MSE 150: Project 2
Team-Based Programming for Materials Analysis
Due date: 11:59pm, Friday April 28, 2023

This assignment will encapsulate all that we've learned together in the course of this semester. The format of this project will be somewhat unusual – instead of one assignment to turn in per person, you as a class will *all* work on the **same codebase**. As such, I am intentionally asking for more work than would be reasonable for one individual to finish alone prior to the due date. It will be up to all of you to coordinate and delegate the workload to create the final product. Divide and conquer!

Learning Objectives:

- Design software that **automates the plotting and** analysis of raw data files.
- **Use statistics to make decisions** and value judgements based on your analysis.
- **Process raw data files** and implement techniques to make them more usable.
- **Engage with version control** rigorously in a collaborative environment.
- Make use of **command-line tools and text editing**.
- **Document your code** sufficiently well that a stranger could clone and use it.

Project Description;

At the GitHub repository indicated below, you will find a set of AFM surface scans as raw text files. Like we saw in a previous homework, these surfaces contain quantum dots. This time, the dots have been deposited with three different deposition methods, with the aim of evenly distributing them on the surface while producing dots with as similar a size as possible.

Your goal in this project is to use all the programming tools at your disposal to **decide which of these three deposition methods best accomplishes these objectives**. You should use statistical analyses and plots of the data to justify your selection. The final codebase should be well-documented enough for an unfamiliar but informed user (someone who has some AFM data files but isn't familiar with Python and Bash) to be able to obtain and run the code on their own set of files with the same format.

How to work on this project:

- Use git to clone or fork https://github.com/RainierBarrett/mse150s23-project2
- Write your code, comments, and text files
    - Coordinate with your peers so no one has to work on the same part!
- Push/pull changes to/from github: manage the changes to the code collectively.

Grading:

Since this is a collaborative project, your individual grade will reflect the overall quality of the final product as well as your individual contributions with the following formula:

- **25 Points Possible**
    - Collectively: deliverables met are worth **up to 25 points**. This will be the same *base value* for everyone. Call this value β.
    - Individually: 1 point per commit **you** make, **up to 10 points**. Call this α.
- Your individual grade will be $\frac{\alpha \cdot \beta}{10}$. In other words, the overall deliverables met, adjusted proportionally to the scale of your contributions.
    - Please avoid "padding" your commits. Each commit should be a significant change to the project. Exercise judgement.

PROJECT DELIVERABLES

The final version of the codebase should contain:

- **(+2 points)** A ‘contributors.txt’ file that contains the names and email addresses of every person who contributed to this project
- **(+8 points)** One or more python scripts that can be used to generate plots and perform analysis to answer the questions in `REPORT.txt` (see below)
- **(+3 points)** Example generated plots/images (must have labeled axes and units)
- **(+1 points)** The original raw data in the project 2 repository as well as any modified data
- **(+1 point)** A correctly-formatted `requirements.txt` file, to allow users to install all prerequisite python packages
- **(+4 points)** A `README.txt` file that describes:
    - How to get the code
    - How to run the code
    - An example of how to run the code, and what the user should expect (you can refer to your example image files by name)
- **(+1 Point)** A software license file of your choice (e.g. MIT, GNU GPL3, etc)
- **(+5 points)** A `REPORT.txt` file that answers the following questions:
    - Which coating method best accomplishes the stated goal?
    - How do you know? Justify your answer.
        - Refer to the statistics you calculated.
        - **Explain** how the images/plots you generated support your conclusions.