

Python for Scientific Data Analysis

Homework - Week 3

1. Broadcasting

Consider two arrays

```
arr1=np.array([[1,2,3],[4,5,6],[7,8,9]])
```

and

```
arr2=np.array([79,89,99])
```

write a line(s) of code that ...

- a) replaces each column of arr1 by arr2
- b) replaces each row of arr1 by arr2
- c) replaces only the 2nd and 3rd column of arr by arr2

2. Repeating Array Elements

take the array `a=np.array([10,20,30,40,50])` ...

part 1

- use `np.tile` to repeat this entire array 5 times
- use `reshape` to convert this array into a 2-D matrix. With the `reshape` command use
 - i) the length of `a` (i.e. `len(a)`) and ii) `-1` to do the reshaping instead of hardcoding the dimensions.
- take the determinant of this matrix and report the result.

part 2

- now take the determinant of the matrix

```
a=np.array([[1,2.333,-4],[-4,-3,-.001],[-.2,5.3,9.99]])
```

part 3

- now, flatten the array in part 2:

you should get

```
aflat=array([ 1, 2.333, -4, -4, -3, -0.001, -.2, 5.3, 9.99])
```

use `np.tile` to repeat this array three times and follow the steps in part 1 to compute the determinant. Notice a pattern?

3. Solving a System of Linear Equations

Consider this system of linear equations :

$$8a_o + 6a_1 - 10a_2 = 2$$

$$-4a_o - 8a_1 + 10a_2 = 5$$

$$16a_o + 16a_1 = -3$$

- Solve this system of equations with i) `np.linalg.solve` and ii) `np.linalg.inv` + `np.dot`
- Verify that the values for a_o , a_1 , and a_2 provide an exact solution (hint: verify that the lefthand side of the equation yields the righthand side).