This is a priliminary analysis of a dataset from bank. The dataset has customer information such as balancd, tenure, gender, credit scort, etc. It also has a record of whether the customer stayed or left the back. This analysis focuses on visualizing feature in order to understand and prepare the data for modeling and predictions.

In [170]:
```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
import xlrd
```

In [171]:
```
#read data from file

ChurnModeling = pd.read_excel('churn-Modelling.xlsx')

ChurnModeling.head()
```

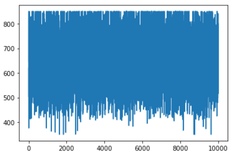
Out[171]:

	RowNumber	CustomerId	Surname	CreditScore	Geography	Gender	Age	Tenure	Balance
0	1	15634602	Hargrave	619	France	Female	42	2	0.00
1	2	15647311	Hill	608	Spain	Female	41	1	83807.86
2	3	15619304	Onio	502	France	Female	42	8	159660.80
3	4	15701354	Boni	699	France	Female	39	1	0.00
4	5	15737888	Mitchell	850	Spain	Female	43	2	125510.82

Scatter Plots of credit scores

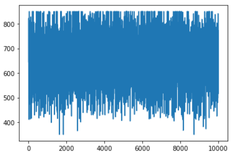
In [172]:
```
# Scatter plot of vredit scores
plt.plot(ChurnModeling.CreditScore)
```

Out[172]:
```
[<matplotlib.lines.Line2D at 0x1aca79b0>]
```



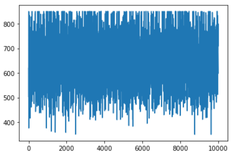
In [173]:
```
plt.plot(ChurnModeling[(ChurnModeling["Gender"] == "Male")].CreditScore)
```

Out[173]:
```
[<matplotlib.lines.Line2D at 0x1a8c3f10>]
```



In [174]:
```
plt.plot(ChurnModeling[(ChurnModeling["Gender"] == "Female")].CreditScor
e)
```

Out[174]:
```
[<matplotlib.lines.Line2D at 0xfa95b30>]
```



Analyse churning by evaluating the Exited feature. Start by evaluating Gender feature aganist Exited Feature with bar charts.

In [175]:
```
male_exited = ChurnModeling[(ChurnModeling["Gender"] == "Male") & (Churn
Modeling["Exited"] == 1)]
len(male_exited)
```

Out[175]:
```
898
```

In [176]:
```
female_exited = ChurnModeling[(ChurnModeling["Gender"] == "Female") & (C
hurnModeling["Exited"] == 1)]
len(female_exited)
```

Out[176]:
```
1139
```

In [177]:
```
width = 0.35       # the width of the bars: can also be len(x) sequence
labels = ["Male","Female"]
exited =[len(male_exited),len(female_exited)]
stayed =[(len(ChurnModeling["Exited"]) - len(male_exited)) , (len(ChurnM
odeling["Exited"]) - len(female_exited))]

print(exited)
```

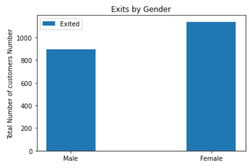
```
[898, 1139]
```

Bar chart showing the number customers by gender who left the bank

In [178]:
```
fig, ax = plt.subplots()

ax.bar(labels, exited, width, label='Exited')
ax.set_ylabel('Total Number of customers Number')
ax.set_title('Exits by Gender')
ax.legend()
```

Out[178]:
```
<matplotlib.legend.Legend at 0x4b1ec90>
```



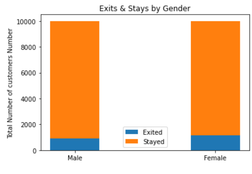
Bar chart showing the number customers by gender who left the bank vs those who stayed. This graph shows both stayed and exited customer based on gender in one glance. However, it is hard to see the difference clearly as the number of those who exited is very close(difference of 241 customers).

In [180]:
```
fig, ax = plt.subplots()

ax.bar(labels, exited, width, label='Exited')
ax.bar(labels, stayed, width, bottom=exited,label='Stayed')

ax.set_ylabel('Total Number of customers Number')
ax.set_title('Exits & Stays by Gender')
ax.legend()
```

Out[180]:
```
<matplotlib.legend.Legend at 0xfc7a050>
```

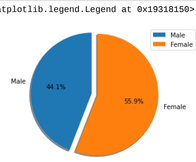


The following pie chart shows the the information as above, but it shows the percenteges and this easier to see the difference.

In [181]:
```
fig, ax = plt.subplots()
explode = (0.1, 0.0)
ax.pie(exited, explode=explode, labels=labels, autopct='%1.1f%%',
       shadow=True, startangle=90)
ax.axis('equal')  # Equal aspect ratio ensures that pie is drawn as a ci
rcle.

ax.legend()
```

Out[181]:
```
<matplotlib.legend.Legend at 0x19318150>
```



The following nested pie chart shows two layers: Outter Layer : the total number of customer who exited vs who stayed Inner layer: Thecustomer who exited collor coded to distinguish those who stated or exited based on gender. With each gender have a shade of its color to distinguish betwen genders.

In [183]:
```
fig, ax = plt.subplots()
size = 0.4
vals = np.array([exited, stayed])
#print(vals)
cmap = plt.get_cmap("tab20c")
outer_colors = cmap(np.arange(2)*4)
inner_colors = cmap(np.array([1, 2, 5, 6, 9, 10]))
#print("vals.sum",vals.sum(axis=1))
ax.pie(vals.sum(axis=1), radius=1, labels=['Exited','Stayed'],colors=out
er_colors,
       wedgeprops=dict(width=size, edgecolor='w'))
#print("vals.flaten",vals.flatten())
ax.pie(vals.flatten(), radius=1-size, colors=inner_colors,wedgeprops=dic
t(width=size, edgecolor='w'))

ax.set(aspect="equal", title='Nested Pie plot of exits and remains')
```

Out[183]:
```
[Text(0.5, 1.0, 'Nested Pie plot of exits and remains'), None]
```