1 line summary: In this project, we learned about waves, properties of waves, and how they affect music, using python programming.

4 line summary:

1. Wave is a disturbance that is moving forwards and backwards in a systematic way like when we drop a stone in water.

2. Waves have different properties like wavelength, frequency, velocity, amplitude and attenuation factor, which we can change.

3. We looked at how wave properties change music, like on a flute when the wavelength increases we get a lower note and when the wavelength is smaller, we will get a higher note.

4. To do all this, we created two functions with the help of AI and python libraries – one to create 2D and 1D wave images using wave properties as parameters and the other to play musical notes when we give musical notes as parameters.

Full Presentation:

1. Title: In this project, we learned about waves, properties of waves, and how they affect music, using python programming.

2. First water waves image: Wave is a disturbance that is moving forwards and backwards in a systematic way like when we drop a stone in water the waves will come around the point where we drop the stone and go away while the wave's height is decreasing. Waves have different properties. They are wavelength, frequency, velocity, amplitude and attenuation factor.

3. Wave properties image: In the first picture, it shows 2D waves that appear on water surface when we drop a stone in the water and the 1D picture shows the height of the waves as the waves move along the radius away from the point of where we drop the stone. From the top first picture to the bottom first picture, the wavelength is increasing in the bottom picture, that means distance between the waves is increasing. Wavelength is the distance between the starting of the first wave and the starting of the second wave. From the top left picture to the top right picture the amplitude is decreasing, that means the height of the wave is decreasing. From the top left picture to the bottom right picture the attenuation factor is increasing that means the amplitude is decreasing as the wave

moves away from the point where we drop the stone. We can see velocity of waves changing on the laptop.

4. Music Images: Now we try to learn how wave properties affect music. In flute, from the blowing hole to the first open hole, that's the wavelength for F#. If we blow closing the first three holes we get the wavelength for the note C. So when the wavelength is increasing we get the lower note. In flute when we move from left to right the wavelength increases and we get a lower note. In piano, when we move from left to right we get higher notes meaning the wavelength of the waves are decreasing. Velocity of the sound does not change in the air meaning the speed of the sound waves in the air is always the same. Wavelength x frequency is velocity so when the wavelength increases frequency decreases. When the amplitude of the wave increases the volume increases. Attenuation is higher for piano than for harmonium. We change the frequencies to hear different notes on the laptop.

5. Python code: To check all of this, we wrote two functions in Python programming language with the help of AI and python libraries. The first function takes wave properties as parameters and gives 2D and 1D images of those waves. The second function takes musical notes as parameters and plays those musical notes. I used these functions. For the first function, I passed different wave properties as parameters and saw how the waves changed. For the second function, I passed different musical notes and saw how the sound changed.

6. Scientific method and conclusions: We didn't not strictly follow the order of the steps for scientific method as our project is a modeling experiment. My question is to check if wave properties and musical sounds are related. My hypothesis is that when we change way properties it also changes musical sounds. For our experiment and data collection, we used Python programming. We also tested how wave properties change musical notes in flute and also in piano. My conclusion is wave properties affect the musical notes. When the wavelength increases or frequency decreases, we get lower notes and when we increase the amplitude the volume increases. Also, the attenuation factor is high in piano and low in harmonium.

7. References: We used these sources as references for PyCharm, Google AI and OpenStax Science textbook.

AI Summary of Poster: (AI didn't say much about how wave property changes affected the images)

This file is a poster presentation about the relationship between **wave properties and music**. The research was conducted by Virata Pusuluri.

Key Findings:

- **Wave Properties and Musical Sounds:** The project explores how properties of waves, such as wavelength (λ), frequency (ν), amplitude (A), velocity (V), and attenuation factor (f), influence the sounds produced by musical instruments like the flute and piano.
- **Changing Wave Properties:** Altering wave properties like frequency (ν) and wavelength (λ) results in different musical notes.
- **Amplitude and Volume:** The amplitude (A) of a wave corresponds to the volume of the sound.
- **Velocity and Sound in Air:** The velocity (V) of sound in air is constant.
- **Attenuation and Instrument Sound:** The attenuation factor (f), which affects how quickly a sound fades, is higher for a piano than for a harmonium.

Methods:

- **Python Programming:** The project utilized Python libraries to create functions for plotting waves and simulating how they propagate.
- **Google Gemini AI:** Google Gemini AI was also employed in the research, likely for additional analysis or modeling.
- **Musical Notes:** The study involved playing Indian Carnatic music songs based on specific musical notes to understand the connection between wave properties and the perceived sound.

Scientific Method:

The project followed the scientific method:

- **Question:** Investigating the relationship between wave properties and musical sounds.
- **Experiment and Data Collection:** Using Python modeling to simulate and analyze wave behavior.
- **Hypothesis:** Proposing that changes in wave properties would lead to changes in musical sounds.
- **Testing:** Conducting experiments with a flute, piano, and Python simulations.
- **Conclusion:** Concluding that frequency and wavelength influence musical notes, amplitude affects volume, and the attenuation factor varies between instruments.

References:

The poster cites PyCharm, Google Gemini AI, and OpenStax Physics as references used in the research.