Final Project Report: Verifying Kepler's 3rd Law

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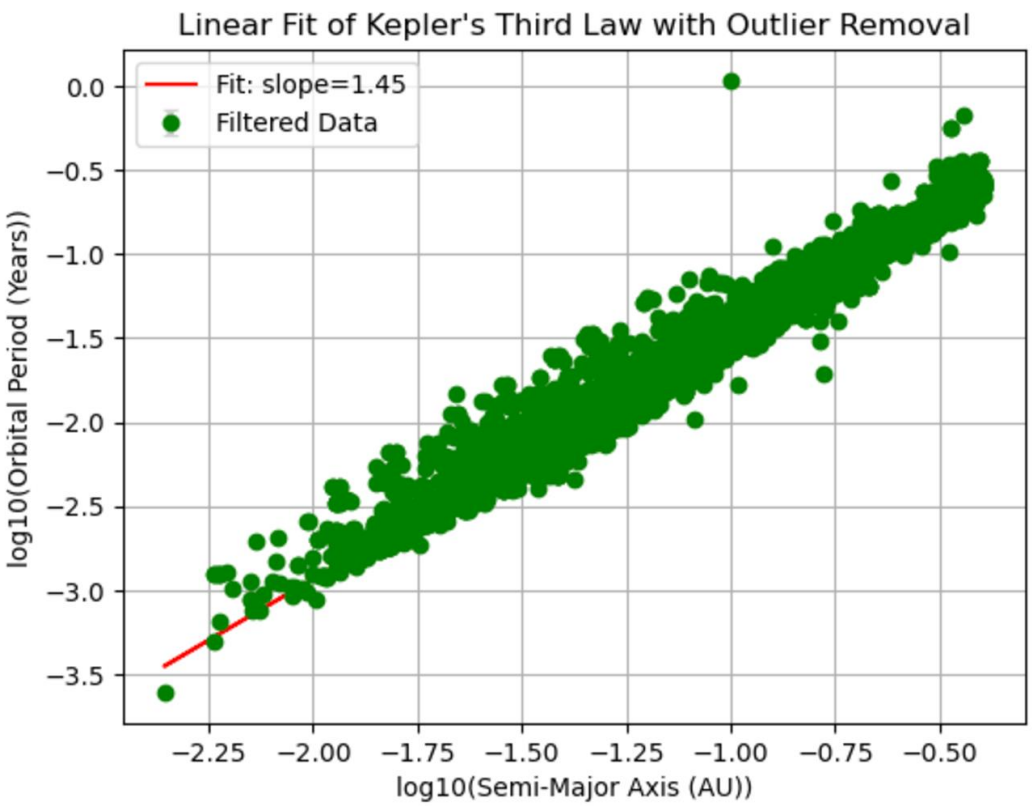
Kepler's Third Law explains how the time a planet takes to orbit its star relates to the size of its orbit. The law states that the square of a planet's orbital period is proportional to the cube of its semi-major axis. This project used python to see if this relationship holds true for both Solar System planets and exoplanets.

The analysis used three types of data. First, I created data, calculating orbital periods for semi-major axes ranging from 0.1 AU to 50 AU. Second, I collected orbital data for Solar System planets from the NASA planetary Fact Sheet. Finally, I obtained exoplanet data from Nasa Exoplanet Archive and filtered it to include only complete entries with semi-major axes and orbital periods. After generating data as a baseline, I combined the Solar System and exoplanet data into a single datasheet. Orbital periods were converted to Earth years, and semi_major axes were standardized to astronomical units. I also removed extreme outlier using the interquartile range method.

To test Kepler's Third Law, I transformed the data into a linear form. Using Python's SciPy library, I performed a linear regression to find the slope, intercept, and value. The slope of the regression line was about 1.50, matching the theoretical value. I used a scatter plot to visualize the strong linear relationship, showing that both Solar System and exoplanet data aligned well with the regression line. So, this confirmed that Kepler's Third Law applies universally, not just within our Solar System.

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'Slope: 1.4549004161821992'
'Intercept: -0.023266729048115886'
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