CSE3006 - Data Visualization

Lab Assignment 2

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Importing libraries

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
```

Importing dataset

In [2]:
```
df = pd.read_csv("autos.csv")
df.head()
```

Out[2]:

	symboling	make	fuel_type	aspiration	num_of_doors	body_style	drive_wheels	engine_location	wheel_base	length	...	engine_s
0	3	alfa-romero	gas	std	2	convertible	rwd	front	88.6	168.8	...	
1	3	alfa-romero	gas	std	2	convertible	rwd	front	88.6	168.8	...	
2	1	alfa-romero	gas	std	2	hatchback	rwd	front	94.5	171.2	...	
3	2	audi	gas	std	4	sedan	fwd	front	99.8	176.6	...	
4	2	audi	gas	std	4	sedan	4wd	front	99.4	176.6	...	

5 rows × 25 columns

In [3]:
```
df.info()
```

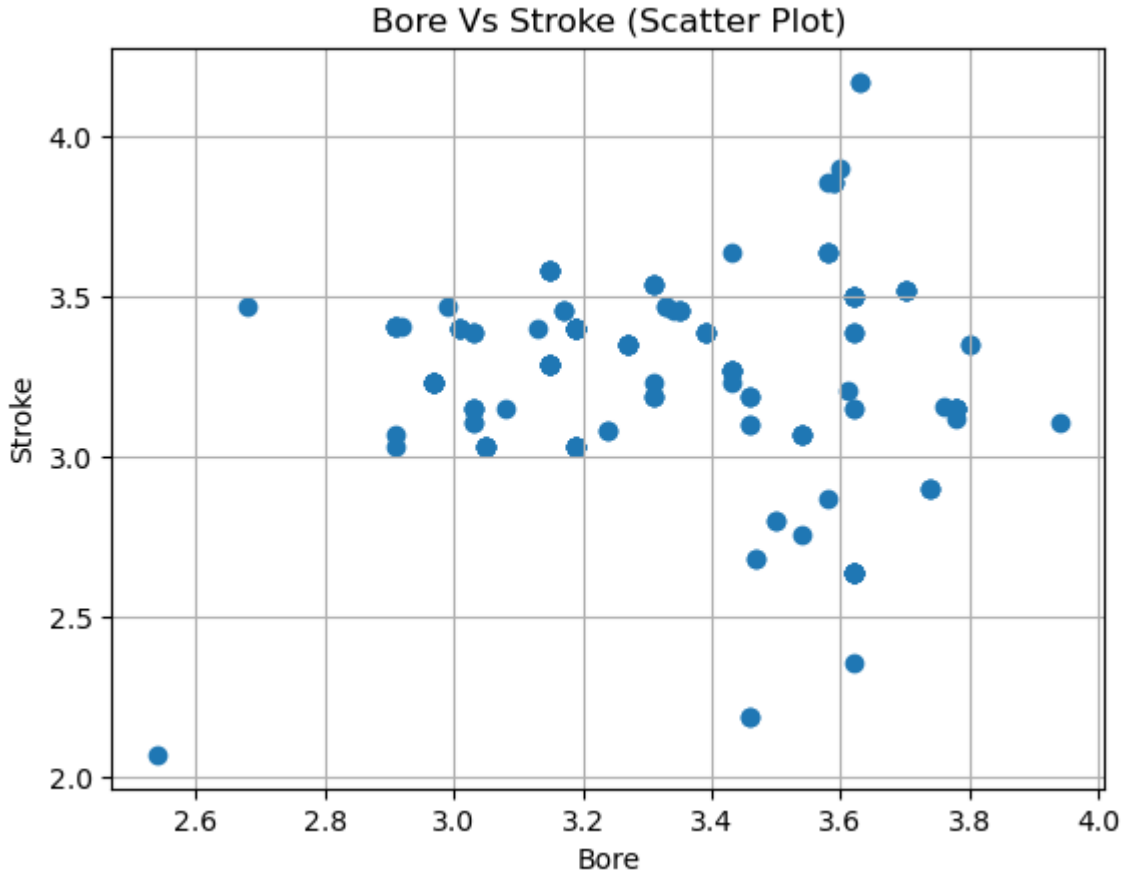
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 193 entries, 0 to 192
Data columns (total 25 columns):
 #   Column             Non-Null Count  Dtype
---  ------             --------------  -----
 0   symboling          193 non-null    int64
 1   make               193 non-null    object
 2   fuel_type          193 non-null    object
 3   aspiration         193 non-null    object
 4   num_of_doors       193 non-null    int64
 5   body_style         193 non-null    object
 6   drive_wheels       193 non-null    object
 7   engine_location    193 non-null    object
 8   wheel_base         193 non-null    float64
 9   length             193 non-null    float64
 10  width              193 non-null    float64
 11  height             193 non-null    float64
 12  curb_weight        193 non-null    int64
 13  engine_type        193 non-null    object
 14  num_of_cylinders   193 non-null    int64
 15  engine_size        193 non-null    int64
 16  fuel_system        193 non-null    object
 17  bore               193 non-null    float64
 18  stroke             193 non-null    float64
 19  compression_ratio  193 non-null    int64
 20  horsepower         193 non-null    int64
 21  peak_rpm           193 non-null    int64
 22  city_mpg           193 non-null    int64
 23  highway_mpg        193 non-null    int64
 24  price              193 non-null    int64
dtypes: float64(6), int64(11), object(8)
memory usage: 37.8+ KB
```

Extract fields for clustering

In [4]:
```
x = df['bore']
y = df['stroke']
```

Plot the points on a graph

In [5]:
```
plt.scatter(x, y)
plt.xlabel("Bore")
plt.ylabel("Stroke")
plt.title("Bore Vs Stroke (Scatter Plot)")
plt.grid()
plt.show()
```



Use scipy for clustering linkage

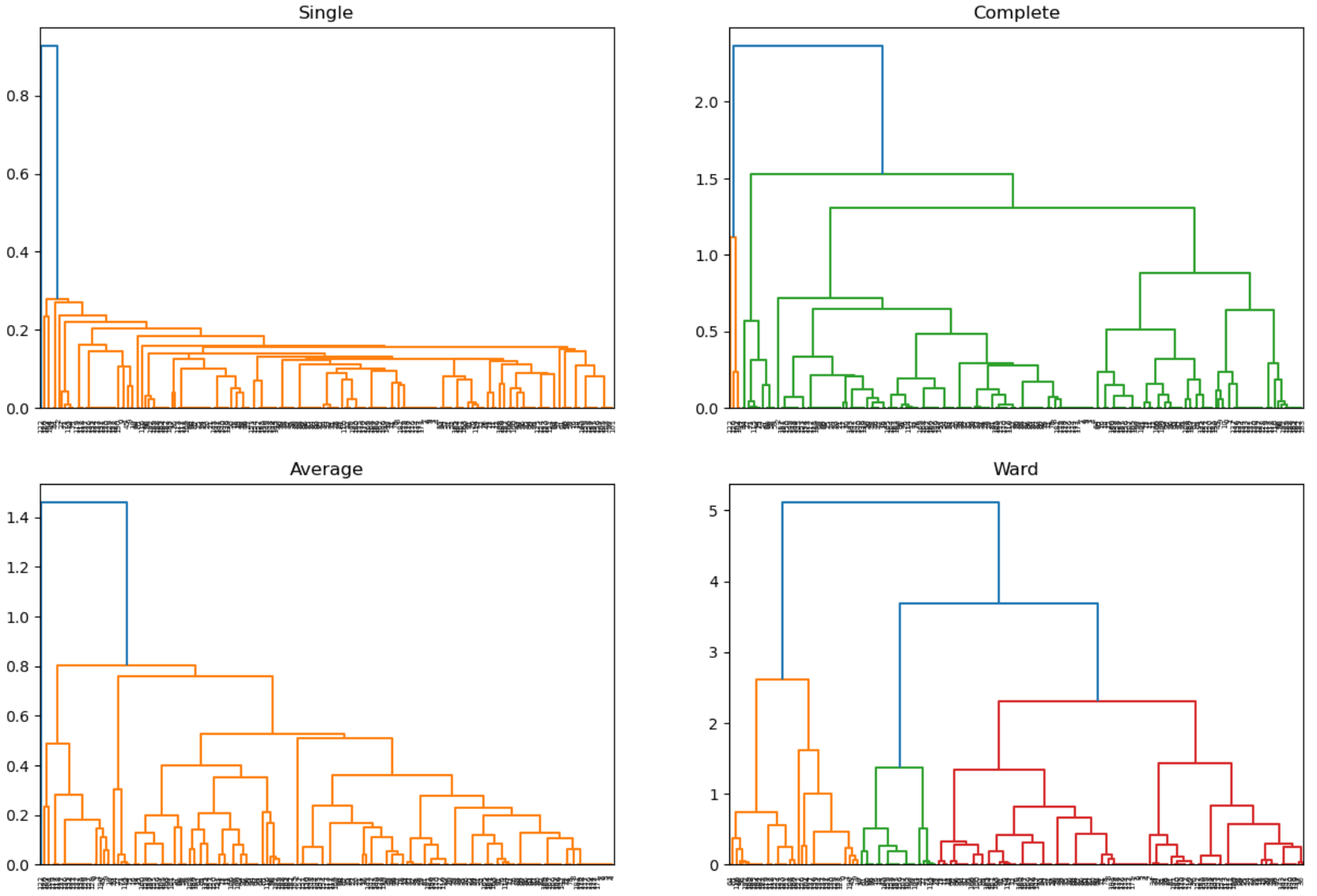
In [6]:
```
from scipy.cluster.hierarchy import dendrogram, linkage
```

In [7]:
```
t = list(zip(x, y))
```

In [8]:
```
l_s = linkage(t, method="single", metric="euclidean")
l_c = linkage(t, method="complete", metric="euclidean")
l_a = linkage(t, method="average", metric="euclidean")
l_w = linkage(t, method="ward", metric="euclidean")
```

Plot the dendograms for the above linkages

In [9]:
```
plt.figure(figsize=(15, 10))
plt.subplot(2,2,1), dendrogram(l_s), plt.title('Single')
plt.subplot(2,2,2), dendrogram(l_c), plt.title('Complete')
plt.subplot(2,2,3), dendrogram(l_a), plt.title('Average')
plt.subplot(2,2,4), dendrogram(l_w), plt.title('Ward')
plt.show()
```

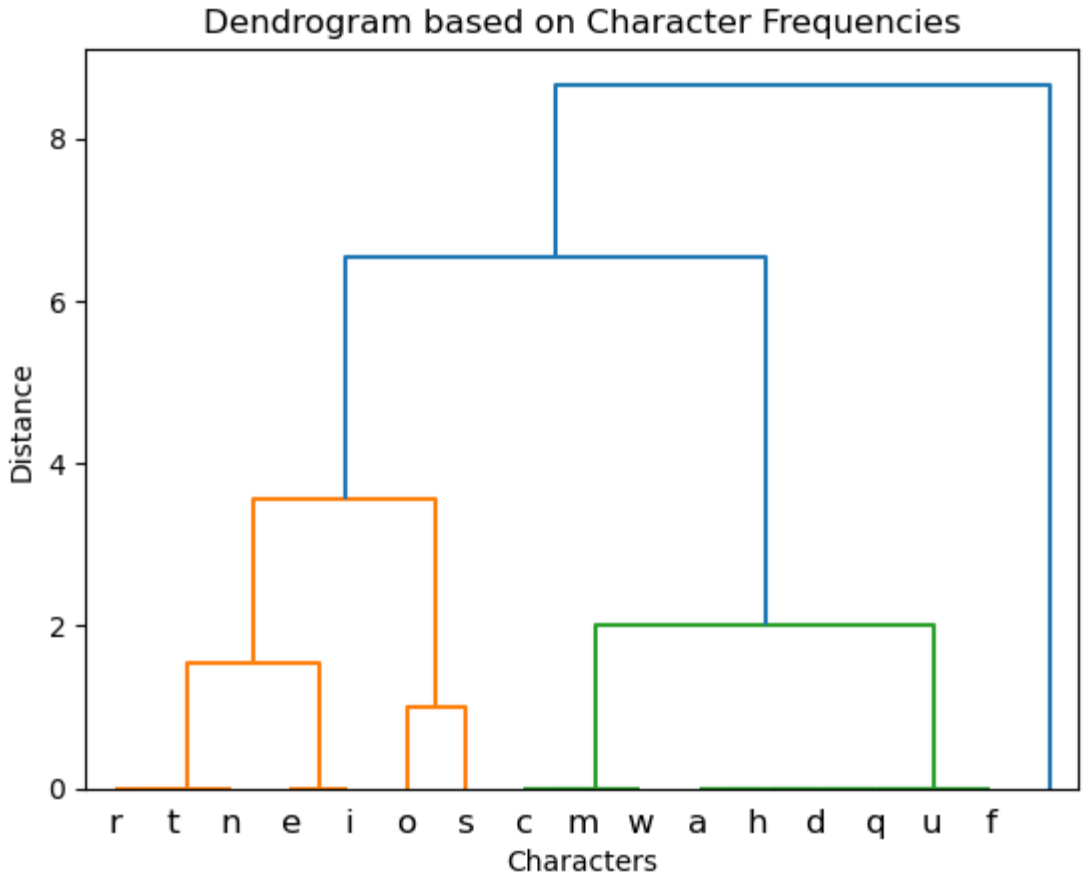


Dendogram for distribution of characters in a string

In [10]:
```
def genStringDendrogram(inputString):
    charCount = dict()

    for char in inputString:
        charCount[char] = charCount.get(char, 0) + 1

    link = linkage(np.array([list(charCount.values())]).T, method='ward')

    print(charCount)

    dendrogram(link, labels=list(charCount.keys()), orientation='top', distance_sort='descending')
    plt.title('Dendrogram based on Character Frequencies')
    plt.xlabel('Characters')
    plt.ylabel('Distance')
    plt.show()
```

In [11]:
```
genStringDendrogram("this is a random sequence of words for this question")
```

```
{'t': 3, 'h': 2, 'i': 4, 's': 6, ' ': 9, 'a': 2, 'r': 3, 'n': 3, 'd': 2, 'o': 5, 'm': 1, 'e': 4, 'q': 2, 'u'
: 2, 'c': 1, 'f': 2, 'w': 1}
```



In [ ]:

DV Lab (25/01/24)

	A	B	C	D	E	F
A	0					
B	0.6	0				
C	0.2	0.5	0			
D	0.4	0.3	0.7	0		
E	0.7	0.8	0.4	0.2	0	
F	0.3	0.1	0.6	0.5	0.9	0

→ ~~Minimum Clustering Linkage~~

→ Minimum Distance Clustering

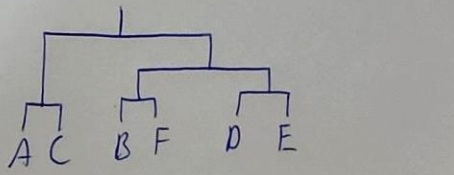
	A	BF	C	D	E
A	0				
BF	0.3	0			
C	0.2	0.5	0		
D	0.4	0.3	0.7	0	
E	0.7	0.8	0.4	0.2	0

	A	BF	C	DE
A	0			
BF	0.3	0		
C	0.2	0.5	0	
DE	0.4	0.3	0.4	0

	AC	BF	DE
AC	0		
BF	0.3	0	
DE	0.4	0.3	0

	AC	BF, DE
AC	0	
BF, DE	0.3	0

AC, (BF, DE)



~~A B C D E F~~

→ Maximum distance clustering

	A	B	C	D	EF
A	0				
B	0.6	0			
C	0.2	0.5	0		
D	0.4	0.3	0.7	0	
EF	0.7	0.8	0.6	0.5	0

	A	B, EF	C	D
A	0			
B, EF	0.7	0		
C	0.2	0.6	0	
D	0.4	0.5	0.7	0

	A	B, EF	CD
A	0		
B, EF	0.7	0	
CD	0.4	0.6	0

	A, (B, EF)	CD
A, (B, EF)	0	
CD	0.6	0