Programming in Science - Project

Project: Data Visualization

For this project, you are provided with the **mathematics.csv** file containing a dataset that includes values of **x** and their corresponding **y** values based on the equation **y = x^2**. Additionally, a **logarithm_noisy.csv** dataset has been provided, which contains logarithmic values with added white noise. Your task is to analyze this data and create various visualizations following these instructions:

1. Scatter Plot: (20%)

- Create a scatter plot to visualize the relationship between **x** and **y**, where **y = x^2**.
- Ensure that the axes are labeled and the plot has an appropriate title.

2. Logarithmic Regression: (20%)

- Use a logarithmic regression model to fit the noisy logarithmic data.
- Plot the best-fit logarithmic curve on the scatter plot.
- Ensure proper axis labeling and titling.

3. Square Root Regression: (20%)

- Fit a square root regression model to the data.
- Plot the best-fit square root curve.
- Ensure the plot clearly shows both the data points and the regression line.

4. Additional Complexity: (20%)

- Calculate a new **y** value based on the equation **y = x^3** and add it to the dataset.
- Create a 3D plot visualizing the relationship between **x**, **y(x^2)**, and **y(x^3)**.

5. Animation: (20%)

- Create an animated plot for **y = x^2**, where the plot progressively adds data points to simulate the evolution of the graph over time.
- The animation should be saved as a GIF.

Guidelines:

- Use libraries like matplotlib, numpy, pandas, etc. to generate the required plots.
- Save each plot as an image file or GIF as instructed.
- Ensure all visualizations are clear and well-labeled.
- Submit your code and all the generated images and animations for evaluation.