Data Visualizations using python from scratch

February 9, 2021

dataset: https://www.kaggle.com/shivamb/netflix-shows

[3]:
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
data = pd.read_csv(r'D:\Projects\New folder\netflix_titles.csv')
data.head(10)
```

[3]:

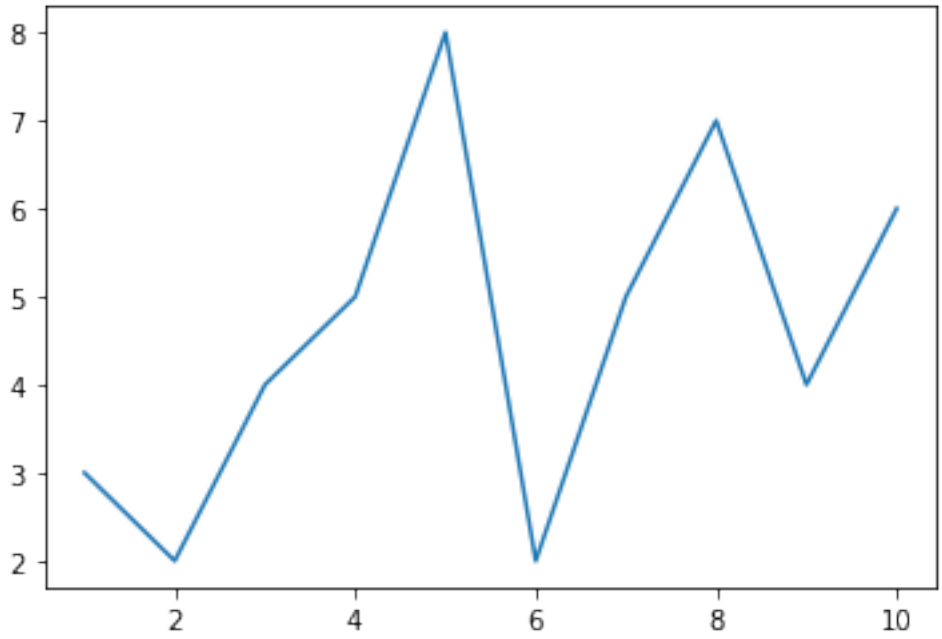
	show_id	type	title	director	cast	country	date_added	release_year	rating	duration
0	s1	TV Show	3%	NaN	João Miguel, Bianca Comparato, Michel Gomes, R…	Brazil	August 14, 2020	2020	TV-MA	4 Seasons
1	s2	Movie	7:19	Jorge Michel Grau	Demián Bichir, Héctor Bonilla, Oscar Serrano, …	Mexico	December 23, 2016	2016	TV-MA	93 min
2	s3	Movie	23:59	Gilbert Chan	Tedd Chan, Stella Chung, Henley Hii, Lawrence …	Singapore	December 20, 2018	2011	R	78 min
3	s4	Movie	9	Shane Acker	Elijah Wood, John C. Reilly, Jennifer Connelly…	United States	November 16, 2017	2009	PG-13	80 min
4	s5	Movie	21	Robert Luketic	Jim Sturgess, Kevin Spacey, Kate Bosworth, Aar…	United States	January 1, 2020	2008	PG-13	123 min
5	s6	TV Show	46	Serdar Akar	Erdal Beşikçioğlu, Yasemin Allen, Melis Birkan…	Turkey				
6	s7	Movie	122	Yasir Al Yasiri	Amina Khalil, Ahmed Dawood, Tarek Lotfy, Ahmed…	Egypt				
7	s8	Movie	187	Kevin Reynolds	Samuel L. Jackson, John Heard, Kelly Rowan, Cl…	United States				
8	s9	Movie	706	Shravan Kumar	Divya Dutta, Atul Kulkarni, Mohan Agashe, Anup…	India				
9	s10	Movie	1920	Vikram Bhatt	Rajneesh Duggal, Adah Sharma, Indraneil Sengup…	India				

```
5       July 1, 2017          2016  TV-MA   1 Season
6       June 1, 2020          2019  TV-MA     95 min
7   November 1, 2019          1997      R    119 min
8      April 1, 2019          2019  TV-14    118 min
9  December 15, 2017          2008  TV-MA    143 min

                                          listed_in  \
0  International TV Shows, TV Dramas, TV Sci-Fi &…
1                      Dramas, International Movies
2               Horror Movies, International Movies
3  Action & Adventure, Independent Movies, Sci-Fi…
4                                           Dramas
5    International TV Shows, TV Dramas, TV Mysteries
6               Horror Movies, International Movies
7                                           Dramas
8               Horror Movies, International Movies
9     Horror Movies, International Movies, Thrillers

                                         description
0  In a future where the elite inhabit an island …
1  After a devastating earthquake hits Mexico Cit…
2  When an army recruit is found dead, his fellow…
3  In a postapocalyptic world, rag-doll robots hi…
4  A brilliant group of students become card-coun…
5  A genetics professor experiments with a treatm…
6  After an awful accident, a couple admitted to …
7  After one of his high school students attacks …
8  When a doctor goes missing, his psychiatrist w…
9  An architect and his wife move into a castle t…
```

1 Basic Visualization using Matplotlib

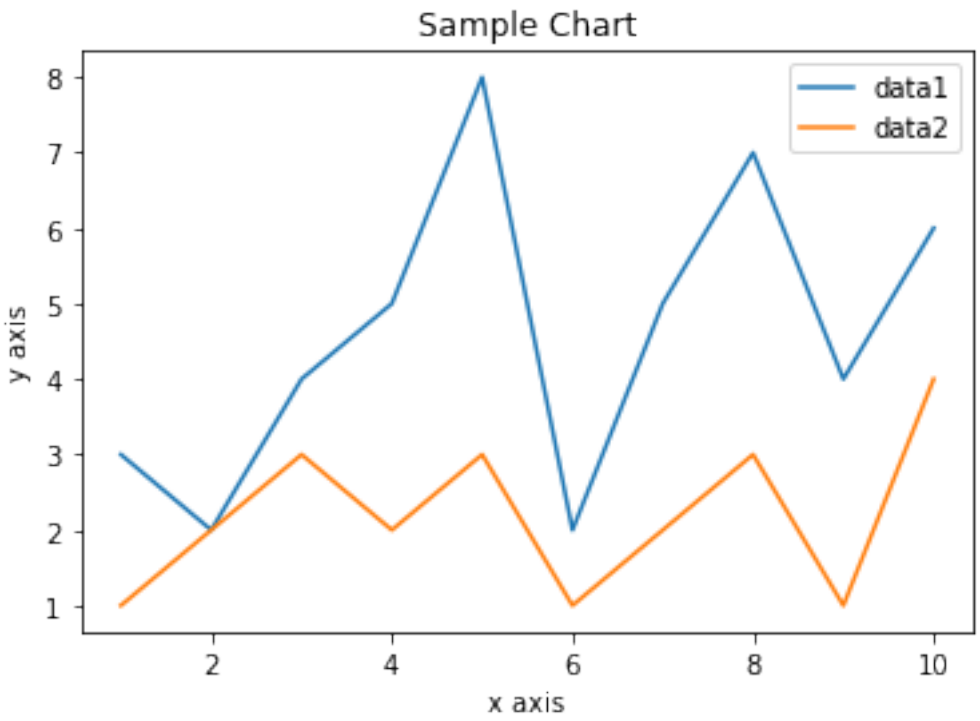
[7]:
```
fig, ax = plt.subplots()
# Creating some  dummy data
ax.plot([1, 2, 3, 4, 5, 6, 7, 8, 9, 10], [3, 2, 4, 5, 8, 2, 5, 7, 4, 6])
```

[7]:
```
[<matplotlib.lines.Line2D at 0x1e87ce832e0>]
```



[11]:
```
#  Declare a chart with one Axis
fig, ax = plt.subplots()
# Creating some  dummy data
ax.plot([1, 2, 3, 4, 5, 6, 7, 8, 9, 10], [3, 2, 4, 5, 8, 2, 5, 7, 4, 6], label␣
 ↪= 'data1')
ax.plot([1, 2, 3, 4, 5, 6, 7, 8, 9, 10], [1, 2, 3, 2, 3, 1, 2, 3, 1, 4], label␣
 ↪= 'data2')
ax.set_xlabel('x axis')
ax.set_ylabel('y axis')
ax.set_title("Sample Chart")
ax.legend()
```

[11]: <matplotlib.legend.Legend at 0x1e87d0823d0>



[12]:
```
n_data = data.groupby(['release_year', 'type'], as_index=False).show_id.count()
n_data.columns = ['release_year', 'type', 'count']
n_data_pivot = n_data.pivot(index='release_year', columns='type',␣
 ↪values='count').reset_index()
n_data_pivot.fillna(0, inplace = True)
n_data_pivot.head()
```

[12]:

type	release_year	Movie	TV Show
0	1925	0.0	1.0
1	1942	2.0	0.0
2	1943	3.0	0.0
3	1944	3.0	0.0
4	1945	3.0	0.0

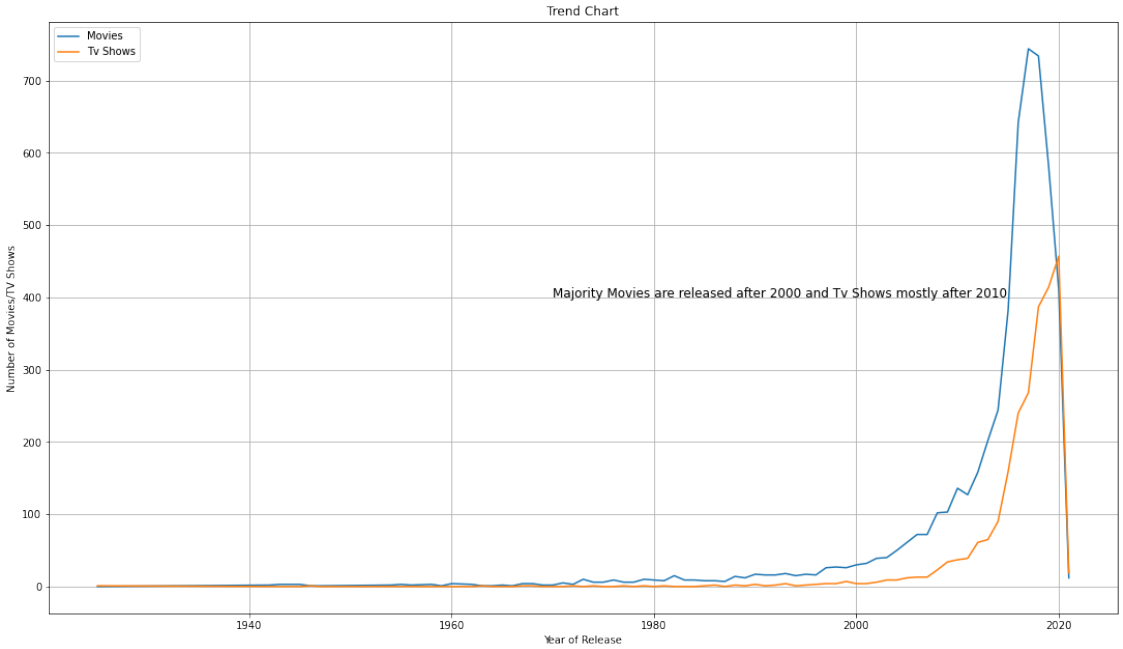
[13]:
```
n_data.head()
```

[13]:

	release_year	type	count
0	1925	TV Show	1
1	1942	Movie	2
2	1943	Movie	3
3	1944	Movie	3
4	1945	Movie	3

[18]:
```
#  Declare a chart with one Axis
fig, ax = plt.subplots()
# Creating some  dummy data
ax.plot(n_data_pivot.release_year, n_data_pivot['Movie'], label = 'Movies')
ax.plot(n_data_pivot.release_year, n_data_pivot['TV Show'], label = 'Tv Shows')
ax.set_ylabel('Number of Movies/TV Shows')
ax.set_xlabel('Year of Release')
ax.set_title("Trend Chart")
plt.text(x=1970, y=400, s=r'Majority Movies are released after 2000 and Tv␣
 ↪Shows mostly after 2010', fontsize = 12)
fig.set_size_inches(18.5, 10.5)
plt.grid()
ax.legend()
```

[18]:
```
<matplotlib.legend.Legend at 0x1e87d1e1610>
```



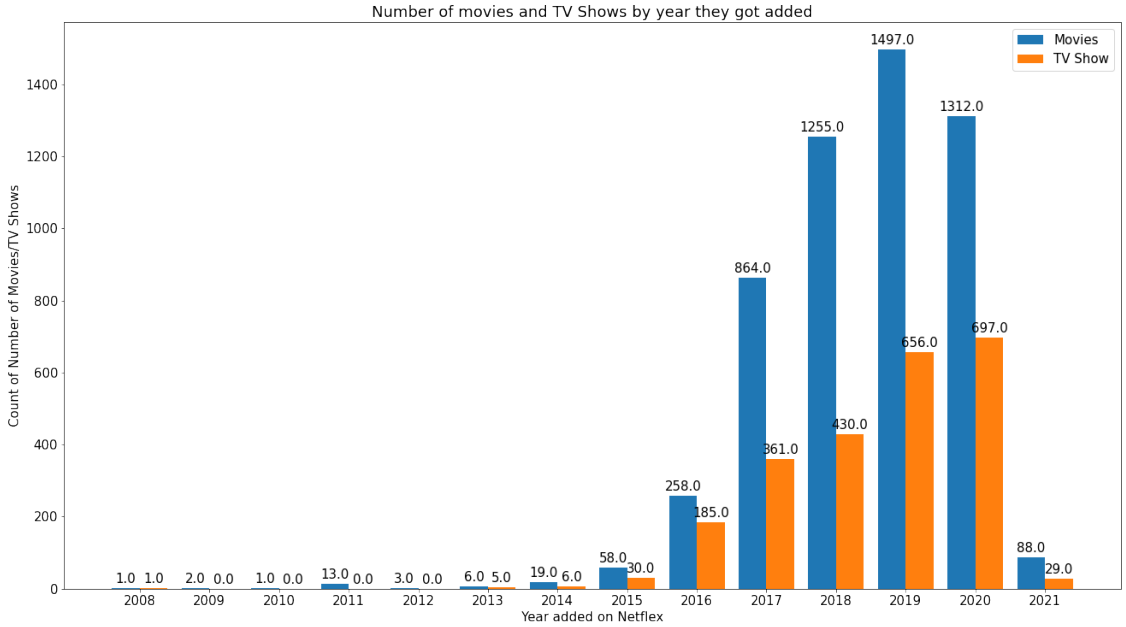
[19]:
```
data['year_added'] = data['date_added'].str.slice(start=-4)
n_data_added = data.groupby(['year_added', 'type'], as_index=False).show_id.
 ↪count()
n_data_added.columns = ['year_added', 'type', 'count']
n_data_added = n_data_added.pivot(index='year_added', columns='type',␣
 ↪values='count').reset_index()
n_data_added.fillna(0, inplace = True)
n_data_added.head()
```

[19]:
```
type year_added  Movie  TV Show
0          2008    1.0      1.0
1          2009    2.0      0.0
2          2010    1.0      0.0
3          2011   13.0      0.0
4          2012    3.0      0.0
```

2 Vertical Bar chart

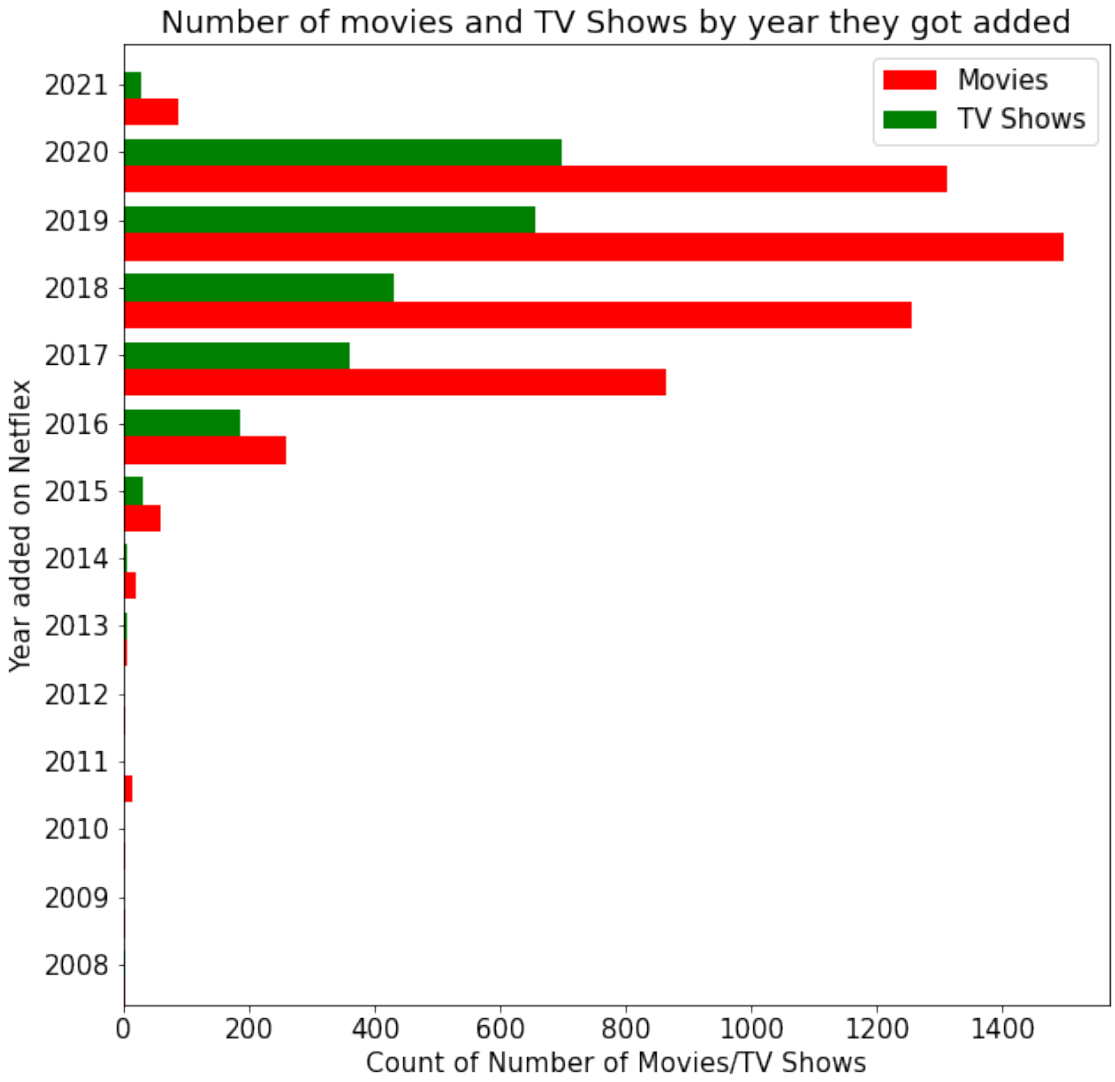
[24]:
```
labels = n_data_added['year_added']

x = np.arange(len(labels))  # the label locations
width = 0.4  # the width of the bars

fig, ax = plt.subplots()
Movies_rects = ax.bar(x - width/2, n_data_added['Movie'], width,␣
 ↪label='Movies') # Add color here
TVshows_rects = ax.bar(x + width/2, n_data_added['TV Show'], width, label='TV␣
 ↪Show')

# Add some text for labels, title, configure chart size
ax.set_xlabel('Year added on Netflex')
ax.set_ylabel('Count of Number of Movies/TV Shows')
ax.set_title('Number of movies and TV Shows by year they got added')
ax.set_xticks(x)
ax.set_xticklabels(labels)
fig.set_size_inches(18.5, 10.5)
plt.rcParams.update({'font.size': 15})
ax.legend()

 #Function to generate labels on top of the bars
def gen_label(rects):
    """Attach a text label above each bar in *rects*, displaying its height."""
    for rect in rects:
        height = rect.get_height()
        ax.annotate('{}'.format(height),
                    xy=(rect.get_x() + rect.get_width() / 2, height),
                    xytext=(0, 3),  # 3 points vertical offset
                    textcoords="offset points",
                    ha='center', va='bottom')


gen_label(Movies_rects)
gen_label(TVshows_rects)

fig.tight_layout()
```

```
plt.show()
```



3 Horizontal Bar Chart

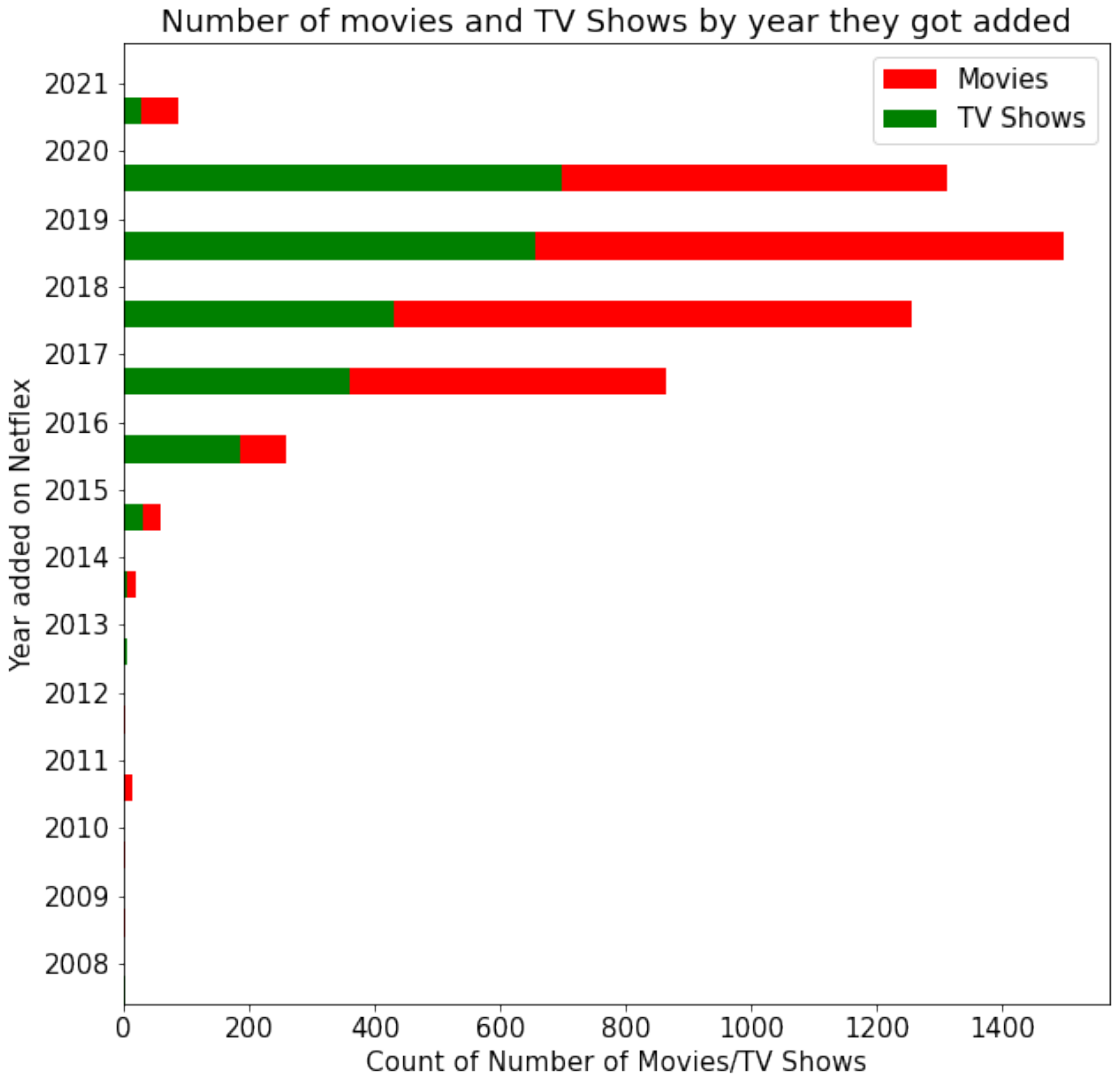
[25]:
```
data = pd.DataFrame(dict(Year = n_data_added['year_added'],
                         Movie = n_data_added['Movie'], TVshow=n_data_added['TV␣
 ↪Show']))

ind = np.arange(len(data))
width = 0.4

fig1, ax1 = plt.subplots()
ax1.barh(ind, data.Movie, width, color='red', label='Movies')
ax1.barh(ind + width, data.TVshow, width, color='green', label='TV Shows')

ax1.set(yticks=ind + width, yticklabels=data.Year, ylim=[2*width - 1,␣
 ↪len(data)])

ax1.set_ylabel('Year added on Netflex')
ax1.set_xlabel('Count of Number of Movies/TV Shows')
ax1.set_title('Number of movies and TV Shows by year they got added')

ax1.legend()
fig1.set_size_inches(10, 10)
plt.show()
```



4 Stacked Bar Chart

[29]:
```
fig1, ax1 = plt.subplots()
ax1.barh(ind, data.Movie, width, color='red', label='Movies')
ax1.barh(ind, data.TVshow, width, color='green', label='TV Shows')

ax1.set(yticks=ind + width, yticklabels=data.Year, ylim=[2*width - 1,␣
↪len(data)])

ax1.set_ylabel('Year added on Netflex')
ax1.set_xlabel('Count of Number of Movies/TV Shows')
ax1.set_title('Number of movies and TV Shows by year they got added')
```

```
ax1.legend()
fig1.set_size_inches(10, 10)
plt.show()
```

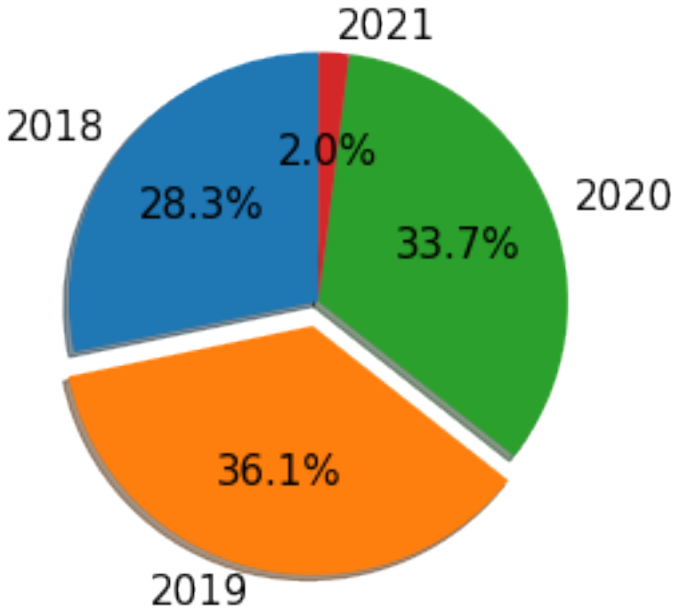


5 Pie Chart

[30]:
```
# Small modification to data to suit for the Pie Chart
n_data_added['Total'] = n_data_added['Movie'] + n_data_added['TV Show']
# To select last few rows only
n_data_added_flt = n_data_added[-4:]
n_data_added_flt = n_data_added_flt.reset_index(drop=True) # For resetting index
n_data_added_flt.head()
```

[30]:
```
type year_added   Movie  TV Show   Total
0           2018  1255.0    430.0  1685.0
1           2019  1497.0    656.0  2153.0
2           2020  1312.0    697.0  2009.0
3           2021    88.0     29.0   117.0
```

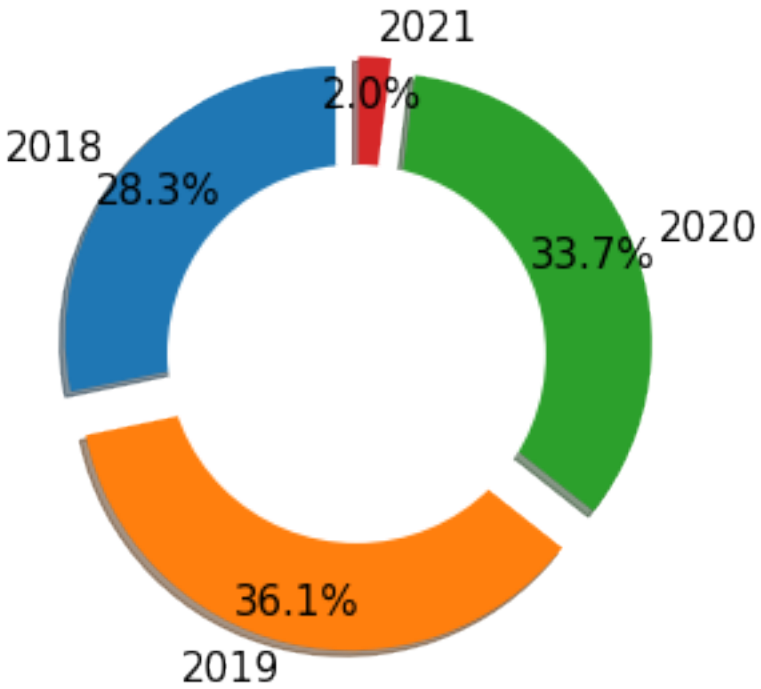
[31]:
```
labels = n_data_added_flt['year_added']
sizes = n_data_added_flt['Total']
explode = (0, 0.1, 0, 0)  # only "explode" the 2nd slice

fig2, ax2 = plt.subplots()
ax2.pie(sizes, explode=explode, labels=labels, autopct='%1.1f%%',
        shadow=True, startangle=90)
ax2.axis('equal')  # Equal aspect ratio ensures that pie is drawn as a circle.

plt.show()
```



6 Donut Chart

[32]:
```
# Pie chart
labels = n_data_added_flt['year_added']
sizes = n_data_added_flt['Total']
explode = (0.1, 0.1, 0.1, 0.1)  # "explode" all the slices

fig2, ax2 = plt.subplots()
```

```
ax2.pie(sizes, explode=explode, labels=labels, autopct='%1.1f%%',
        shadow=True, startangle=90, pctdistance=0.85) # Adjust font location

#draw circle and convert pie chart to Donut Chart
centre_circle = plt.Circle((0,0),0.70,fc='white')
fig2 = plt.gcf()
fig2.gca().add_artist(centre_circle)

# Equal aspect ratio ensures that pie is drawn as a circle
ax2.axis('equal')
plt.tight_layout()
plt.show()
```



7 Seaborn

Dataset: https://www.kaggle.com/andrewmvd/heart-failure-clinical-data

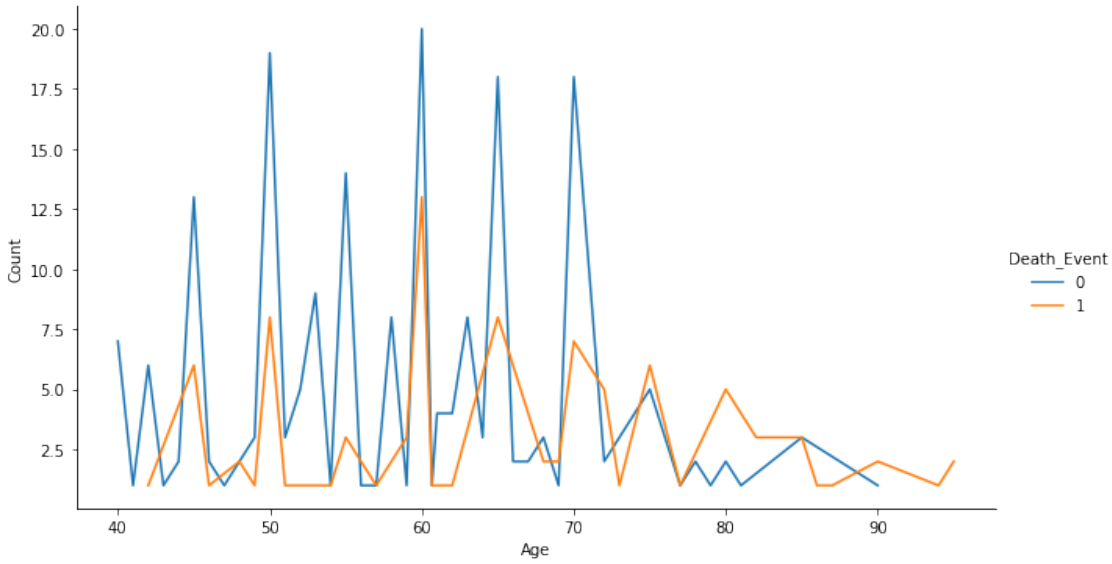
[9]:
```
import pandas as pd
import seaborn as sns
heart_failure_data = pd.read_csv(r'D:\Projects\New␣
 ↪folder\heart_failure_clinical_records_dataset.csv')
heart_failure_data.head()
```

[9]:
```
    age  anaemia  creatinine_phosphokinase  diabetes  ejection_fraction  \
0  75.0        0                       582         0                 20
1  55.0        0                      7861         0                 38
2  65.0        0                       146         0                 20
3  50.0        1                       111         0                 20
4  65.0        1                       160         1                 20

   high_blood_pressure  platelets  serum_creatinine  serum_sodium  sex  \
0                    1  265000.00               1.9           130    1
1                    0  263358.03               1.1           136    1
2                    0  162000.00               1.3           129    1
3                    0  210000.00               1.9           137    1
4                    0  327000.00               2.7           116    0

   smoking  time  DEATH_EVENT
0        0     4            1
1        0     6            1
2        1     7            1
3        0     7            1
4        0     8            1
```

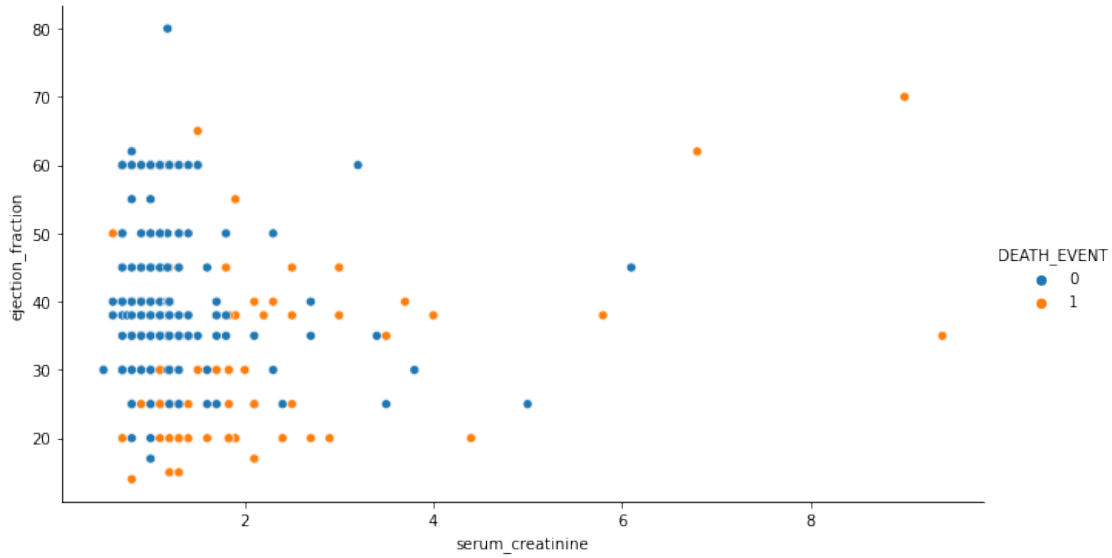
[10]:
```
# transforming data for visualization
agg_data = heart_failure_data.groupby(['age', 'DEATH_EVENT'], as_index=False).
 ↪ejection_fraction.count()
agg_data.columns = ['Age', 'Death_Event', 'Count']
agg_data.head()
```

[10]:
```
    Age  Death_Event  Count
0  40.0            0      7
1  41.0            0      1
2  42.0            0      6
3  42.0            1      1
4  43.0            0      1
```

[11]:
```
#relplot: scatterplot() (with kind="scatter"; the default) & ineplot() (with␣
 ↪kind="line")

lineplot() (with kind="line")
sns.relplot(x="Age", y="Count",
            hue="Death_Event" , aspect=16/9,
            kind="line", data=agg_data);
```



[12]:
```
sns.relplot(x="serum_creatinine", y="ejection_fraction",
            hue="DEATH_EVENT", kind="scatter", # Kind is optional
            data=heart_failure_data, aspect=16/9);
```



8 Heatmap

[13]:
```
# Data for heatmap
agg_data2 = heart_failure_data.groupby(['age', 'ejection_fraction'],␣
 ↪as_index=False).DEATH_EVENT.sum()
agg_data2.columns = ['Age', 'ejection_fraction', 'Deaths']
agg_data2_p = agg_data2.pivot(index='Age', columns='ejection_fraction',␣
 ↪values='Deaths')
agg_data2_p.fillna(0, inplace=True)
agg_data2_p.head(20)
```

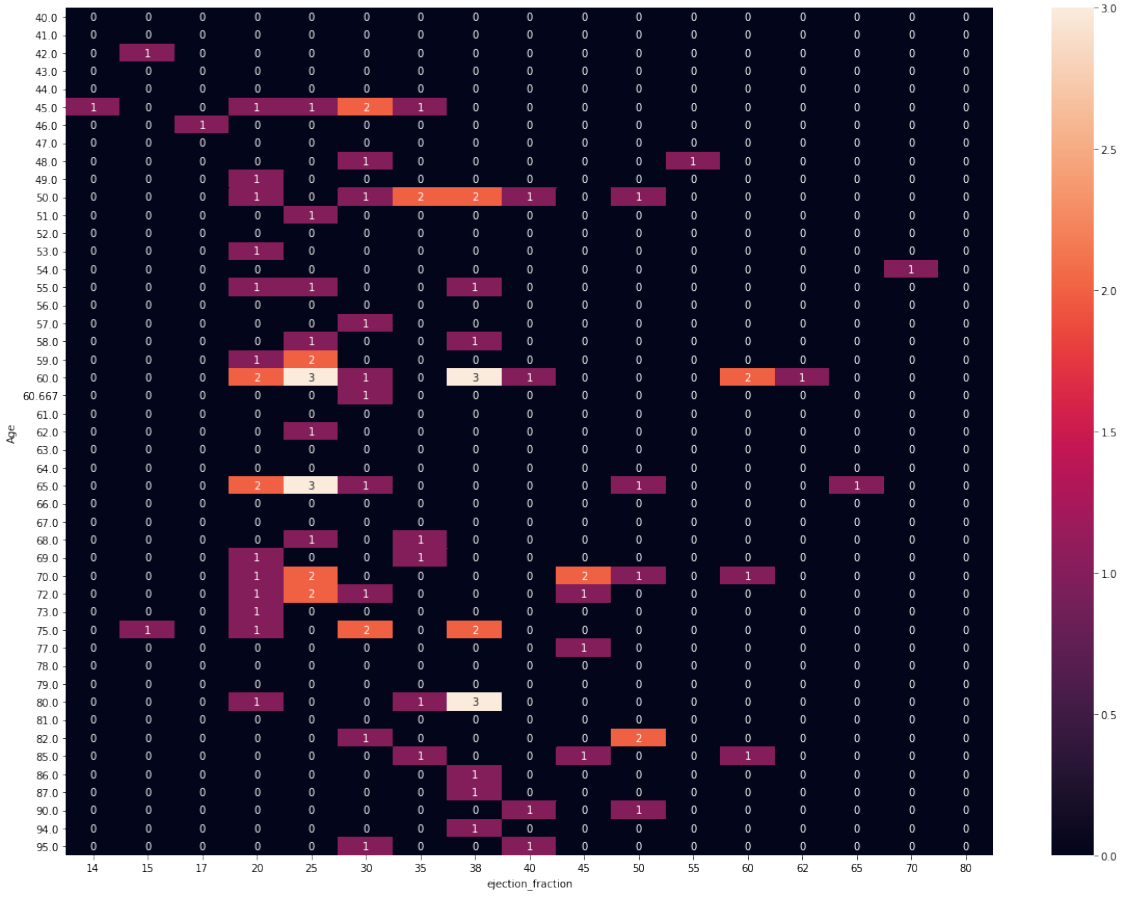
[13]:

ejection_fraction	14	15	17	20	25	30	35	38	40	45	50	55
Age												
40.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
41.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
42.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
43.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
44.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
45.0	1.0	0.0	0.0	1.0	1.0	2.0	1.0	0.0	0.0	0.0	0.0	0.0
46.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
47.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
48.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	1.0
49.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
50.0	0.0	0.0	0.0	1.0	0.0	1.0	2.0	2.0	1.0	0.0	1.0	0.0
51.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
52.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
53.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
54.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
55.0	0.0	0.0	0.0	1.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
56.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
57.0	0.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0
58.0	0.0	0.0	0.0	0.0	1.0	0.0	0.0	1.0	0.0	0.0	0.0	0.0
59.0	0.0	0.0	0.0	1.0	2.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0

ejection_fraction	60	62	65	70	80
Age					
40.0	0.0	0.0	0.0	0.0	0.0
41.0	0.0	0.0	0.0	0.0	0.0
42.0	0.0	0.0	0.0	0.0	0.0
43.0	0.0	0.0	0.0	0.0	0.0
44.0	0.0	0.0	0.0	0.0	0.0
45.0	0.0	0.0	0.0	0.0	0.0
46.0	0.0	0.0	0.0	0.0	0.0
47.0	0.0	0.0	0.0	0.0	0.0
48.0	0.0	0.0	0.0	0.0	0.0
49.0	0.0	0.0	0.0	0.0	0.0
50.0	0.0	0.0	0.0	0.0	0.0

51.0	0.0	0.0	0.0	0.0	0.0
52.0	0.0	0.0	0.0	0.0	0.0
53.0	0.0	0.0	0.0	0.0	0.0
54.0	0.0	0.0	0.0	1.0	0.0
55.0	0.0	0.0	0.0	0.0	0.0
56.0	0.0	0.0	0.0	0.0	0.0
57.0	0.0	0.0	0.0	0.0	0.0
58.0	0.0	0.0	0.0	0.0	0.0
59.0	0.0	0.0	0.0	0.0	0.0

[14]:
```
plt.subplots(figsize=(20,15))
sns.heatmap(agg_data2_p, annot=True)
plt.show()
```



9 Pair Plot

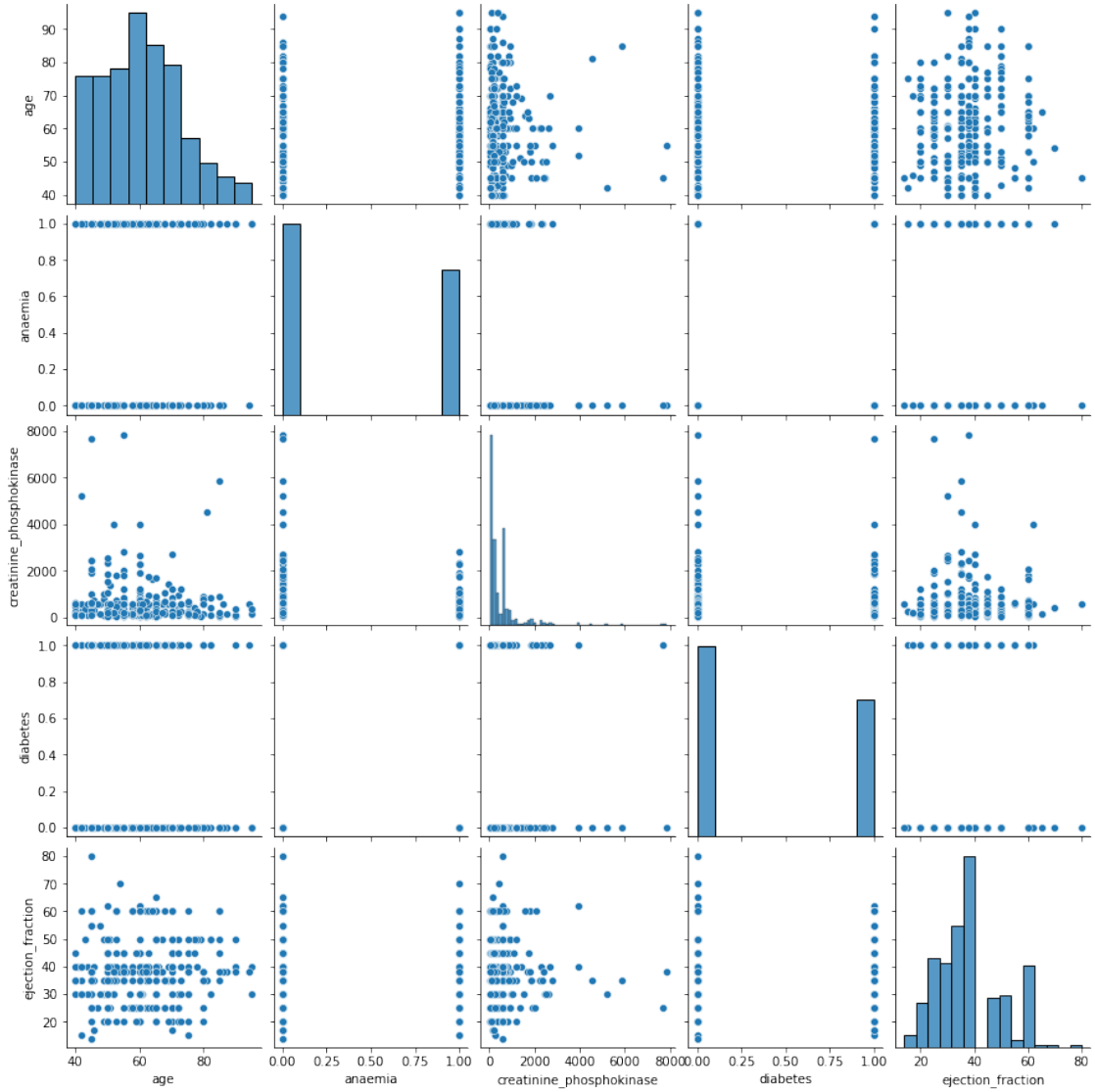
[15]:
```
subset = heart_failure_data.iloc[:,[0,1,2,3,4]]
subset.head()
```

[15]:

	age	anaemia	creatinine_phosphokinase	diabetes	ejection_fraction
0	75.0	0	582	0	20
1	55.0	0	7861	0	38
2	65.0	0	146	0	20
3	50.0	1	111	0	20
4	65.0	1	160	1	20

[16]:
```
sns.pairplot(subset)
```

[16]: <seaborn.axisgrid.PairGrid at 0x252d915e0a0>



10 Bokeh Plot

[20]:
```
from bokeh.plotting import figure, output_file, show

p = figure(title = "Age Vs Ejection Fraction")
p.xaxis.axis_label = 'Age'
p.yaxis.axis_label = 'Ejection Fraction'

p.circle(agg_data2["Age"], agg_data2["ejection_fraction"],
         fill_alpha=0.2, size=10)

output_file("test.html", title="Example")

show(p)
```

[ ]:
```

```