

## Reading and In-Class Problem

### Reading

- Swaroop, Byte of Python: Ch. 12
- Langtangen, Primer on Scientific Programming with Python: Ch. 3,6

### Problem

- generate a 100 by 100 nested list of numbers that represent elevations, such that the elevations represent a flat surface. Make the code flexible so that the orientation and grade of this surface can be changed easily within the script.
- save the list of data to a file
- make a separate script or function that reads this file into the computer

### Date input: input commands

- raw\_input: pauses running script and reads in user response as string
- input: pauses running script and reads in user response as python, converts 'type'
- commands to convert between data types: int,float,str,eval
  - int and float: convert string or number to integer or float
  - str: converts to string
  - eval: evaluates string (not number) as python expression

```
a=raw_input('enter some stuff')
print 'stuff + stuff = %s'%(a+a)

a=eval(a)
print 'stuff + stuff = %s'%(a+a)

b=input('enter some stuff')
print 'stuff + stuff = %s'%(b+b)

a=eval(raw_input('enter some stuff'))
print a+a
```

### Date input: arguments

- argv in sys module
- parses command into list (space delimited) command 'input2.py -t 1 13 helpme' sys.argv=['input2.py', '-t', '1', '13', 'helpme']
- can use these as flags or data in script

### Data input: reading file

- access files with 'open' command (note 'r' flag)
- treated as sequence of lines (each line is string)
- string method:split()

```
dataset=open('data/sebagoWtrshdElev.txt','r')
header=[]
data=[]
for line in dataset:
    words=line.split()
    try:
        data.append([float(i) for i in words])
    except ValueError:
        header.append(words)
```

## Data output: saving file

- create file with open command (note 'w' flag)
- separate rows with newline character 'n'
- close file when finished (may corrupt file if not closed)

```
import math
import copy
#make base data

data=[[100 for i in range(20)] for j in range(10)]
data[0] = [100.+2*math.cos(math.pi*i/19.) for i in range(20)]

error=1.
while error>1.e-4:
    print error
    error=0.
    olddata=copy.deepcopy(data)
    for i in range(1,10):
        if i==0:
            n=0
        else:
            n=i-1
        if i==9:
            s=9
        else:
            s=i+1
        for j in range(20):
            if j==19:
                w=19
            else:
                w=j+1

            if j==0:
                e=0
            else:
                e=j-1

            data[i][j]=(data[n][j]+data[s][j]+data[i][e]+data[i][w])/4.
            error=max(error,abs(data[i][j]-olddata[i][j]))
    print error

datafile=open('./data/saveData.txt','w')

for i in range(10):
    for j in range(20):
        datafile.write(' %.2f'%(data[i][j]))
    datafile.write('\n')
datafile.close()
```