

DSC 430: Python Programming
Assignment 1002: Closest Planet

Continuing our investigation in the which planet is closest to Earth, create a simulation that runs for 1000 Earth years. On each day, compute the distance between every pair of planets, keeping the average.

Create a final report with the following sections:

- 1) A well-documented top-down structure chart showing how both the planets and the simulation work and interact. Include any assumptions you made about your design.
- 2) Create a 8x8 chart showing the average distance between all the planets.
- 3) Which planet is on average closest to Earth? Did that result match your expectations? Explain.
- 4) Run another simulation, this time for only 1000 days, each day writing to a file the distance from Earth to Mercury, Venus, and Mars. In the end, you should have a dataset with 1000 rows and 3 columns. Using Pandas and Matplotlib, create three timeseries. Describe the time-series and discuss them considering your findings in #3.
- 5) Describe three ways you could extend the simulation.
- 6) Include all your code of the simulation and analysis in an appendix to your report.

Record a three-minute video in which you run the Pandas and Matplotlib code. Then, present your code. Specifically, answer the following questions:

- How efficient is your simulation? Can you do better?
- When computing the average distance between planets, would it be better to sample random days rather than iterating over every day for 1000 years?
- What was your original assumption regarding the closest planet to Earth? Did the results match your expectation? Does the definition of “closest” matter?

Submission: Submit a single **.pdf** file.