EE2703 Applied Programming Lab - Assignment 1

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1 Part 1

First, numpy and matplotlib are imported inline using pylab.

```
In [1]: %pylab inline
```

```
Populating the interactive namespace from numpy and matplotlib
```

```
In [2]: rcParams['figure.figsize']=12,9 # bigger plots
        rcParams['font.size']=15 # bigger text in plots
```

The given algorithm for computing fibonacci numbers is implemented in C below. The contents of the cell below are written into the file **fib.c** whenever it is run.

```
In [3]: %%writefile fib.c
        #include<stdlib.h>
        #include<stdio.h>

        int main(){
            int n=1, nold=1, new=0,k;
            printf("1 %d\n",n);
            printf("2 %d\n",nold);
            for(k=3;k<=10;k++){
                new = n+nold;
                nold=n;
                n=new;
                printf("%d %d\n",k,new);
            }
        }
```

```
Overwriting fib.c
```

Terminal commands are run using the **!** prefix.

```
In [4]: !gcc fib.c -o fib.out
```

```
In [5]: !./fib.out
```

```
1 1

2 1

3 2

4 3

5 5

6 8

7 13

8 21

9 34

10 55
```

Now, the python implementation:

```
In [6]: def fib():
            n=1
            nold=1
            new=0
            print("1 1\n2 1")
            for k in range(3,11,1):
                new=n+nold
                nold=n
                n=new
                print (k,new)

In [7]: fib()
```

```
1 1
2 1
3 2
4 3
5 5
6 8
7 13
8 21
9 34
10 55
```

2 Part 2

The C implementation of the second question is given below:

```
In [8]: %%writefile list.c
        #include<stdlib.h>
        #include<stdio.h>
        #include<math.h>

        int main(){
            double n[1000];
            n[0]=0.2;
            double alpha = M_PI, temp;
            int k;
            for(k=1;k<1000;k++){
                temp = (n[k-1]+M_PI)*100;
                n[k] = temp - (long)(temp);
            }
            for(k=0;k<1000;k++){
                printf("%0.4f\n",n[k]);
            }
        }

Overwriting list.c


In [9]: !gcc list.c -o list.out

In [10]: !./list.out > outC.txt
         !head out.txt -n 30 #print only a few lines

0.2000

0.1593

0.0858

0.7394

0.0984

0.9963

0.7896

0.1154

0.6964
```

```
0.8029

0.4540

0.5602

0.1808

0.2372

0.8794

0.1018

0.3353

0.6935

0.5089

0.0519

0.3488

0.0363

0.7863

0.7863

0.7863

0.7863

0.7863

0.7863

0.7863

0.7863
```

The python implementation:

```
In [11]: def listProgram():
             import math
```

```
    n=[0.2]
    for k in range(1,1000):
        t = (n[k-1]+math.pi)*100
        n.append(t-int(t))

    for i in n:
        print("%.4f"%i)
```

In [12]:
```
# Context manager to redirect stdout to a file
from contextlib import redirect_stdout

with open("outPy.txt","w") as f:
    with redirect_stdout(f):
        listProgram()

!head outPy.txt -n 30 # display few lines of the file
```

```
0.2000

0.1593

0.0858

0.7394

0.0984

0.9963

0.7896

0.1154

0.6964

0.8029

0.4540

0.5602

0.1808

0.2372

0.8794

0.1018
```

```
0.3353

0.6935

0.5089

0.0519

0.3488

0.0363

0.7863

0.7863

0.7863

0.7863

0.7863

0.7863

0.7863

0.7863
```

3 Part 3

The third part is implemented below:

```
In [13]: def freq():
             import re, string

             with open('the-hound-of-the-baskervilles.txt', 'r') as f:
                 contents = f.read()

             d = {}
             words = re.split("[" + string.punctuation + "\\n ]+", contents)

             for word in words:
                 if len(word.strip())==0:continue
                 d[word] = d.get(word,0)+1
```

```
            # sort based on number of words in descending order
            for key in sorted(d, key = lambda x:-d[x]):
                print(key,d[key])
```

```
In [14]: with open("wordFreq.txt","w") as f:
             with redirect_stdout(f):
                 freq()
         !head wordFreq.txt -n 10
```

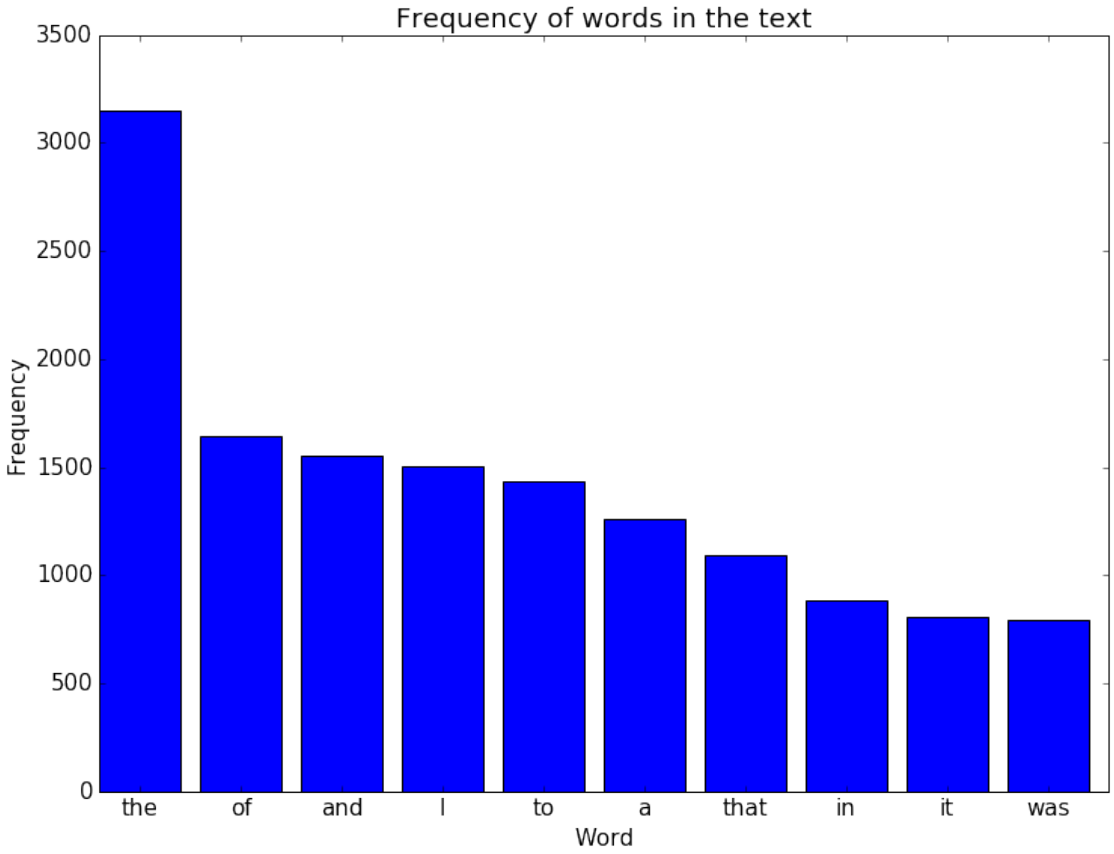
```
the 3146

of 1643

and 1552

I 1501

to 1433

a 1260

that 1091

in 885

it 804

was 793
```

The word distribution of the most common words is visulaized using a bar plot.

```
In [15]: a = np.genfromtxt("wordFreq.txt",
                           dtype=[("word","<U16"), ("freq",np.uint32)])
```

```
In [16]: # extract the words and frequencies from the file
         words,freq=list(zip(*list(a)))
```

```
In [17]: numWords = 10 #how many words to plot
         title("Frequency of words in the text")
         bar(arange(numWords),freq[:numWords]) # plot the bars
         xticks(arange(numWords)+0.4,words[:numWords]) # label the axis
         xlabel("Word")
         ylabel("Frequency")
         show()
```


Frequency of words in the text
3500
3000
2500
2000
1500
1000
500
0
Frequency
the
of
and
I
to
a
that
in
it
was
Word