EXPLORATORY DATA ANALYSIS ON ASTEROID ORBITAL ELEMENTS AND NEAR-EARTH OBJECT TAGGING USING DESCRIPTIVE STATISTICS

Using Python's NumPy for calculations and Pandas for Dataframes

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COMPUTATIONAL THINKING WITH PYTHON

Google Colab Link:
https://colab.research.google.com/drive/11P8E8sSsJv6PkBIJ4Dht3PyiPn_B4RFy?usp=sharing

VARIABLES CONSIDERED IN OBJECT TAGGING:

- Near-Earth Objects, abbreviated as NEOs (Yes/No)
- Eccentricity (Rate, Unitless)
- Semi-Major Axis (in AU)
- Perihelion Distance (in AU)
- Inclination (in Degrees)

Number of Objects Tagged: 1819

Number of NEOs: 1599

Number of Non-NEOs: 220

**AU = Astronomical Units = 149,597,870.7 km (92,955,807.3 miles)
- Mean Distance between the Sun and the Earth

CONSIDERED VARIABLES AND THEIR DEFINITIONS:

Near-Earth Objects (NEOs) - Yes or No:

Space objects flagged as Near-Earth are those with a trajectory of 0.3 AUs (approx. 45,000,000 kms.) relative to the Earth, and 1.3 AU relative to the Sun.

Diameter (in Kilometers):

The totality of a space object's coverage of space measured by a measuring line passing through the center, meeting both ends of the asteroid's circumference.

Asteroid Eccentricity (Unitless):

A measure of asteroid trajectory where its rate of ellipticity is measured unitless.

Semi-Major Axis (in Astronomical Units, AU):

A measure of asteroid trajectory by its mean or average distance relative to the Sun.

Perihelion Distance (in Astronomical Units, AU):

A measure of asteroid trajectory by its closest possible distance relative to the Sun.

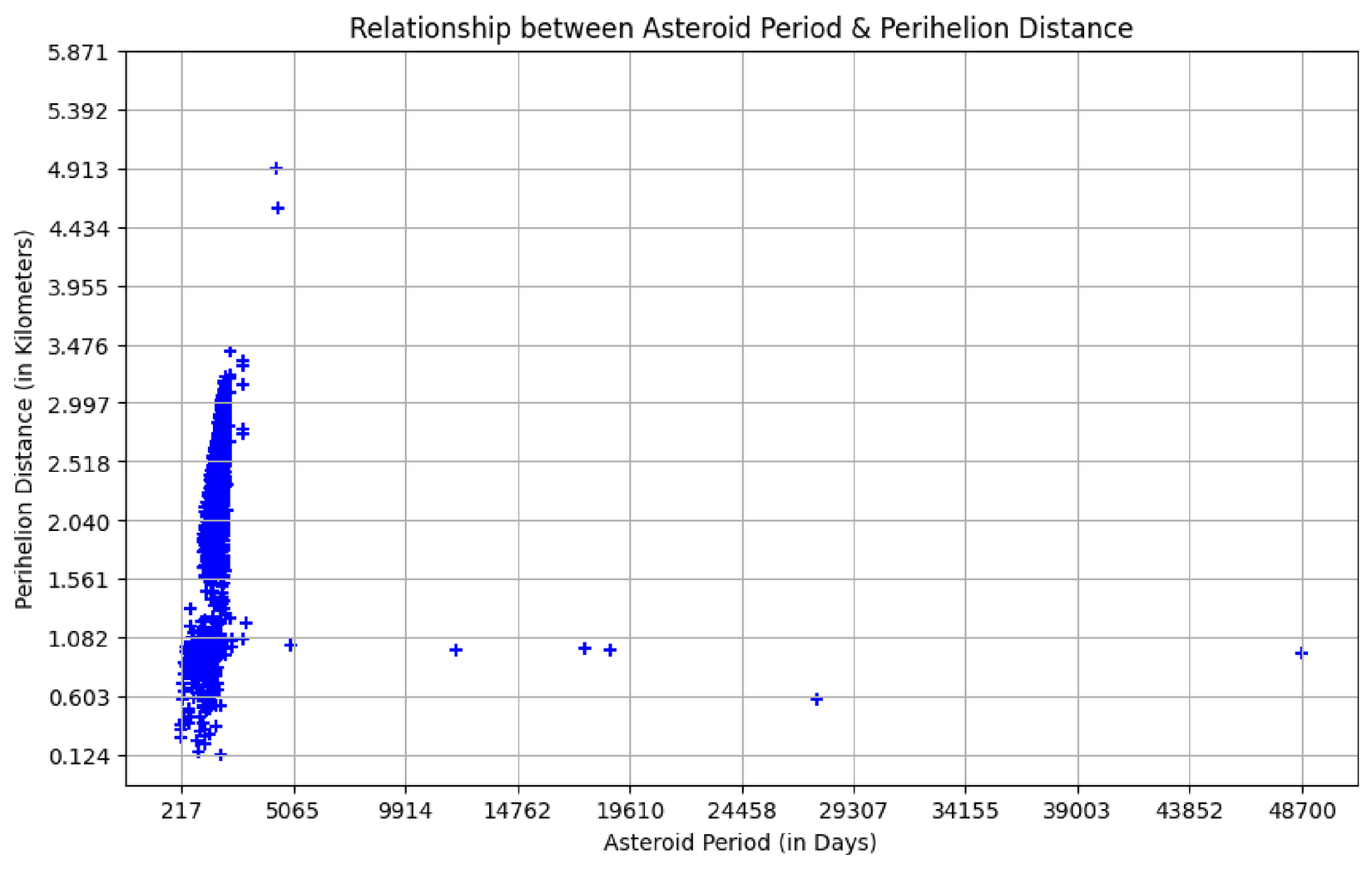
Inclination (in Degrees):

The angle between orbit and the ecliptic plane, reference plane (from Earth) in degrees.

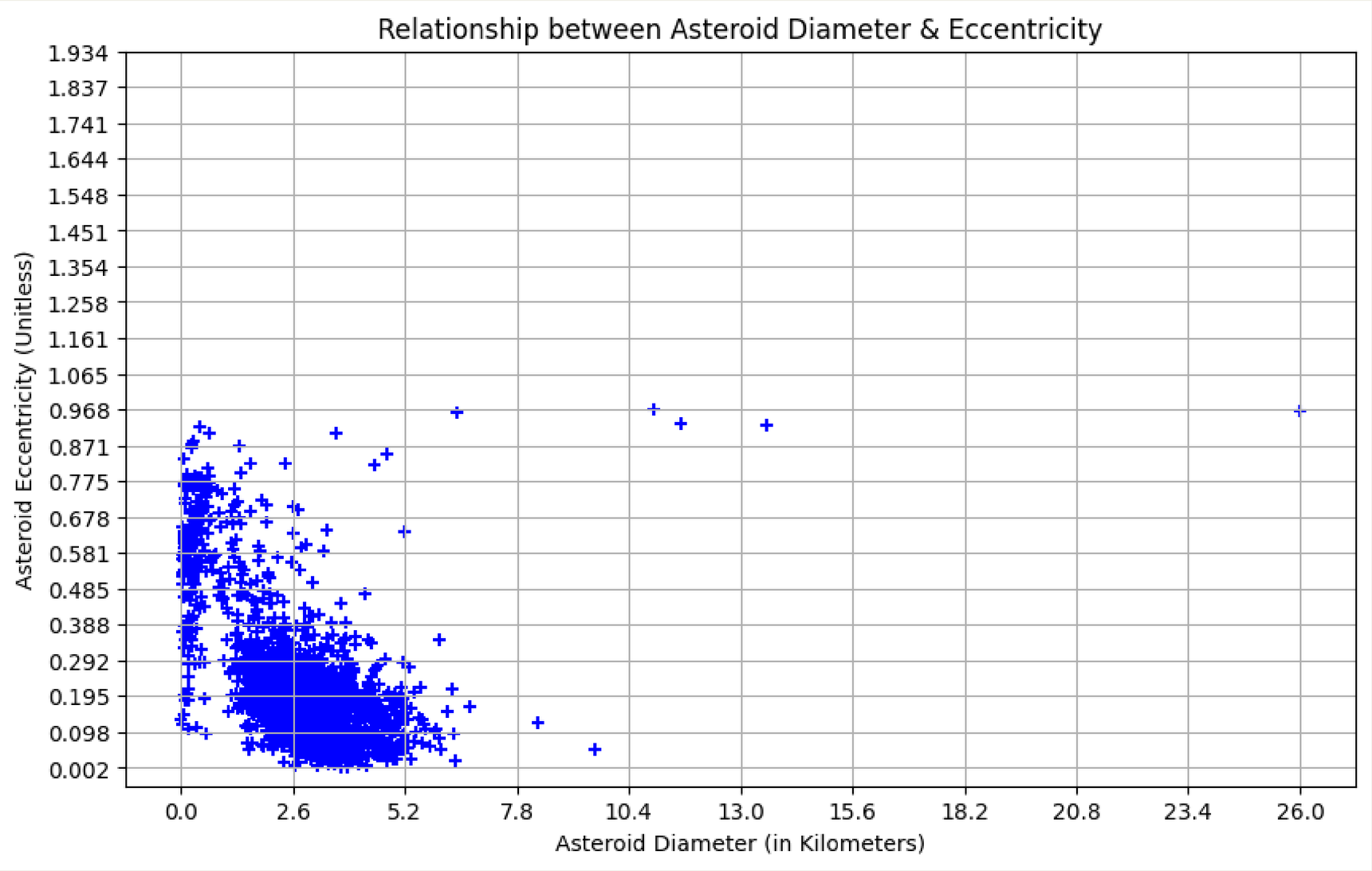
Period (in Days):

The time it takes for a tagged object to complete its own orbital revolution measured in days.

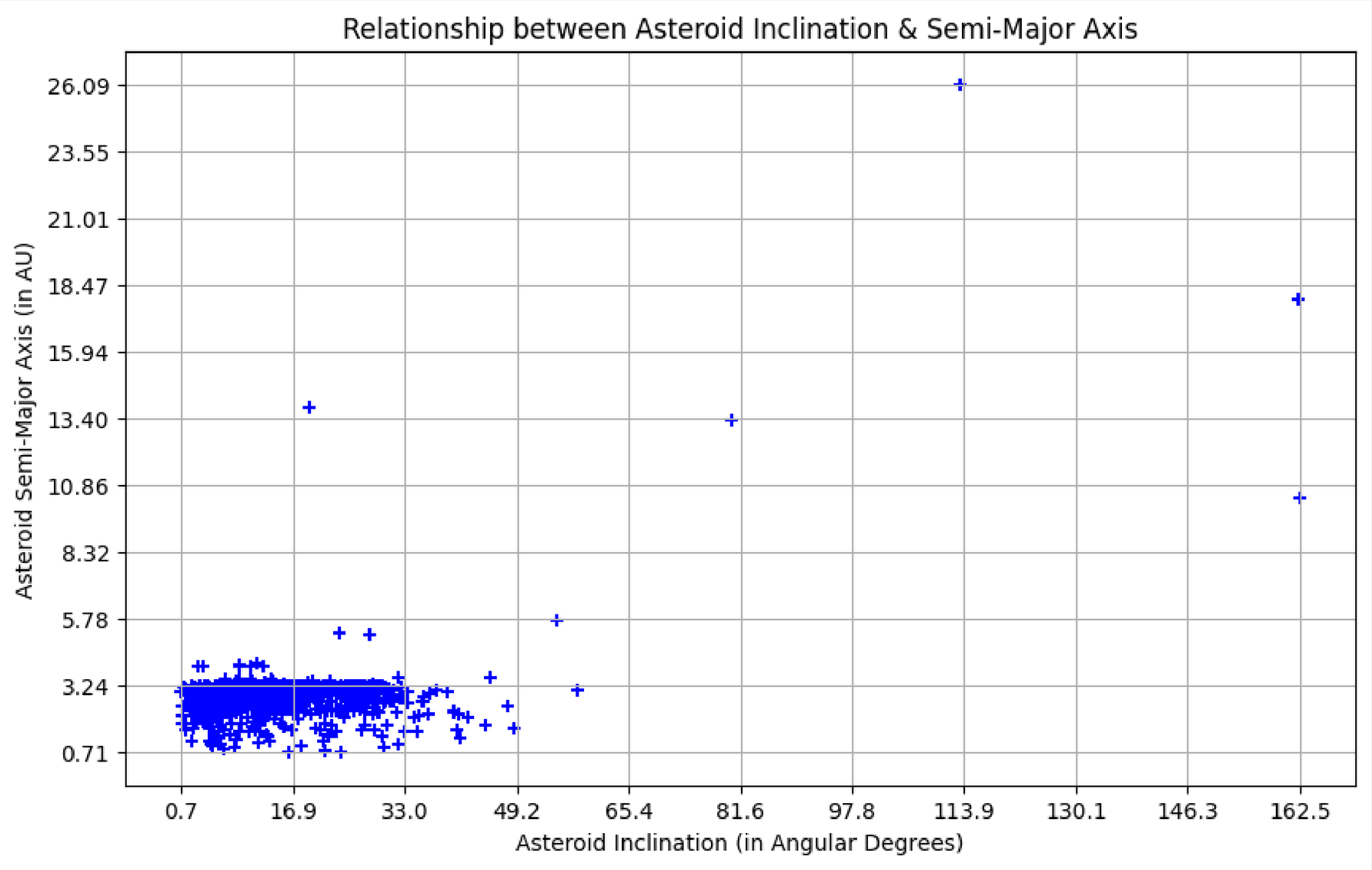
GRAPHS AND RELATIONS OF RELATED VARIABLES USING MATPLOTLIB (PERIOD & DISTANCE)



GRAPHS AND RELATIONS OF RELATED VARIABLES USING MATPLOTLIB (DIAMETER AND ECCENTRICITY):



GRAPHS AND RELATIONS OF RELATED VARIABLES USING MATPLOTLIB (INCLINATION AND S-M AXIS):



SAMPLE CODE FOR PLOTTING THE GRAPHS USING MATPLOTLIB

```
import pandas as pd
import matplotlib.pyplot as plt

filepath = '/content/asteroidData.csv'
data = pd.read_csv(filepath)

x_column = 'period'
y_column = 'perihelionDistance'

x = data[x_column]
y = data[y_column]

plt.figure(figsize=(10, 6))
plt.scatter(x, y, color='blue', marker='+')

plt.xticks(np.arange(min(x), max(x)+1, (max(x)-min(x))/10)) # Start, Stop, Step. Minimum, Maximum values of x, (Max-Min)/10 for Step.
plt.yticks(np.arange(min(y), max(y)+1, (max(y)-min(y))/10))

plt.title('Relationship between Asteroid Period & Perihelion Distance')
plt.xlabel('Asteroid Period (in Days)')
plt.ylabel('Perihelion Distance (in Kilometers)')

plt.grid(True)
plt.show()
```

**Graph conveys relationship between Period and Perihelion Distance