Министерство науки и высшего образования Российской Федерации
Федеральное государственное бюджетное образовательное учреждение высшего образования
«Московский государственный технический университет имени Н.Э. Баумана (национальный исследовательский университет)»
(МГТУ им. Н.Э. Баумана)

Факультет «Информатика и системы управления»

Кафедра ИУ5 «Системы обработки информации и управления»

Отчет по лабораторной работе №1

по дисциплине «Методы машинного обучения»

по теме «Создание “истории о данных”»

Выполнил:
студент группы № ИУ5-21М
Камалов М.Р.
подпись, дата

Проверил:
Балашов А.М.
подпись, дата

2023 г.

Задание.

Создать "историю о данных" в виде юпитер-ноутбука, с учетом следующих требований:

1. История должна содержать не менее 5 шагов (где 5 - рекомендуемое количество шагов). Каждый шаг содержит график и его текстовую интерпретацию.
2. На каждом шаге наряду с удачным итоговым графиком рекомендуется в юпитер-ноутбуке оставлять результаты предварительных "неудачных" графиков.
3. Не рекомендуется повторять виды графиков, желательно создать 5 графиков различных видов.
4. Выбор графиков должен быть обоснован использованием методологии data-to-viz. Рекомендуется учитывать типичные ошибки построения выбранного вида графика по методологии data-to-viz. Если методология Вами отвергается, то просьба обосновать Ваше решение по выбору графика.
5. История должна содержать итоговые выводы. В реальных "историях о данных" именно эти выводы представляют собой основную ценность для предприятия.

Лабраторная работа №1. Создание "истории о данных".

Загрузка необходимых библиотек.

```
import numpy as np
import pandas as pd
import seaborn as sns
import matplotlib.pyplot as plt
%matplotlib inline
sns.set(style="ticks")
```

Описание набора данных. Загрузка данных.

Context Dataset of Starcraft 2 games, played in different leagues/levels.

Content Screen movements aggregated into screen-fixations. -- Time is recorded in terms of timestamps in the StarCraft 2 replay file. When the game is played on 'faster', 1 real-time second is equivalent to roughly 88.5 timestamps.

Attribute Information:

GameID: Unique ID number for each game (integer)

LeagueIndex: Bronze, Silver, Gold, Platinum, Diamond, Master, GrandMaster, and Professional leagues coded 1-8 (Ordinal)

Age: Age of each player (integer)

HoursPerWeek: Reported hours spent playing per week (integer)

TotalHours: Reported total hours spent playing (integer)

APM: Action per minute (continuous)

SelectByHotkeys: Number of unit or building selections made using hotkeys per timestamp (continuous)

AssignToHotkeys: Number of units or buildings assigned to hotkeys per timestamp (continuous)

UniqueHotkeys: Number of unique hotkeys used per timestamp (continuous)

MinimapAttacks: Number of attack actions on minimap per timestamp (continuous)

MinimapRightClicks: number of right-clicks on minimap per timestamp (continuous)

NumberOfPACs: Number of PACs per timestamp (continuous)

GapBetweenPACs: Mean duration in milliseconds between PACs (continuous)

ActionLatency: Mean latency from the onset of a PACs to their first action in milliseconds (continuous)

ActionsInPAC: Mean number of actions within each PAC (continuous)

TotalMapExplored: The number of 24x24 game coordinate grids viewed by the player per timestamp (continuous)

WorkersMade: Number of SCVs, drones, and probes trained per timestamp (continuous)

UniqueUnitsMade: Unique unites made per timestamp (continuous)

ComplexUnitsMade: Number of ghosts, infestors, and high templars trained per timestamp (continuous)

ComplexAbilitiesUsed: Abilities requiring specific targeting instructions used per timestamp (continuous)

```
data = pd.read_csv('starcraft_player_data.csv', sep=",")
# Первые 5 строк датасета
data = data.drop(['GameID'], axis=1)
data.head()
```

```
   LeagueIndex Age HoursPerWeek TotalHours       APM  SelectByHotkeys
\
0            5  27           10       3000  143.7180         0.003515

1            5  23           10       5000  129.2322         0.003304

2            4  30           10        200   69.9612         0.001101

3            3  19           20        400  107.6016         0.001034

4            3  32           10        500  122.8908         0.001136


   AssignToHotkeys  UniqueHotkeys  MinimapAttacks  MinimapRightClicks
\
0         0.000220              7        0.000110            0.000392

1         0.000259              4        0.000294            0.000432

2         0.000336              4        0.000294            0.000461

3         0.000213              1        0.000053            0.000543

4         0.000327              2        0.000000            0.001329


   NumberOfPACs  GapBetweenPACs  ActionLatency  ActionsInPAC  \
0      0.004849         32.6677        40.8673        4.7508
1      0.004307         32.9194        42.3454        4.8434
2      0.002926         44.6475        75.3548        4.0430
```

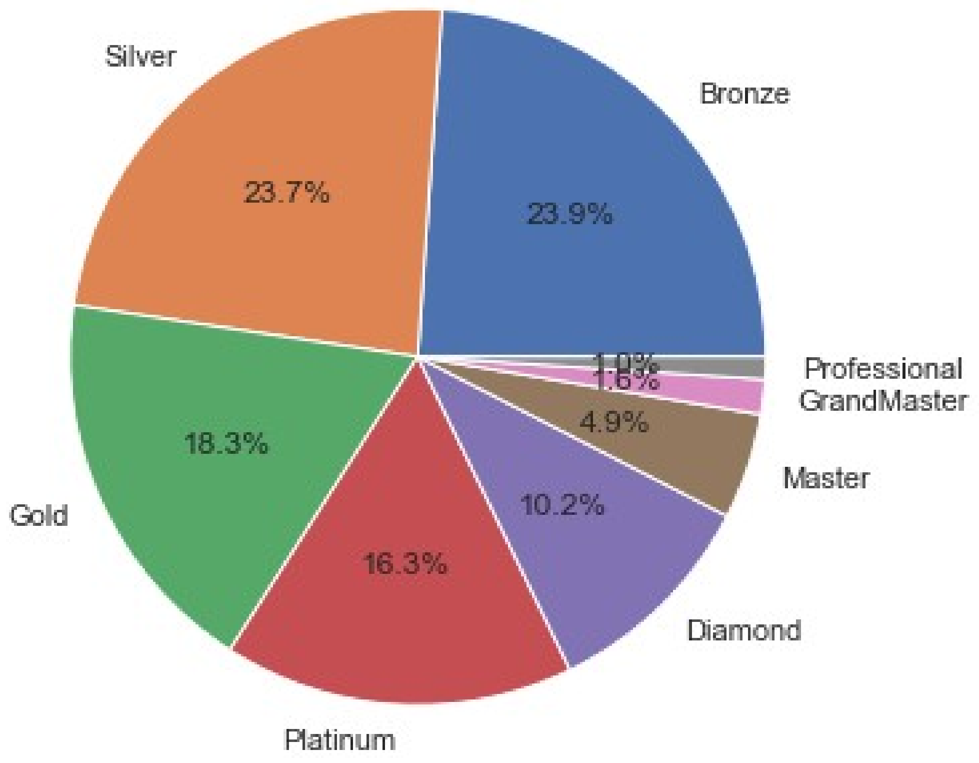
```
3      0.003783         29.2203        53.7352        4.9155
4      0.002368         22.6885        62.0813        9.3740

   TotalMapExplored  WorkersMade  UniqueUnitsMade  ComplexUnitsMade  \
0                28     0.001397                6               0.0
1                22     0.001194                5               0.0
2                22     0.000745                6               0.0
3                19     0.000426                7               0.0
4                15     0.001174                4               0.0

   ComplexAbilitiesUsed
0              0.000000
1              0.000208
2              0.000189
3              0.000384
4              0.000019
```

```
data.dtypes
```

```
LeagueIndex               int64
Age                      object
HoursPerWeek             object
TotalHours               object
APM                     float64
SelectByHotkeys         float64
AssignToHotkeys         float64
UniqueHotkeys             int64
MinimapAttacks          float64
MinimapRightClicks      float64
NumberOfPACs            float64
GapBetweenPACs          float64
ActionLatency           float64
ActionsInPAC            float64
TotalMapExplored          int64
WorkersMade             float64
UniqueUnitsMade           int64
ComplexUnitsMade        float64
ComplexAbilitiesUsed    float64
dtype: object
```

```
plt.figure(figsize=(6,6))
plt.pie(data['LeagueIndex'].value_counts(),labels=['Bronze', 'Silver',
'Gold', 'Platinum', 'Diamond', 'Master', 'GrandMaster',
'Professional'], autopct='%1.1f%%')
```

```
([<matplotlib.patches.Wedge at 0x1c464144580>,
  <matplotlib.patches.Wedge at 0x1c464144c70>,
  <matplotlib.patches.Wedge at 0x1c4643a8340>,
  <matplotlib.patches.Wedge at 0x1c4643a89d0>,
  <matplotlib.patches.Wedge at 0x1c4643b50a0>,
  <matplotlib.patches.Wedge at 0x1c4643b5730>,
  <matplotlib.patches.Wedge at 0x1c4643b5dc0>,
  <matplotlib.patches.Wedge at 0x1c4643c2490>],
 [Text(0.8045083504569398, 0.7501775216874028, 'Bronze'),
  Text(-0.6882236115228018, 0.8581073712202407, 'Silver'),
  Text(-1.0018407647429992, -0.45421920049593084, 'Gold'),
  Text(-0.06459903035833876, -1.0981015277636046, 'Platinum'),
  Text(0.7689506830637547, -0.7865842911066717, 'Diamond'),
  Text(1.0437779190648944, -0.3471709314913321, 'Master'),
  Text(1.0926494802731535, -0.12695319318082604, 'GrandMaster'),
  Text(1.0994231286952005, -0.03561999564930912, 'Professional')],
 [Text(0.4388227366128762, 0.40918773910221967, '23.9%'),
  Text(-0.37539469719425544, 0.4680585661201312, '23.7%'),
  Text(-0.5464585989507268, -0.24775592754323497, '18.3%'),
  Text(-0.03523583474091205, -0.5989644696892388, '16.3%'),
  Text(0.4194276453075025, -0.4290459769672754, '10.2%'),
  Text(0.5693334103990332, -0.18936596263163566, '4.9%'),
  Text(0.5959906256035381, -0.06924719628045056, '1.6%'),
  Text(0.5996853429246547, -0.019429088535986794, '1.0%')])
```

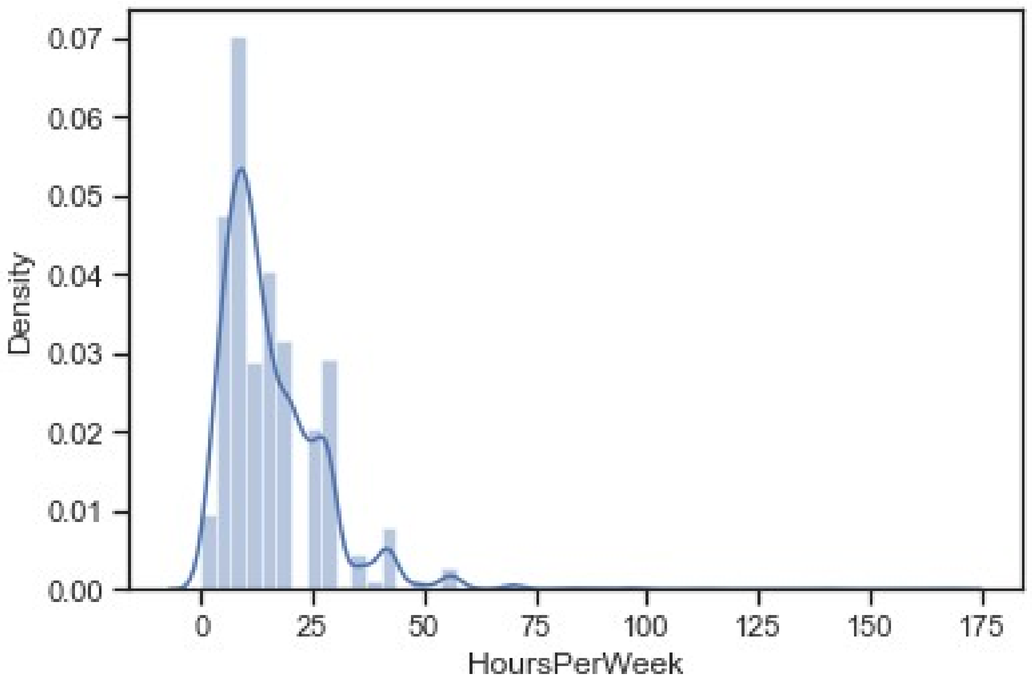


```
mean = 0
count = 0
for i in range(len(data['HoursPerWeek'])):
    if (data['HoursPerWeek'][i] !='?'):
        mean+=int(data['HoursPerWeek'][i])
        count+=1
mean=mean/count
print(mean)
for i in range(len(data['HoursPerWeek'])):
    try:
      data['HoursPerWeek'][i]= int(data['HoursPerWeek'][i])
    except: data['HoursPerWeek'][i]=mean
#print(data['HoursPerWeek'])
sns.distplot(data['HoursPerWeek'])
```

```
15.910751722072478
```

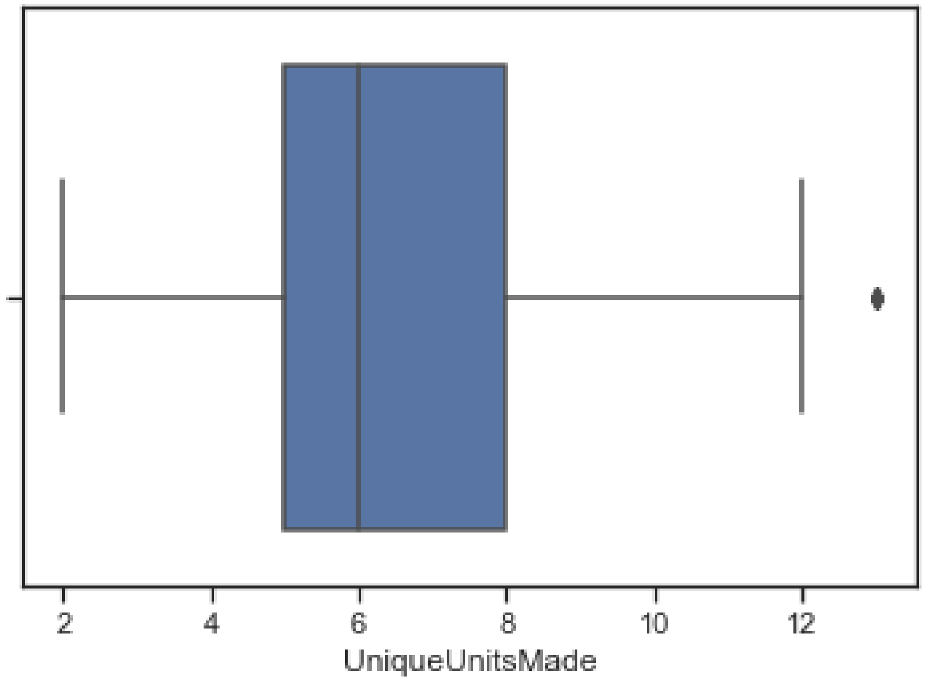
```
<ipython-input-5-8b6b9db67a72>:11: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  data['HoursPerWeek'][i]= int(data['HoursPerWeek'][i])
<ipython-input-5-8b6b9db67a72>:12: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  except: data['HoursPerWeek'][i]=mean
C:\Users\User\anaconda3\lib\site-packages\seaborn\
distributions.py:2551: FutureWarning: `distplot` is a deprecated
function and will be removed in a future version. Please adapt your
code to use either `displot` (a figure-level function with similar
flexibility) or `histplot` (an axes-level function for histograms).
  warnings.warn(msg, FutureWarning)
```

```
<AxesSubplot:xlabel='HoursPerWeek', ylabel='Density'>
```



```
sns.boxplot(x=data['UniqueUnitsMade'])
```

```
<AxesSubplot:xlabel='UniqueUnitsMade'>
```

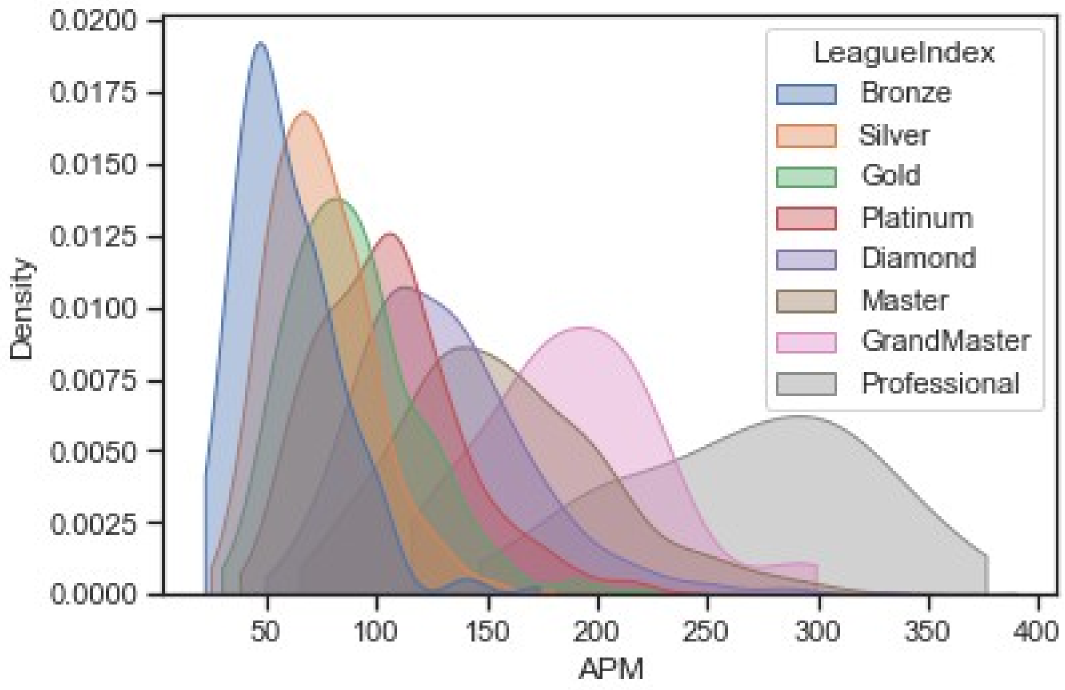


```
labels=['Bronze', 'Silver', 'Gold', 'Platinum', 'Diamond', 'Master',
'GrandMaster', 'Professional']
for i in range(len(data['LeagueIndex'])):
     data['LeagueIndex'][i]=labels[data['LeagueIndex'][i]-1]
```

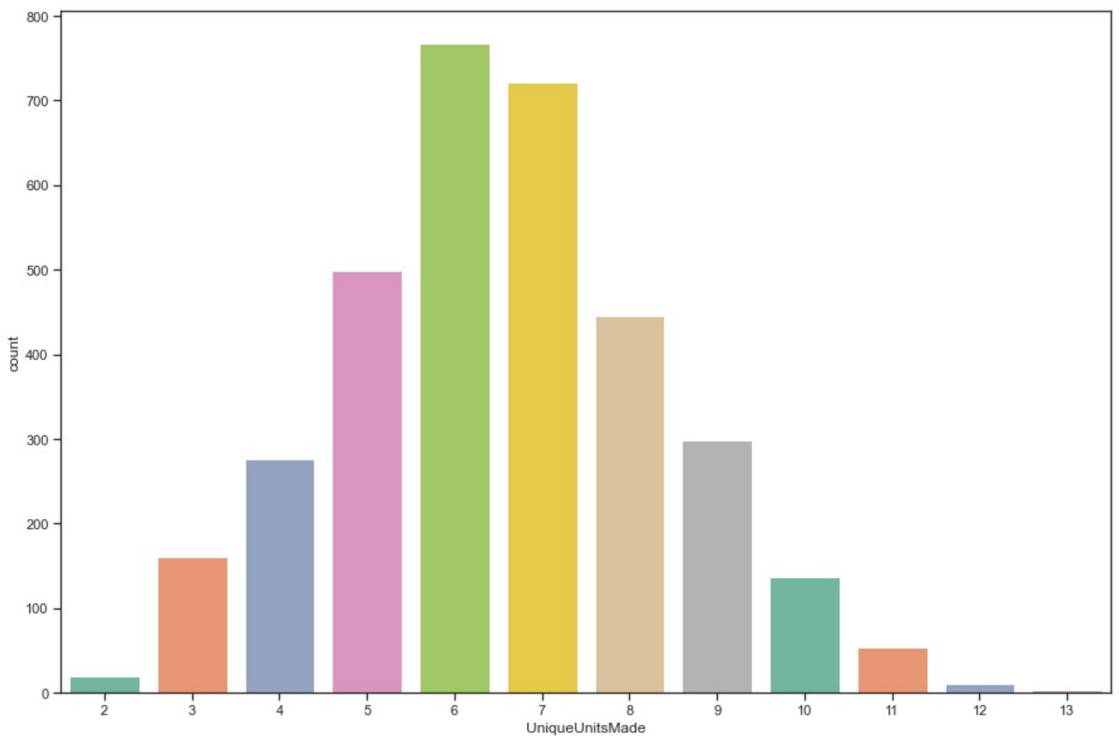
```
sns.kdeplot(data=data, x="APM", hue="LeagueIndex",
hue_order=labels,cut=0, fill=True, common_norm=False, alpha=0.4)
```

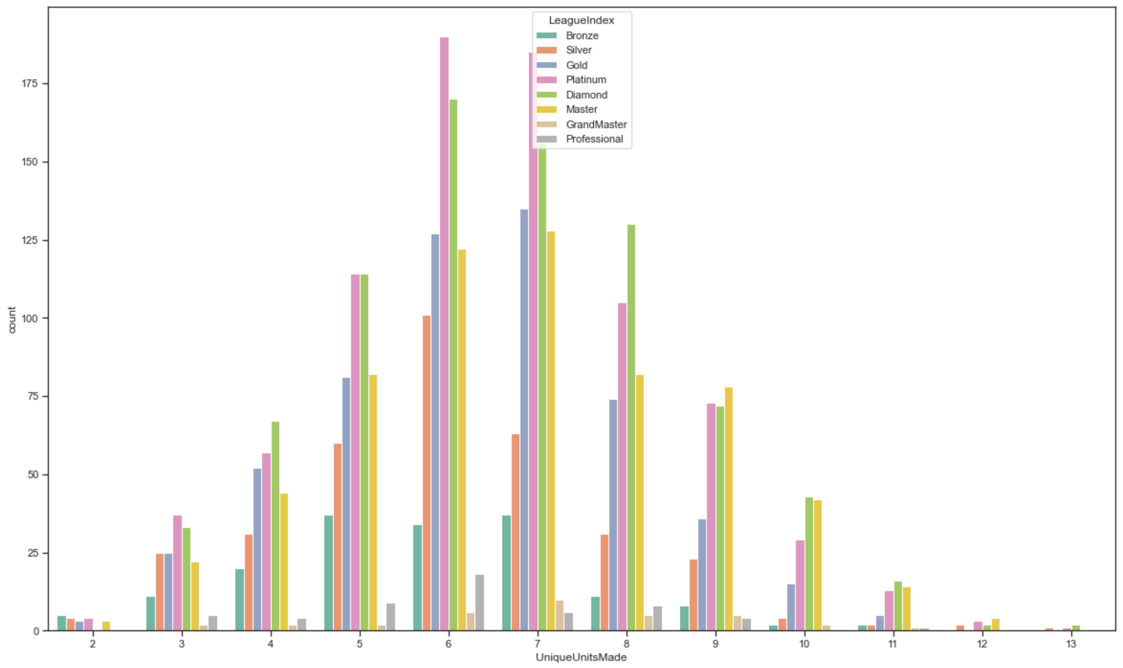
```
<ipython-input-7-743ad4758516>:3: SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  data['LeagueIndex'][i]=labels[data['LeagueIndex'][i]-1]
C:\Users\User\anaconda3\lib\site-packages\pandas\core\indexing.py:670:
SettingWithCopyWarning:
A value is trying to be set on a copy of a slice from a DataFrame

See the caveats in the documentation:
https://pandas.pydata.org/pandas-docs/stable/user_guide/indexing.html#
returning-a-view-versus-a-copy
  iloc._setitem_with_indexer(indexer, value)
```

```
<AxesSubplot:xlabel='APM', ylabel='Density'>
```

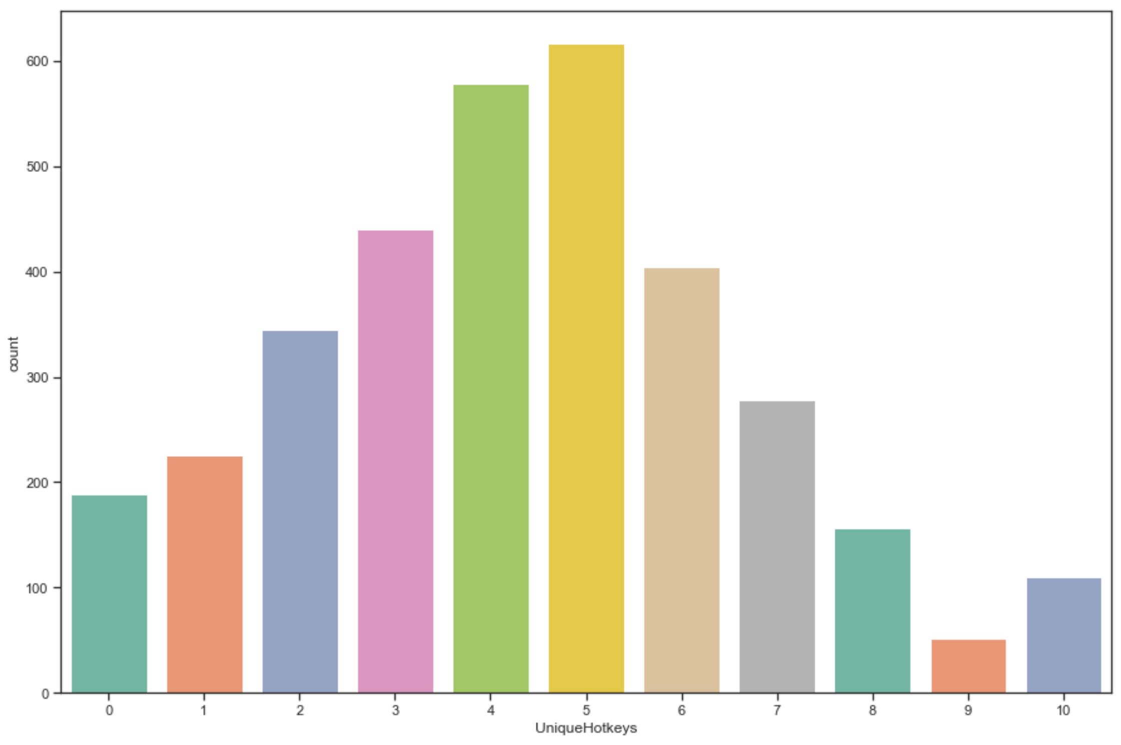


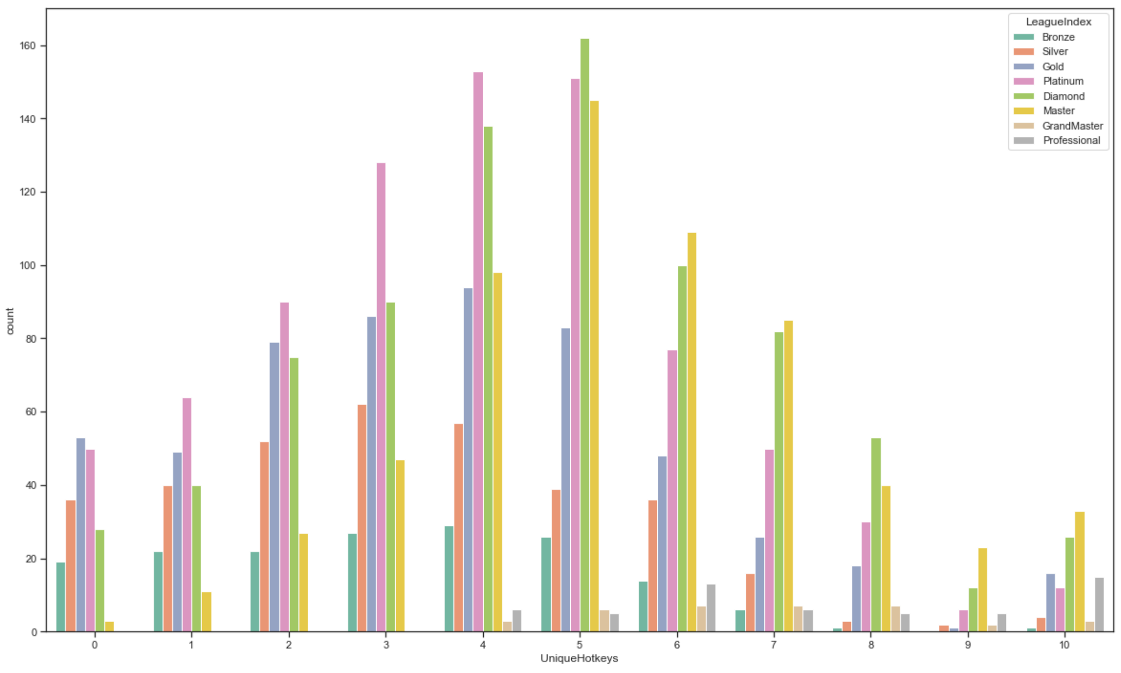
```
fig, axes = plt.subplots(figsize = (15, 10))
sns.countplot(x = 'UniqueUnitsMade',  data = data, palette="Set2");
fig, axes = plt.subplots(figsize = (20, 12))
sns.countplot(x = 'UniqueUnitsMade', hue="LeagueIndex",
hue_order=labels, data = data, palette="Set2");
```





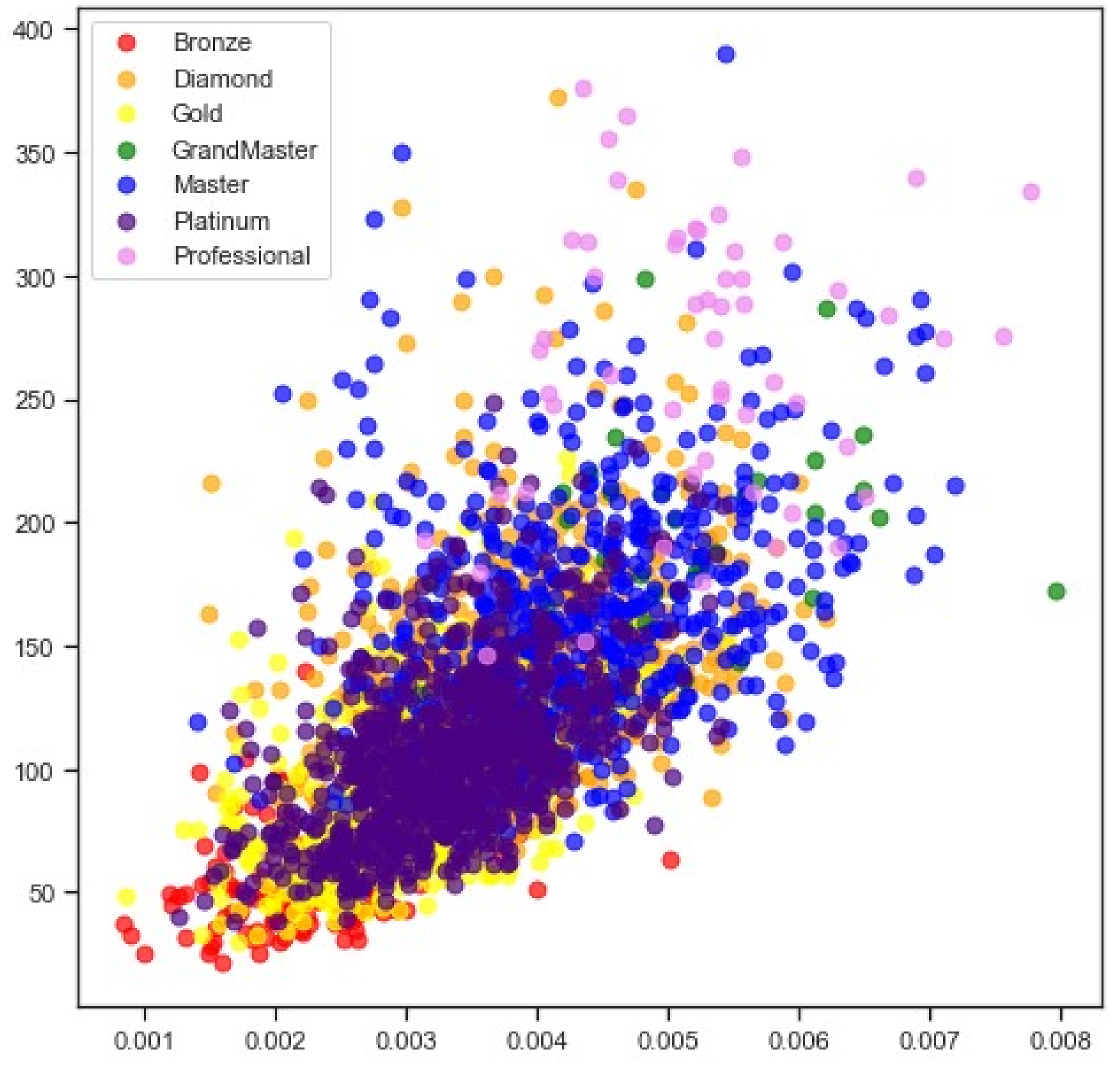
```
fig, axes = plt.subplots(figsize = (15, 10))
sns.countplot(x = 'UniqueHotkeys',  data = data, palette="Set2");
fig, axes = plt.subplots(figsize = (20, 12))
sns.countplot(x = 'UniqueHotkeys', hue="LeagueIndex",
hue_order=labels, data = data, palette="Set2");
```





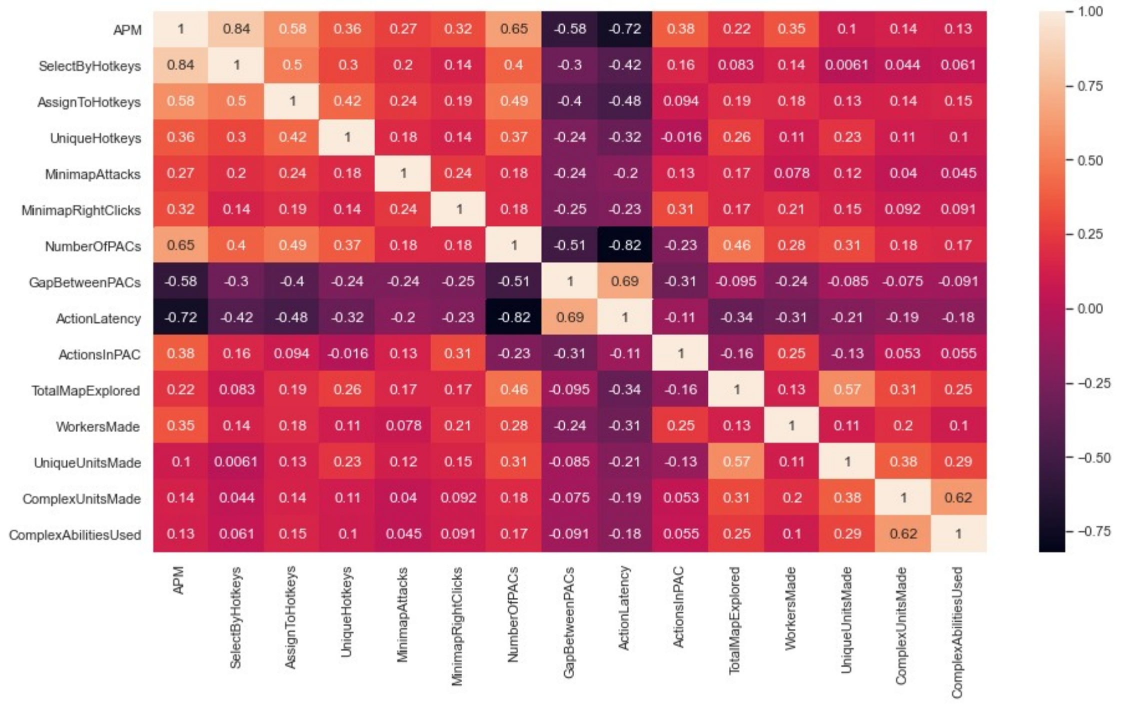
```python
import numpy as np
import matplotlib.pyplot as plt
FLIPPER_LENGTH = data["NumberOfPACs"].values
BILL_LENGTH = data["APM"].values

SPECIES = data["LeagueIndex"].values
SPECIES_ = np.unique(SPECIES)
```

```
COLORS = ["#ff0000", "#ffa500", "#ffff00", "#008000", "#0000ff",
"#4b0082", "#ee82ee" ]

fig, ax = plt.subplots(figsize=(8,8))
for species, color in zip(SPECIES_, COLORS):
    idxs = np.where(SPECIES == species)
    # No legend will be generated if we don't pass label=species
    ax.scatter(
        FLIPPER_LENGTH[idxs], BILL_LENGTH[idxs], label=species,
        s=50, color=color, alpha=0.7
    )

ax.legend();
```



```
corr_matrix = data.corr()
```

```python
sns.heatmap(data.corr(), annot=True)
sns.set(rc = {'figure.figsize':(30,30)})
```



	APM	SelectByHotkeys	AssignToHotkeys	UniqueHotkeys	MinimapAttacks	MinimapRightClicks	NumberOfPACs	GapBetweenPACs	ActionLatency	ActionsInPAC	TotalMapExplored	WorkersMade	UniqueUnitsMade	ComplexUnitsMade	ComplexAbilitiesUsed
APM	1	0.84	0.58	0.36	0.27	0.32	0.65	-0.58	-0.72	0.38	0.22	0.35	0.1	0.14	0.13
SelectByHotkeys	0.84	1	0.5	0.3	0.2	0.14	0.4	-0.3	-0.42	0.16	0.083	0.14	0.0061	0.044	0.061
AssignToHotkeys	0.58	0.5	1	0.42	0.24	0.19	0.49	-0.4	-0.48	0.094	0.19	0.18	0.13	0.14	0.15
UniqueHotkeys	0.36	0.3	0.42	1	0.18	0.14	0.37	-0.24	-0.32	-0.016	0.26	0.11	0.23	0.11	0.1
MinimapAttacks	0.27	0.2	0.24	0.18	1	0.24	0.18	-0.24	-0.2	0.13	0.17	0.078	0.12	0.04	0.045
MinimapRightClicks	0.32	0.14	0.19	0.14	0.24	1	0.18	-0.25	-0.23	0.31	0.17	0.21	0.15	0.092	0.091
NumberOfPACs	0.65	0.4	0.49	0.37	0.18	0.18	1	-0.51	-0.82	-0.23	0.46	0.28	0.31	0.18	0.17
GapBetweenPACs	-0.58	-0.3	-0.4	-0.24	-0.24	-0.25	-0.51	1	0.69	-0.31	-0.095	-0.24	-0.085	-0.075	-0.091
ActionLatency	-0.72	-0.42	-0.48	-0.32	-0.2	-0.23	-0.82	0.69	1	-0.11	-0.34	-0.31	-0.21	-0.19	-0.18
ActionsInPAC	0.38	0.16	0.094	-0.016	0.13	0.31	-0.23	-0.31	-0.11	1	-0.16	0.25	-0.13	0.053	0.055
TotalMapExplored	0.22	0.083	0.19	0.26	0.17	0.17	0.46	-0.095	-0.34	-0.16	1	0.13	0.57	0.31	0.25
WorkersMade	0.35	0.14	0.18	0.11	0.078	0.21	0.28	-0.24	-0.31	0.25	0.13	1	0.11	0.2	0.1
UniqueUnitsMade	0.1	0.0061	0.13	0.23	0.12	0.15	0.31	-0.085	-0.21	-0.13	0.57	0.11	1	0.38	0.29
ComplexUnitsMade	0.14	0.044	0.14	0.11	0.04	0.092	0.18	-0.075	-0.19	0.053	0.31	0.2	0.38	1	0.62
ComplexAbilitiesUsed	0.13	0.061	0.15	0.1	0.045	0.091	0.17	-0.091	-0.18	0.055	0.25	0.1	0.29	0.62	1