Демьянчук Г.В. ИУ5-22М ЛР№1

```
import numpy as np
import pandas as pd
import seaborn as sb
import matplotlib.pyplot as plt

%matplotlib inline
sb.set(style='ticks')
```

```
/usr/local/lib/python3.6/dist-packages/statsmodels/tools/_testing.py:19: FutureWarning:
  import pandas.util.testing as tm
```

```
# Будем анализировать данные только на обучающей выборке
data = pd.read_csv('/content/athlete_events.csv', sep=",")
```

```
# Первые 5 строк датасета
data.head()
```

	ID	Name	Sex	Age	Height	Weight	Team	NOC	Games	Year	Season
0	1	A Dijiang	M	24.0	180.0	80.0	China	CHN	1992 Summer	1992	Summer
1	2	A Lamusi	M	23.0	170.0	60.0	China	CHN	2012 Summer	2012	Summer
2	3	Gunnar Nielsen Aaby	M	24.0	NaN	NaN	Denmark	DEN	1920 Summer	1920	Summer
3	4	Edgar Lindenau Aabye	M	34.0	NaN	NaN	Denmark/Sweden	DEN	1900 Summer	1900	Summer
4	5	Christine Jacoba Aaftink	F	21.0	185.0	82.0	Netherlands	NED	1988 Winter	1988	Winter

```
# Размер датасета - 271116 строк, 15 колонок
data.shape
```

```
(271116, 15)
```

```
total_count = data.shape[0]
print('Всего строк: {}'.format(total_count))
```

```
Всего строк: 271116
```

```
data.columns
```

```
Index(['ID', 'Name', 'Sex', 'Age', 'Height', 'Weight', 'Team', 'NOC', 'Games',
       'Year', 'Season', 'City', 'Sport', 'Event', 'Medal'],
      dtype='object')
```

```
data.dtypes
```

```
ID          int64
Name       object
Sex        object
Age       float64
Height    float64
Weight    float64
Team       object
NOC        object
Games      object
Year        int64
Season     object
City       object
Sport      object
Event      object
Medal      object
dtype: object
```

```
#Проверим на пустые значения
for column in data.columns:
    temp_null_count = data[data[column].isnull()].shape[0]
    print('{} - {}'.format(column,temp_null_count))
```

```
ID - 0
Name - 0
Sex - 0
Age - 9474
Height - 60171
Weight - 62875
Team - 0
NOC - 0
Games - 0
Year - 0
Season - 0
City - 0
Sport - 0
Event - 0
Medal - 231333
```

```
#основные статические характеритсики набора данных
data.describe()
```

	ID	Age	Height	Weight	Year
count	271116.000000	261642.000000	210945.000000	208241.000000	271116.000000
mean	68248.954396	25.556898	175.338970	70.702393	1978.378480
std	39022.286345	6.393561	10.518462	14.348020	29.877632
min	1.000000	10.000000	127.000000	25.000000	1896.000000
25%	34643.000000	21.000000	168.000000	60.000000	1960.000000
50%	68205.000000	24.000000	175.000000	70.000000	1988.000000
75%	102097.250000	28.000000	183.000000	79.000000	2002.000000
max	135571.000000	97.000000	226.000000	214.000000	2016.000000

```
# Определим уникальные значения для целевого признака
data['Season'].unique()
```

```
array(['Summer', 'Winter'], dtype=object)
```

```
# Определим уникальные значения для целевого признака
data['Sport'].unique()
```

```
array(['Basketball', 'Judo', 'Football', 'Tug-Of-War', 'Speed Skating',
       'Cross Country Skiing', 'Athletics', 'Ice Hockey', 'Swimming',
       'Badminton', 'Sailing', 'Biathlon', 'Gymnastics',
       'Art Competitions', 'Alpine Skiing', 'Handball', 'Weightlifting',
       'Wrestling', 'Luge', 'Water Polo', 'Hockey', 'Rowing', 'Bobsleigh',
       'Fencing', 'Equestrianism', 'Shooting', 'Boxing', 'Taekwondo',
       'Cycling', 'Diving', 'Canoeing', 'Tennis', 'Modern Pentathlon',
       'Figure Skating', 'Golf', 'Softball', 'Archery', 'Volleyball',
       'Synchronized Swimming', 'Table Tennis', 'Nordic Combined',
       'Baseball', 'Rhythmic Gymnastics', 'Freestyle Skiing',
       'Rugby Sevens', 'Trampolining', 'Beach Volleyball', 'Triathlon',
       'Ski Jumping', 'Curling', 'Snowboarding', 'Rugby',
       'Short Track Speed Skating', 'Skeleton', 'Lacrosse', 'Polo',
       'Cricket', 'Racquets', 'Motorboating', 'Military Ski Patrol',
       'Croquet', 'Jeu De Paume', 'Roque', 'Alpinism', 'Basque Pelota',
       'Aeronautics'], dtype=object)
```

```
# Определим уникальные значения для целевого признака
data['Sex'].unique()
```

```
array(['M', 'F'], dtype=object)
```

```
# Определим уникальные значения для целевого признака
```

```
data['NOC'].unique()
```

```
array(['CHN', 'DEN', 'NED', 'USA', 'FIN', 'NOR', 'ROU', 'EST', 'FRA',
       'MAR', 'ESP', 'EGY', 'IRI', 'BUL', 'ITA', 'CHA', 'AZE', 'SUD',
       'RUS', 'ARG', 'CUB', 'BLR', 'GRE', 'CMR', 'TUR', 'CHI', 'MEX',
       'URS', 'NCA', 'HUN', 'NGR', 'ALG', 'KUW', 'BRN', 'PAK', 'IRQ',
       'UAR', 'LIB', 'QAT', 'MAS', 'GER', 'CAN', 'IRL', 'AUS', 'RSA',
       'ERI', 'TAN', 'JOR', 'TUN', 'LBA', 'BEL', 'DJI', 'PLE', 'COM',
       'KAZ', 'BRU', 'IND', 'KSA', 'SYR', 'MDV', 'ETH', 'UAE', 'YAR',
       'INA', 'PHI', 'SGP', 'UZB', 'KGZ', 'TJK', 'EUN', 'JPN', 'CGO',
       'SUI', 'BRA', 'FRG', 'GDR', 'MON', 'ISR', 'URU', 'SWE', 'ISV',
       'SRI', 'ARM', 'CIV', 'KEN', 'BEN', 'UKR', 'GBR', 'GHA', 'SOM',
       'LAT', 'NIG', 'MLI', 'AFG', 'POL', 'CRC', 'PAN', 'GEO', 'SLO',
       'CRO', 'GUY', 'NZL', 'POR', 'PAR', 'ANG', 'VEN', 'COL', 'BAN',
       'PER', 'ESA', 'PUR', 'UGA', 'HON', 'ECU', 'TKM', 'MRI', 'SEY',
       'TCH', 'LUX', 'MTN', 'CZE', 'SKN', 'TTO', 'DOM', 'VIN', 'JAM',
       'LBR', 'SUR', 'NEP', 'MGL', 'AUT', 'PLW', 'LTU', 'TOG', 'NAM',
       'AHO', 'ISL', 'ASA', 'SAM', 'RWA', 'DMA', 'HAI', 'MLT', 'CYP',
       'GUI', 'BIZ', 'YMD', 'KOR', 'THA', 'BER', 'ANZ', 'SCG', 'SLE',
       'PNG', 'YEM', 'IOA', 'OMA', 'FIJ', 'VAN', 'MDA', 'YUG', 'BAH',
       'GUA', 'SRB', 'IVB', 'MOZ', 'CAF', 'MAD', 'MAL', 'BIH', 'GUM',
       'CAY', 'SVK', 'BAR', 'GBS', 'TLS', 'COD', 'GAB', 'SMR', 'LAO',
       'BOT', 'ROT', 'CAM', 'PRK', 'SOL', 'SEN', 'CPV', 'CRT', 'GEQ',
       'BOL', 'SAA', 'AND', 'ANT', 'ZIM', 'GRN', 'HKG', 'LCA', 'FSM',
       'MYA', 'MAW', 'ZAM', 'RHO', 'TPE', 'STP', 'MKD', 'BOH', 'TGA',
       'LIE', 'MNE', 'GAM', 'COK', 'ALB', 'WIF', 'SWZ', 'BUR', 'NBO',
       'BDI', 'ARU', 'NRU', 'VNM', 'VIE', 'BHU', 'MHL', 'KIR', 'UNK',
       'TUV', 'NFL', 'KOS', 'SSD', 'LES'], dtype=object)
```

```
# Определим уникальные значения для целевого признака
data['Medal'].unique()
```

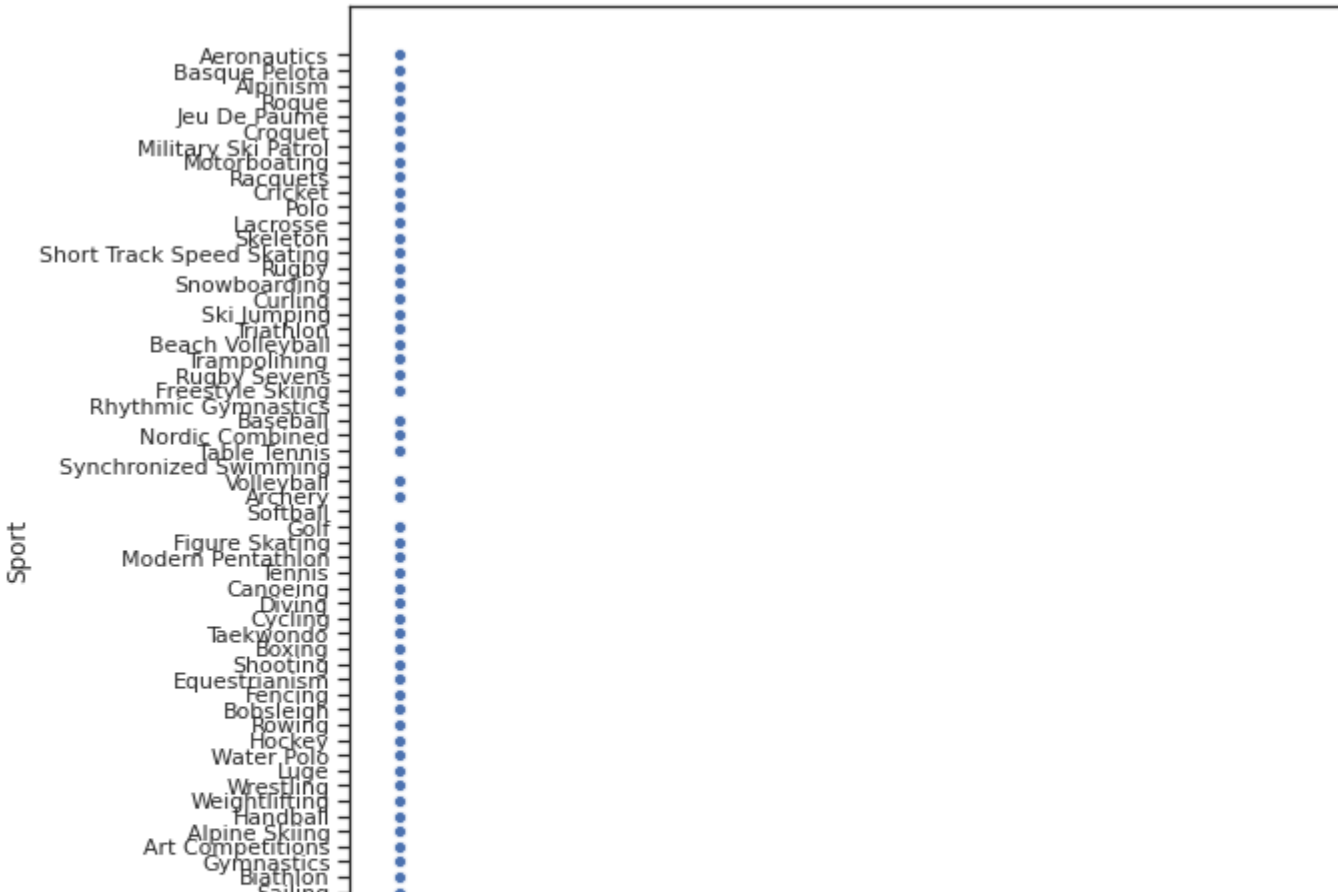
```
array([nan, 'Gold', 'Bronze', 'Silver'], dtype=object)
```

```
# Определим уникальные значения для целевого признака
data['Year'].unique()
```

```
array([1992, 2012, 1920, 1900, 1988, 1994, 1932, 2002, 1952, 1980, 2000,
       1996, 1912, 1924, 2014, 1948, 1998, 2006, 2008, 2016, 2004, 1960,
       1964, 1984, 1968, 1972, 1936, 1956, 1928, 1976, 2010, 1906, 1904,
       1908, 1896])
```

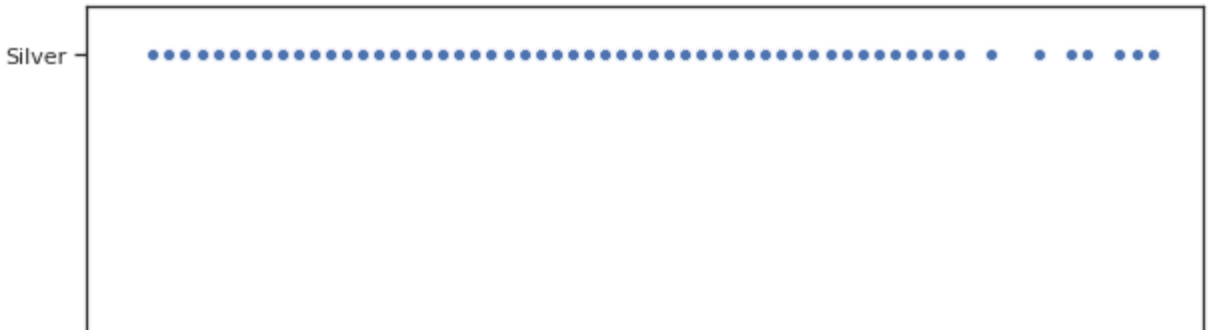
```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Sex', y='Sport', data=data)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c1e191cf8>
```




```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Age', y='Medal', data=data)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c1b8a16a0>
```




```
data['Age'].unique()
```

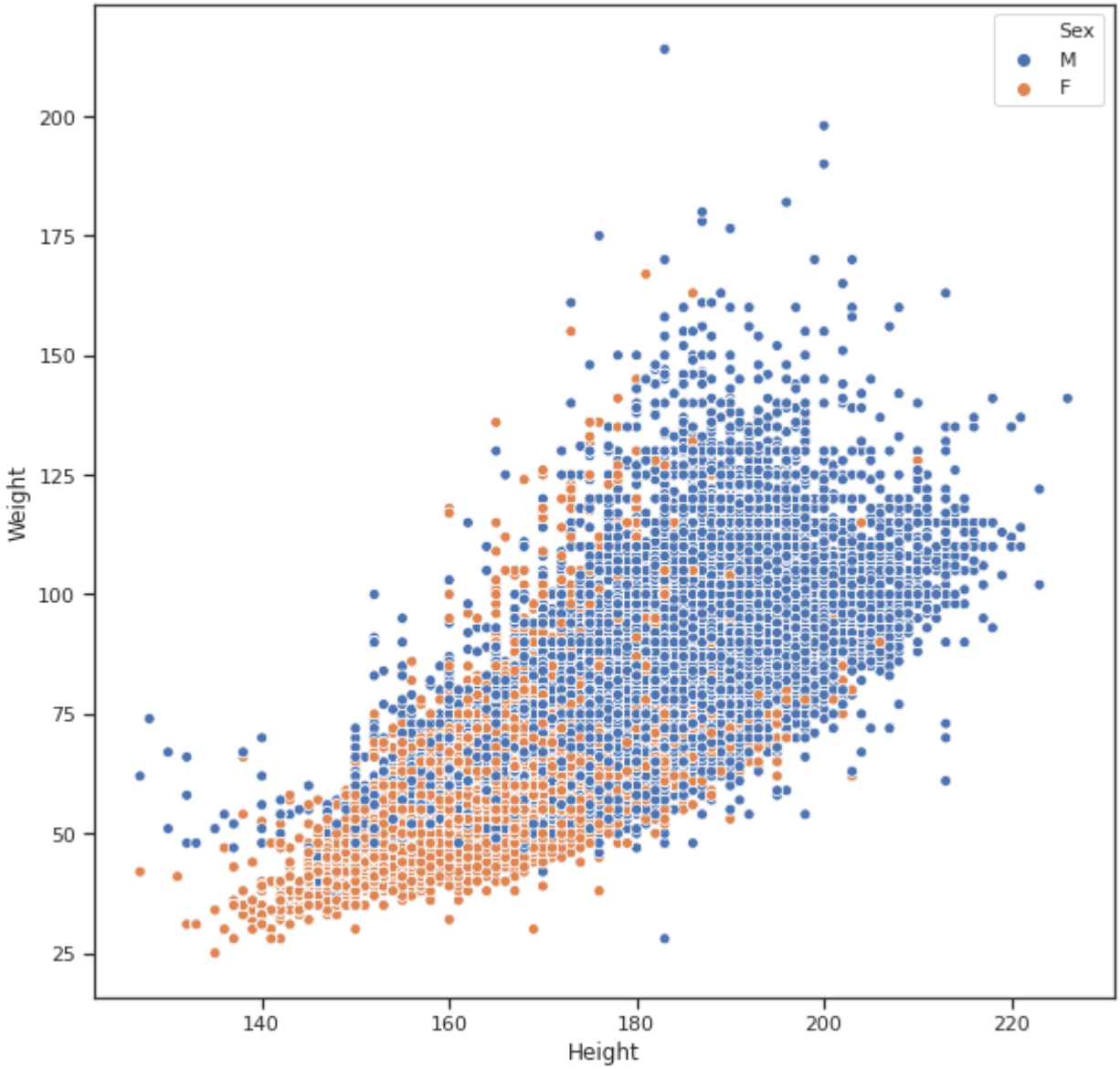
```
array([24., 23., 34., 21., 25., 27., 31., 33., 18., 26., 22., 30., 32.,
       28., 54., 20., 17., 43., 47., 29., 41., 45., 49., 53., 57., nan,
       19., 38., 35., 16., 37., 15., 42., 46., 40., 36., 14., 39., 48.,
       52., 44., 55., 50., 71., 63., 51., 58., 13., 60., 75., 65., 56.,
       64., 68., 84., 12., 72., 59., 61., 70., 74., 62., 67., 69., 73.,
       66., 11., 76., 88., 96., 80., 10., 81., 77., 97.])
```

```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Height', y='Weight', data=data)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c19b4a9b0>
```

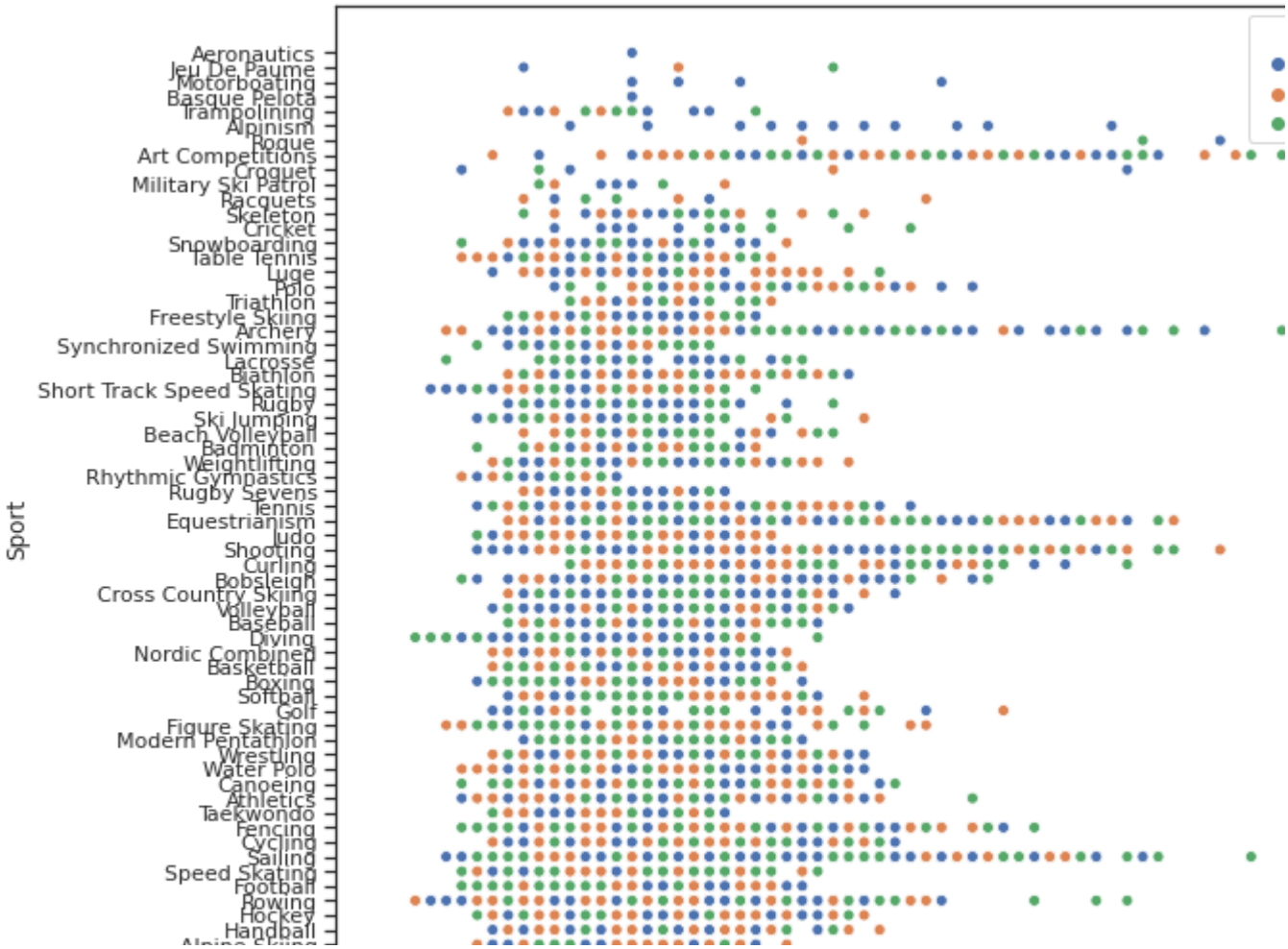
```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Height', y='Weight', data=data, hue='Sex')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c19abc1d0>
```




```
fig, ax = plt.subplots(figsize=(10,10))
sb.scatterplot(ax=ax, x='Age', y='Sport', data=data, hue='Medal')
```

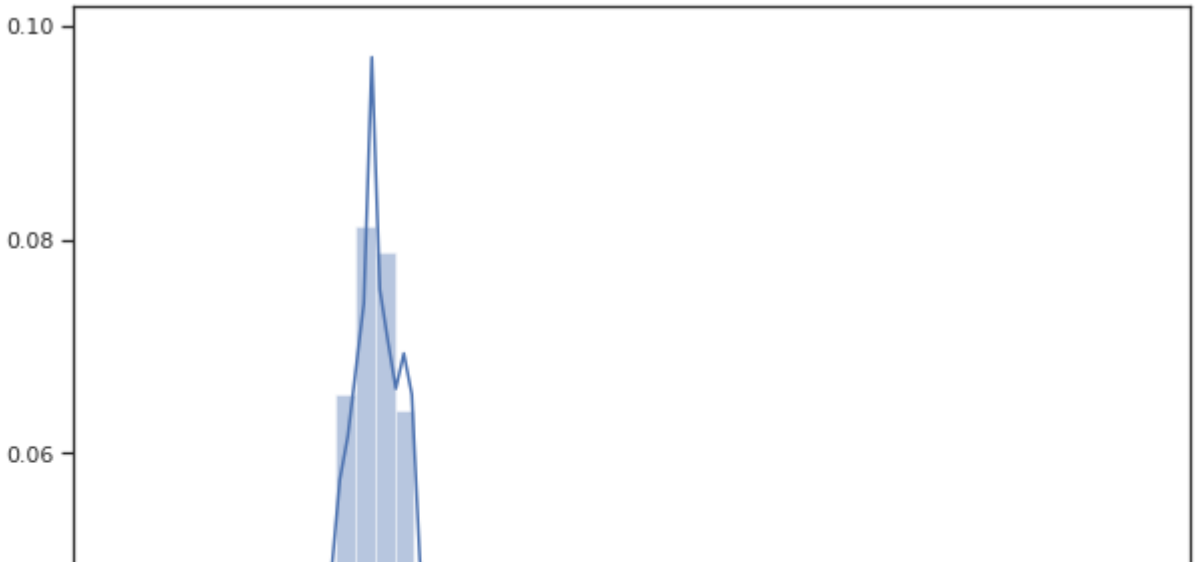
```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c19ab35c0>
```




```
data=data.fillna(0)
```

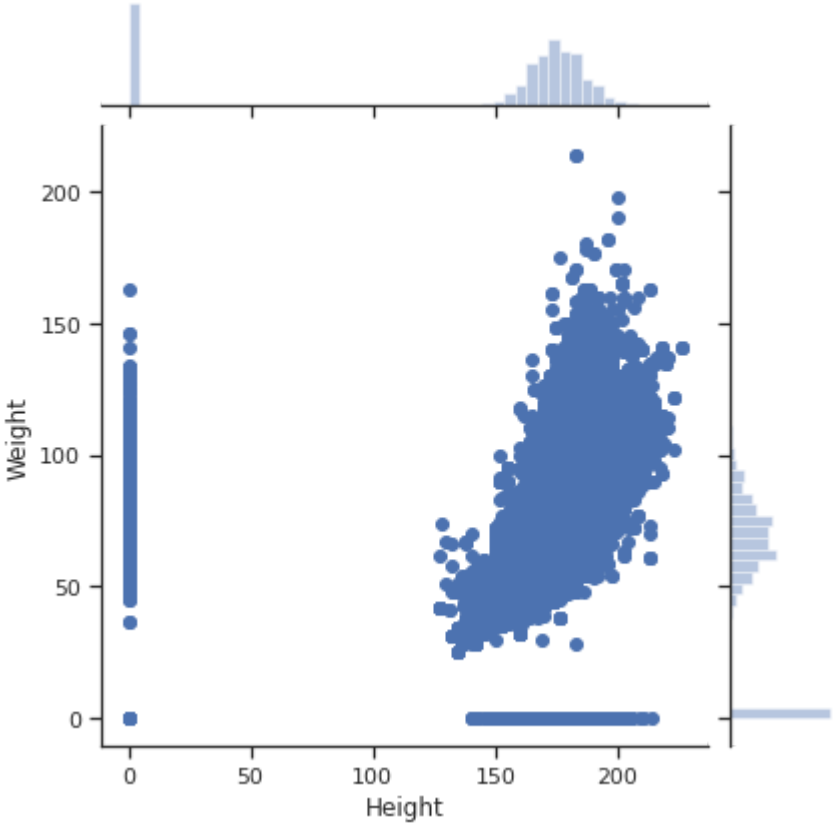
```
fig, ax = plt.subplots(figsize=(10,10))
sb.distplot(data['Age'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c19ab32b0>
```



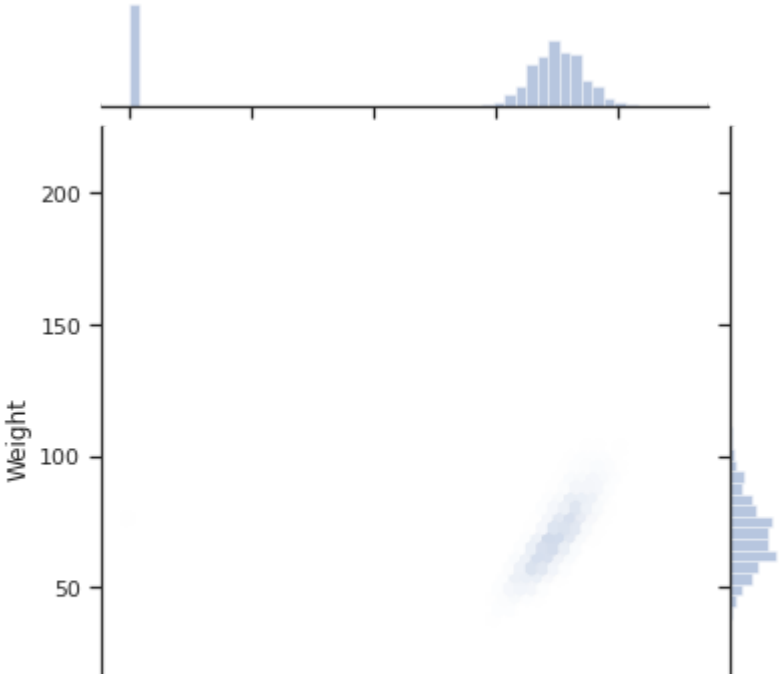

```
sb.jointplot(x='Height', y='Weight', data=data)
```

```
<seaborn.axisgrid.JointGrid at 0x7f5c198f0fd0>
```



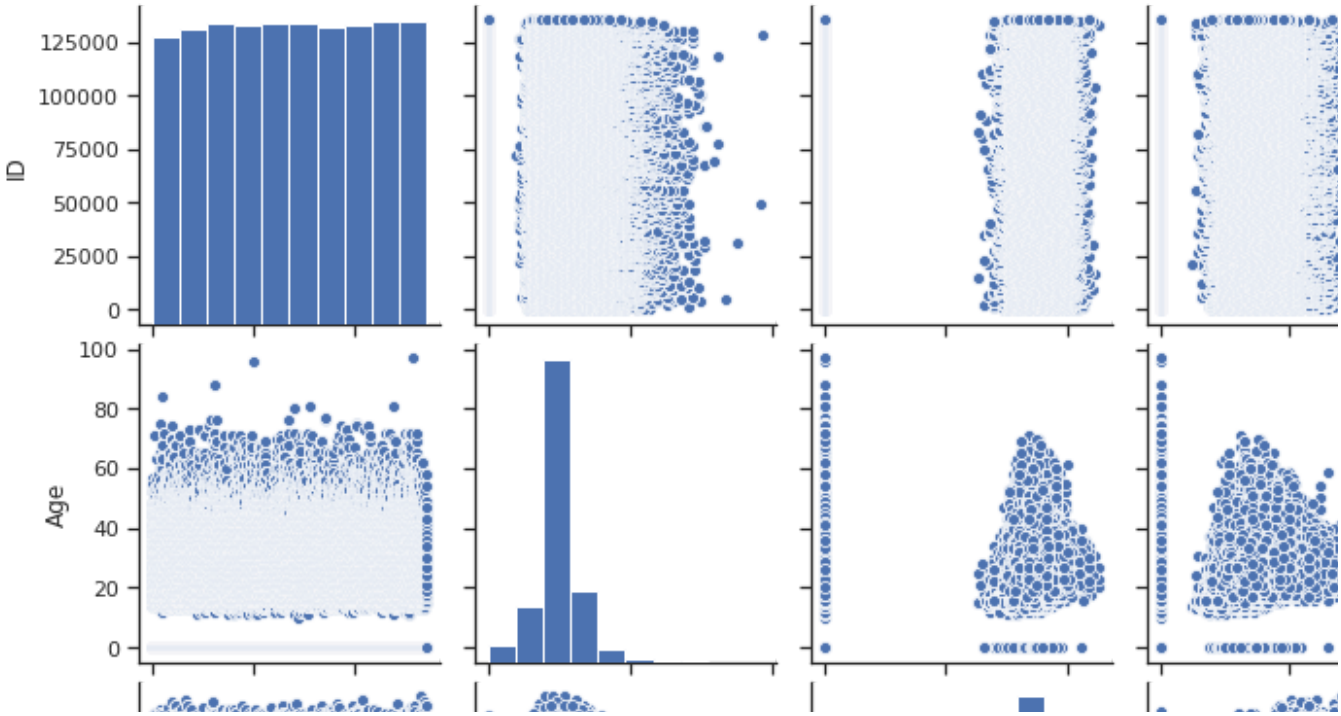

```
sb.jointplot(x='Height', y='Weight', data=data, kind="hex")
```

```
<seaborn.axisgrid.JointGrid at 0x7f5c197adac8>
```



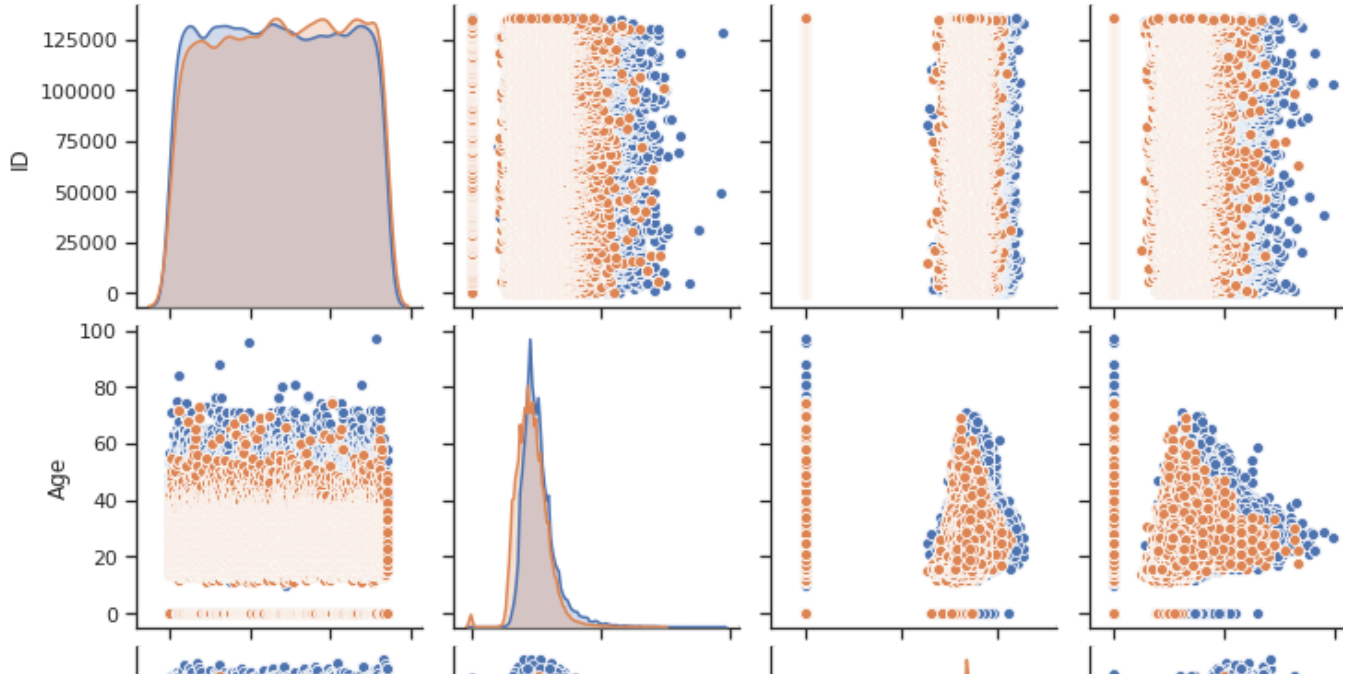

```
sb.pairplot(data)
```

```
<seaborn.axisgrid.PairGrid at 0x7f5c1e1913c8>
```



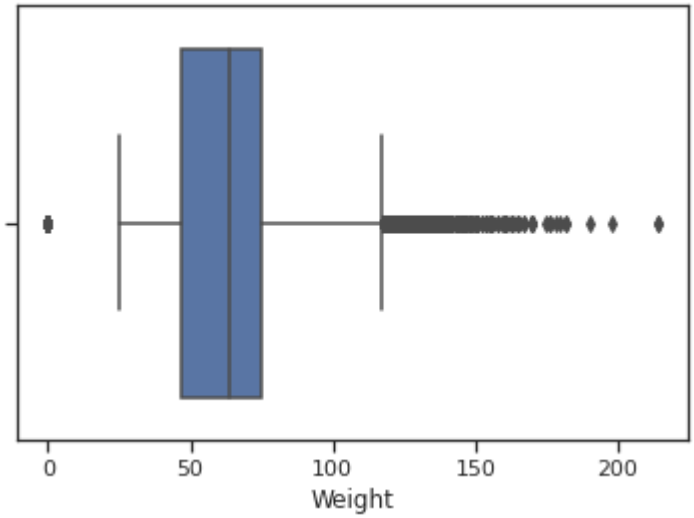

```
sb.pairplot(data, hue="Sex")
```

```
<seaborn.axisgrid.PairGrid at 0x7f5c18babf60>
```




```
sb.boxplot(x=data['Weight'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c1821c898>
```

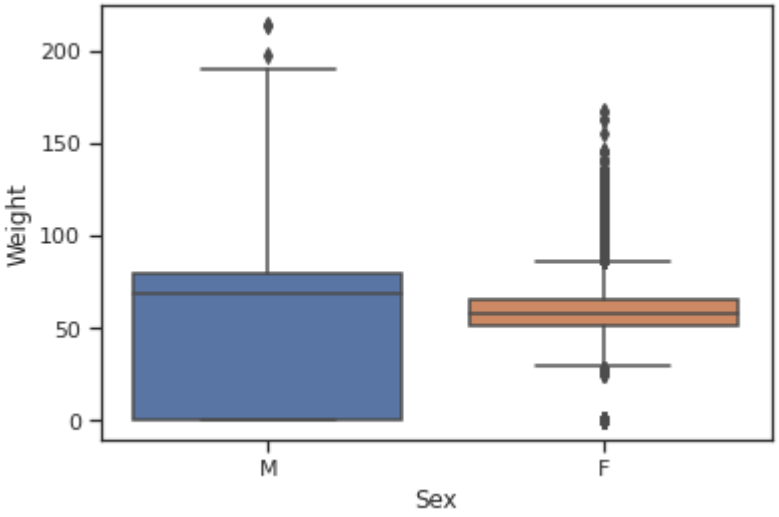



```
sb.boxplot(y=data['Height'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c18176438>
```

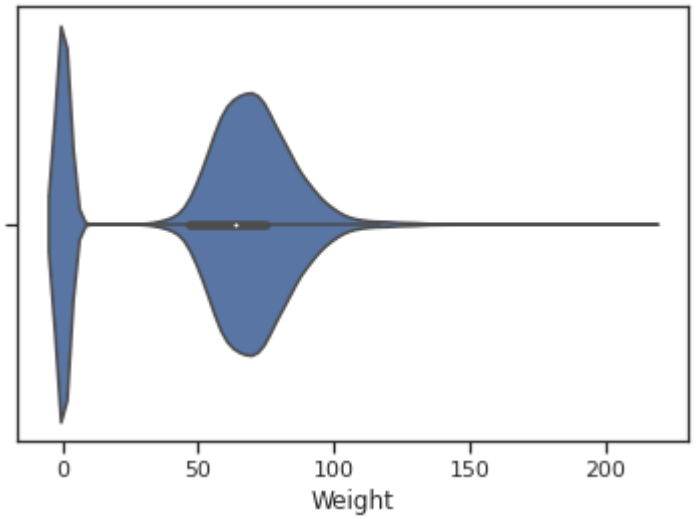
```
sb.boxplot(x='Sex', y='Weight',data=data)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c180ca198>
```



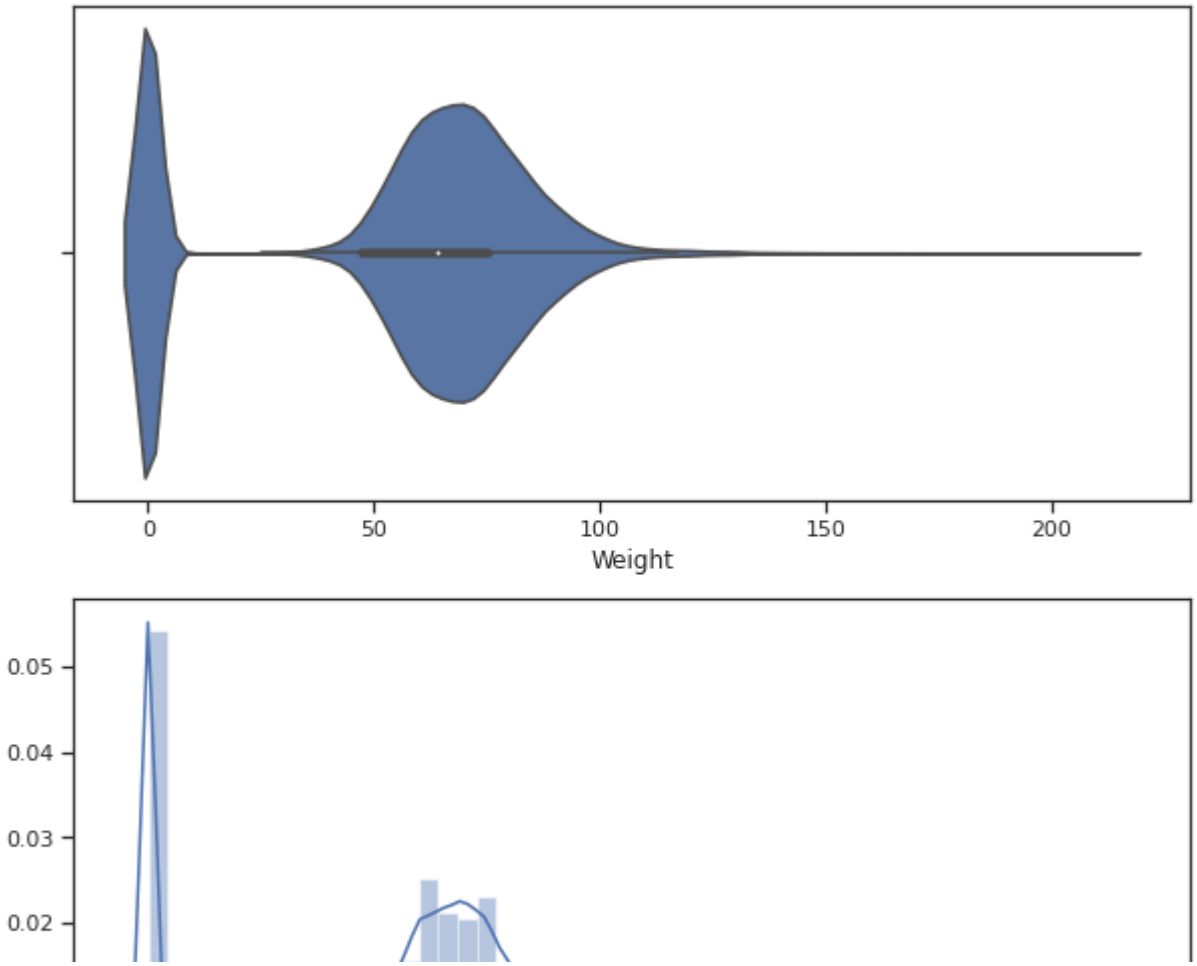

```
sb.violinplot(x=data['Weight'])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c180d0780>
```



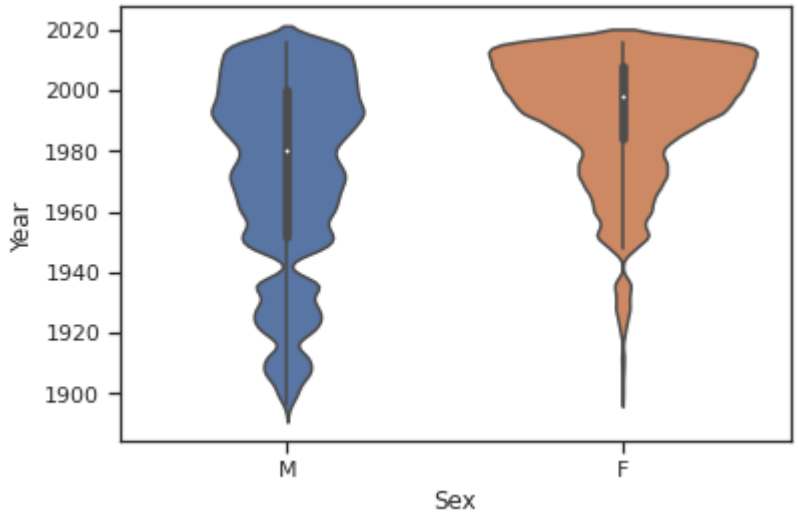

```
fig, ax = plt.subplots(2, 1, figsize=(10,10))
sb.violinplot(ax=ax[0], x=data['Weight'])
sb.distplot(data['Weight'], ax=ax[1])
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c17fcc400>
```



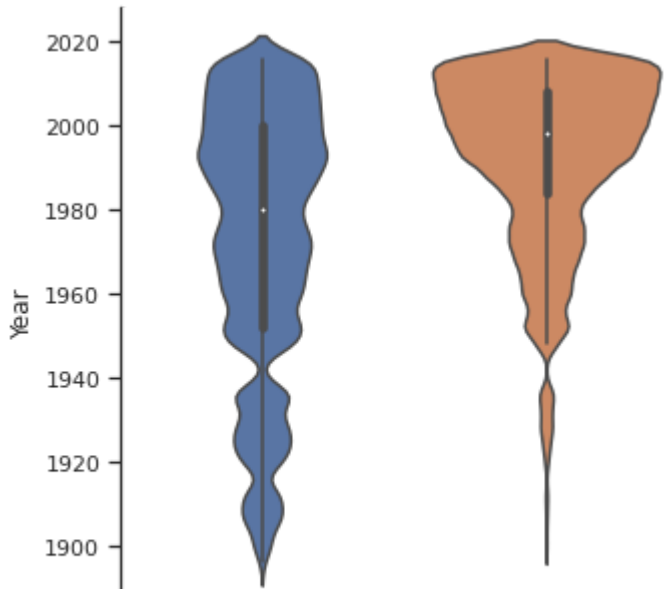

```
sb.violinplot(x='Sex', y='Year',data=data)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c17f1ef98>
```




```
sb.catplot(x='Sex', y='Year', data=data, kind="violin", split=True)
```

```
<seaborn.axisgrid.FacetGrid at 0x7f5c17f332b0>
```




```
data.corr()
```

	ID	Age	Height	Weight	Year
ID	1.000000	0.000555	0.011114	0.010938	0.011885
Age	0.000555	1.000000	0.086514	0.114378	0.094453
Height	0.011114	0.086514	1.000000	0.899466	0.652054
Weight	0.010938	0.114378	0.899466	1.000000	0.622125
Year	0.011885	0.094453	0.652054	0.622125	1.000000

```
data.corr(method='pearson')
```

	ID	Age	Height	Weight	Year
ID	1.000000	0.000555	0.011114	0.010938	0.011885
Age	0.000555	1.000000	0.086514	0.114378	0.094453
Height	0.011114	0.086514	1.000000	0.899466	0.652054
Weight	0.010938	0.114378	0.899466	1.000000	0.622125
Year	0.011885	0.094453	0.652054	0.622125	1.000000

```
data.corr(method='kendall')
```

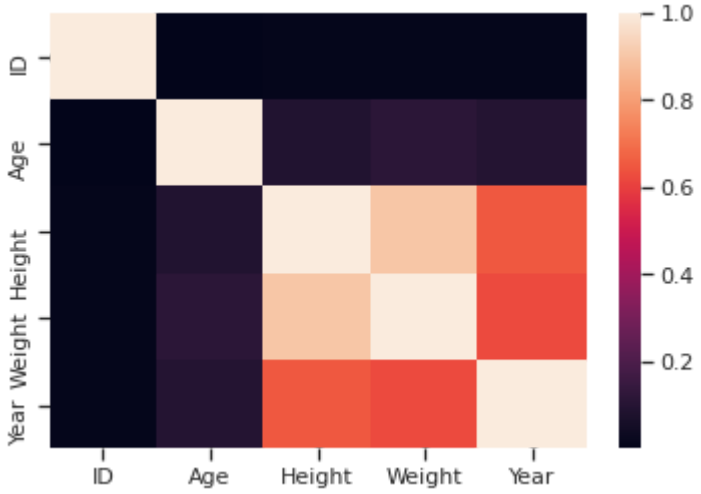
	ID	Age	Height	Weight	Year
ID	1.000000	-0.000083	0.001710	0.002794	0.008940
Age	-0.000083	1.000000	0.077636	0.104872	0.057767

```
data.corr(method='spearman')
```

	ID	Age	Height	Weight	Year
ID	1.000000	-0.000118	0.002461	0.004066	0.013191
Age	-0.000118	1.000000	0.105464	0.140278	0.078540
Height	0.002461	0.105464	1.000000	0.884870	0.446163
Weight	0.004066	0.140278	0.884870	1.000000	0.440047
Year	0.013191	0.078540	0.446163	0.440047	1.000000

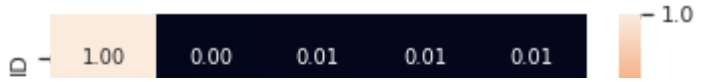
```
sb.heatmap(data.corr())
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c17e24be0>
```



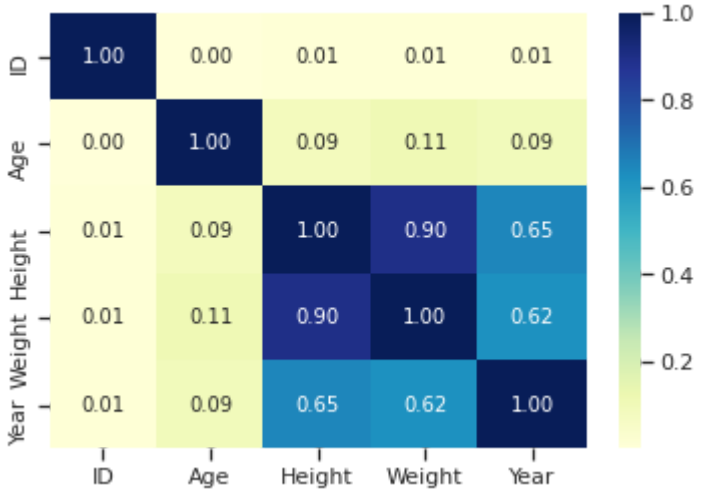

```
sb.heatmap(data.corr(), annot=True, fmt='.2f')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c17ec1908>
```



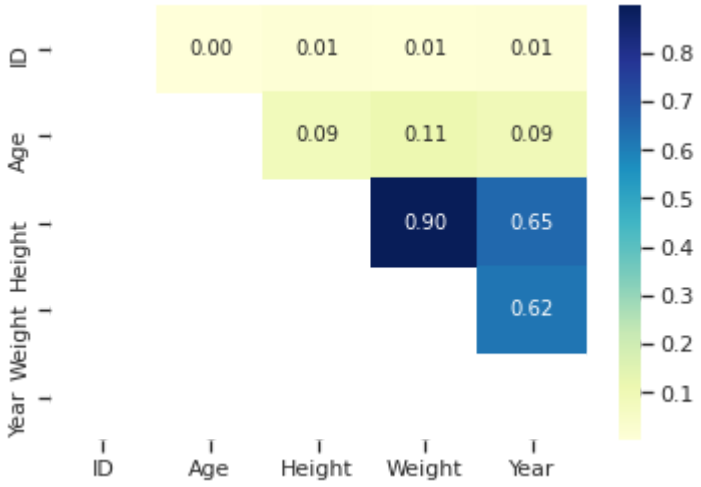

```
sb.heatmap(data.corr(), cmap='YlGnBu', annot=True, fmt='.2f')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c169c9780>
```




```
# Треугольный вариант матрицы
mask = np.zeros_like(data.corr(), dtype=np.bool)
# чтобы оставить нижнюю часть матрицы
# mask[np.triu_indices_from(mask)] = True
# чтобы оставить верхнюю часть матрицы
mask[np.tril_indices_from(mask)] = True
sb.heatmap(data.corr(), mask=mask, cmap='YlGnBu', annot=True, fmt='.2f')
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f5c1694bd30>
```




```
fig, ax = plt.subplots(1, 3, sharex='col', sharey='row', figsize=(15,5))
sb.heatmap(data.corr(method='pearson'), ax=ax[0], cmap='YlGnBu', annot=True, fmt='.2f')
sb.heatmap(data.corr(method='kendall'), ax=ax[1],cmap='YlGnBu', annot=True, fmt='.2f')
sb.heatmap(data.corr(method='spearman'), ax=ax[2], cmap='YlGnBu', annot=True, fmt='.2f')
fig.suptitle('Корреляционные матрицы, построенные различными методами')
ax[0].title.set_text('Pearson')
```

```
ax[1].title.set_text('Kendall')
ax[2].title.set_text('Spearman')
```