ASTR 400B Research Assignment 5: Hack Day 2

Due: April 22 2025 9 AM + Class Hack Day April 22

Prepare for an in-class code check-in. If you cannot make it in person you must contact Dr. Besla and the TA.

The goal of this check in is to look over PLOTS. The aim is to have at minimum one plot completed by the code check in, but ideally two.

This assignment will be graded on a 3 point scale:

- 0 = didn't do the code check-in

- 1 = no plots but plan is detailed in documentation for at least one plot

- 2 = one plot completed. No documentation for 2nd plot outlined

- 3 = one plot completed. Detailed documentation for a 2nd plot (or ideally, 2nd plot complete).

1 The Assignment

You are expected to push your code for your research project to your Github account by the morning deadline (9 AM AZ time) in a new folder called ResearchAssignment5.

We expect the following:

1.1 Explain your Goal in Code Documentation

1. At the top of your primary code write a detailed set of comments (or use a markdown box) that states the topic of your research project.

2. Many of you have outlined multiple questions to pursue. For assignment 3 you were to pick ONE of those questions and add it to the comments (markdown). For this assignment include more documentation if you are pursuing other questions.

3. Code must be documented, with each step outlined and all parameters defined.

4. Equations must have references to papers if applicable.

5. Code can be largely based on Homework Assignments and In Class Labs, but there **must be at least one function or method that YOU created.**. Indicate this new code in the code documentation. You can get help from others, but must acknowledge their support in the code description, and they cannot use the same code in their submission.

6. Your code cannot be one long stream on consciousness or even one code with multiple functions. You must import some code from separate classes or functions. E.g. importing functions/methods from past homeworks or labs. You can also create your own standalone functions that you then import. Consider creating a class to do your primary calculation.

7. The name of your code should be informative regarding what the code does.

1.2 Assignment 5 : Refine your Code and Create 2 Plots

1. You must have code for **TWO plots outlined or completed** (you must know exactly what you are going to plot). **AT LEAST one plot must be completed by the check in**.

2. The first plot can be made using code from previous labs or homeworks. The second must be generated using code that you largely created yourself.

3. **The second plot must be QUANTITATIVE not Qualitative.** For example, if your project was to understand the evolution of SMBHs in the centers of the galaxies, one plot could show images of the galaxies, marking the location of the SMBHs. The second, however, must convey the physics: e.g. a plot of mass growth as a function of time. That second plot must ANSWER THE QUESTION you are after.

4. Before you start writing code, OUTLINE as much of your code **in words** (that are commented out) as you can. Like the templates you've been using for In Class Labs or Homeworks, where the steps are laid out. It is very hard for us to help you debug your code if it is not documented.

1.3 3-5 minute Presentation

You will be expected to present your methodology and code to the group.

1. Start with the topic and specific question you are trying to answer.

2. Describe the two plots you are trying to make and why they support your analysis.

3. Explain the steps you need to follow to generate at least one of the plots. You can walk through the code.

4. Present the plot(s) you have made and describe what it means.

You can discuss where you are stuck and need help. The goal is for us to see where you are at and provide feedback on how to fix any issues you have.

1.4 General Guidelines

- Your code should be getting close to working for at least ONE question by this check-in.

- You may work together to brainstorm how to write your code - all collaborators need to be acknowledged. BUT you must create a final function that is uniquely yours. This means there must be at least **one new function/method that was NOT part of a homework or lab and also NOT created by/or is the same as that of someone else**.

- If you use Chat GPT remember to cite it and note that you run the risk of someone else generating the same code - your function must be unique to you.

- The next assignment will be to start writing up results based on your plots.