, players must answer a quiz question to proceed. They are allowed unlimited attempts to promote learning while incorporating a competitive element for added fun and motivation.

**Conclusion:** The game culminates with a deep field image, showcasing the farthest reaches of the cosmos captured by the Webb Telescope, marking the end of their journey.

**Leaderboard:** A leaderboard ranks players based on the time taken to complete the game, enhancing engagement and encouraging repeated play.

**Archive Access:** Users will have access to an extensive archive of over 500 images captured by the James Webb Space Telescope. Each image is accompanied by spatial audio that enhances the viewing experience. Additionally, users can explore detailed descriptions of how the music was created, providing insight into the artistic process behind the soundscapes.

#### **Benefits**

**Accessible Language:** The game employs clear, easy-to-understand language, making complex concepts more approachable for all users.

**Educational Support:** The character Sun provides enlightenment on difficult terms, fostering understanding and stimulating further interest in space science.

**Healthy Competition:** The competitive element encourages players to engage in friendly rivalry, igniting curiosity and promoting shared experiences among friends and family, appealing to audiences of all ages.

**Inclusivity:** The game is designed to impart knowledge even to those with no background in space technology, making it accessible to a wide audience.

**Emotional Connection:** The audio output creates a captivating experience, sparking interest in musical theory and the sounds of space.

**Creative Insight:** Players gain imaginative insights into the auditory landscape of the universe, enriching their understanding of both space and sound.

## **Objectives**

**Awareness:** Our goal is for every player to gain an understanding of the fundamental aspects of this groundbreaking project of the decade.

**Encouragement of Inquiry:** We aim to inspire players to think outside the box and cultivate a passion for scientific exploration as well as gain an understanding of musical theory in the imaging perspective.

**Critical Thinking:** Enhance players' critical thinking skills through engaging quiz questions that challenge their understanding and encourage deeper reflection on the content.

**Inspiration for STEM Careers:** Spark interest in STEM fields, motivating players to consider careers in science and technology by showcasing the wonders of space exploration.

**Future Generations:** By supporting curiosity and creative thinking, we hope to pave the way for the next generation to explore their inquisitive nature and expand their horizons.

## **Technical Aspects of the Project:**

### **Music Generation:**

#### **General Information**

This code utilized an intricate set of functions to convert visual information from the James Webb Telescope imagery into musical components.

**Music is produced through the detailed visual features analysis of the image such as:**

- Color information
- Brightness
- Complexity

**The system maps these elements to musical parameters such as:**

- Tempo
- Key
- Scale
- Instrument selection

**The program leverages computational methods to:**

- Form motifs
- Establish melodic themes
- Design patterns
- Progress chords
- Create other melodic elements

**Tools and Technical details:**

**1. Coding language:** This program was implemented using Python.

**2. Image processing:** OpenCV (cv2) and PIL (Python Imaging Library) were used for the image manipulation and analysis. Colorsys was utilized to convert between different color spaces.

**3. Musical generation:** The code employs custom functions to determine musical aspects based on the image data. Some examples for such mapping include:

- a. Color information to key and scale selection
- b. Brightness and complexity to tempo calculation
- c. Edge detection to rhythm complexity
- d. Luminance to general volume

**4. Audio creation:** We used the midiutil library (MIDIFile) to create musical data as MIDI files

## **Gameplay**

We created the complete design for the 'Powehi' webapp on Figma, including all interactions and user flows. Our design encompasses:

- **Landing Page:**
  - An visually intriguing introduction to 'Powehi' with cosmic imagery
  - Clear navigation options and a prominent "Login or Sign up" call-to-action
- **Login Page:**
  - User-friendly login form with options for user name
  - Smooth transitions and feedback
- **Instructions Page:**
  - Step-by-step guide on how to use the 'Powehi' webapp
  - Interactive elements to demonstrate key features
- **Game Flow Section:**
  - Immersive scrolling experience simulating travel through space

- The user advances through different cosmic locations, each offering unique experiences:
  - a. Scrolling mechanism that responds to user input
  - b. Key concepts highlighted throughout the user journey to ensure the educational aspect of the application
  - c. Interactive elements throughout the flow, including the 'Helper sun'
- **Quiz Pages:**
  - A quiz page for every destination, ensuring the user is attentive and engaged throughout the experience
  - Validation to ensure the user gets the answer right every time
- **Thank you Page:**
  - A page marking the end of the game
  - Navigates to the leaderboard page
- **Leaderboard page**
  - Summarizes the user's journey and performance
  - Displays the user's score and ranking among other players