

Python Packages & Programming Style

Python packages

- `numpy`
- `math`
- `cmath`
- `matplotlib.pyplot`
- `scipy`

```
import math  
from math import factorial
```

```
import numpy  
import numpy as np
```

```
from scipy import linalg  
from scipy.linalg import eig  
from matplotlib import pyplot as plt
```

Programming Tips

Think before you start to program...

Algorithm

Clean design

Think simple

KISS (Keep it simple, stupid!)

Comment

Good choice of variables (i,j for loops)

No goto's

Structured programming

Search Algorithm

Unsorted Array

Linear search: $O(n)$

```
def search(A, x):  
    i = 0  
  
    while (A[i] != x):  
        i += 1  
        if (i == len(A)):  
            break  
  
    if (i < len(A)):  
        return i  
    else:  
        return -1
```


Sorted Array

Binary search: $O(\log n)$

```
def binsearch_recursive(A, lower, upper, x):  
    mid = (lower+upper)/2  
    if ((x < A[lower]) | (x>A[upper])):  
        return -1  
    elif ((lower==upper) & (A[mid] != x)):  
        return -1  
    else:  
        if (A[mid] == x):  
            ans = mid  
        elif (x < A[mid]):  
            ans = binsearch  
                _recursive(A, lower, mid-1, x)  
        else:  
            ans = binsearch  
                _recursive(A, mid+1, upper, x)  
    return ans
```

```
def binsearch(A, x):
    n = len(A)
    lower = 0
    upper = n-1
    mid = (lower+upper)/2

    if ((x < A[0]) | (x>A[-1])):
        return -1

    while (A[mid] != x):
        if (lower == upper):
            break
        if (x<A[mid]):
            upper = mid-1
        else:
            lower = mid+1
        mid = (lower+upper)/2

    if (A[mid] == x):
        return mid
    else:
        return -1
```

Sort Algorithm

Help

```
In [1]: ? plot
In [2]: ? sqrt
In [3]: math. TAB
In [6]: help()
Welcome to Python 2.7!  This is the online
utility.
help> array
help> list
help> matplotlib
help> quit
```