

Physics 325 — Scientific Computing — Fall 2016 — Lab 02

September 1, 2016

Exercise 1. Reading CO₂ Data

The file "co2_mm_mlo.txt" contains data on the CO₂ content in the atmosphere as measured at the Mauna Loa Observatory. It has a significantly long header describing the data and then delimited values after. You will have to inspect the file to see the line number for which the header ends and data begins using an editor or other tool.

1a: Write a script to read the data into a single numpy array and use the array indexing of python to plot the decimal date vs. average for the first 60 months. Comment on the shape of the data and any anomalies you see. (10 pts)

1b: Investigate the use of the pyplot savefig command to save a hardcopy of the plot in 1a, and create a plot file in jpg format. Learn about and use the plt.ylim function to restrict the plotted range of the y-axis to enhance the view of the data oscillations. Include the plot file in your submission (5 pts)

1c: Use a for loop or direct vectorized equations to plot the difference between the interpolated data and the seasonally corrected trend. Save a hardcopy and include in your submission. (5 pts)

1d: With the instructor explore and use the numpy savetxt function to write a file containing only the decimal date and trend columns. Write all values to keep only 3 decimal places using the "fmt" parameter. (5 pts)

Exercise 2. Initial Integration

Using the code from the "Midpoint Integration" notebook or trapezoidal.py, alter the program to calculate $\int_0^1 \sin(x)e^{-x}dx$. You may need to investigate math.sin and math.exp. Calculate for 10 and 100 bins. (5 points)