General Points

- Use the course material located at:
  - Python Data Science Handbook
- Assignment 10 can be completed using previously covered material and content from the following chapters:
  - 00.00-Preface *through* 02.09-Structured Data NumPy
- After completing requirements, test to ensure all cells run correctly in the .ipynb file.
- Include appropriate markdown cells to identify the requirements below by number. See this example.
- Produce an .html file that shows the .ipynb after a *successful test run*.
  - by File | Download as | HTML (.html) .
- Test the .html file by opening it in a browser and ensure the content is produced correctly from the run in Jupyter Notebook.
- Submit BOTH the .ipynb and .html files to the appropriate link in Blackboard | Assignments. Submit the files individually (via a multi-select). However, if your browser posts an error for the .html file, submit it as a .zip.
- Submit any additional files required to complete the assignment.

Requirements

(*Ensure that all Requirements are complete*)

1. Using Jupyter Notebook (or similar tool), create a file named:
   - assignment-10.ipynb
2. Add an H1 markdown: "This is Assignment 10 - <yournamehere>"
3. Create a one-dimensional NumPy array named one_d_array of 20 random numbers with values between 1 – 10. Demonstrate the following comparison operators as universal functions:
   - <, >, <=, >=, !=, and ==

4. Create a two-dimensional NumPy array named two_d_array size = (4,5) with any values between 11 – 34. Demonstrate the following comparison operators as universal functions:
    - <, >, <=, >=, !=, and ==
    - count the values < 15
    - sum the values > 20
    - count the values >= 19 in each row
    - determine if *any* values < 12
    - determine if *all* values > 12
    - determine if *all* values in each column > 14
5. Using the *inches* array from Chapter 02.06, determine the number of values where:
    - 0.15 <= value <= 1.15
    - Use ~ and | to return the same number as & above
6. Using the *inches* array from Chapter 02.06, show the following:
    - Number of days without rain
    - Number of days with rain
    - Days with >= 1 inch of rain
7. Use Boolean masking on two_d_array to:
    - return a Boolean array where < 15
    - return an array of values < 15
8. Using the *inches* rain data and the following definition (pouring = (inches > 0.5)), output the following data:
    - Median precip on pouring days in 2014 (inches):
    - Median precip on summer days in 2014 (inches):
    - Maximum precip on summer days in 2014 (inches):
    - Median precip on non-summer pouring days in 2014 (inches):
9. In your own words, explain the difference between the keywords *and* and *or* and the operators & and |. When are the keywords used and when are the operators used?
10. Demonstrate fancy indexing with:

- one_d_array
- two_d_array

11. Demonstrate combined indexing with:
    - two_d_array and slicing
    - two_d_array and masking
12. Demonstrate the following using two_d_array:
    - sort each row
    - sort each column
    - partition the array such that the first three values in each column are the lowest values in that column
13. Produce a k-nearest neighbor plot using:
    - a 25 X 2 array
    - K = 3
14. Create a structured array named super_heroes using:
    - the dictionary method
    - NumPy data types for the element names
    - with the following element names:
        i. name
        ii. age
        iii. birthplace
        iv. super_power
15. Use markdown to include a statement at the end of assignment-10.ipynb explaining your experiences with Assignment 10. Make this authentic (minimum of 2-3 sentences).

TEST – TEST – TEST your .ipynb file to ensure all requirements are met. Produce an .html file from a *successful test run* of the .ipynb file. Ensure that the .html is produced correctly by opening it in a browser.

- Use the list above as a confirmation checklist.
- Not meeting all requirements = 0 points for the assignment.