SPRAWOZDANIE

Zajęcia: Nauka o danych I

Prowadzący: prof. dr hab. Vasyl Martsenyuk

Laboratorium Nr 2 Data 19.10.2024 Temat: "Wykorzystanie pakietu Pandas do manipulacji i przetwarzania danych w pythonie" Wariant 7	Tomasz Pietrzyk Informatyka II stopień, niestacjonarne, 1semestr, gr.1a

1. Polecenie: wariant 7 zadania

W tym ćwiczeniu nauczysz się,, jak korzystać z pakietu Pandas w Pythonie do manipulacji, analizy i przetwarzania danych. Pandas to potężna biblioteka, która umożliwia łatwą i efektywna prace z tabelarycznymi danymi.

Twoim zadaniem będzie wykonanie szeregu operacji na danych, takich jak:

• Wczytywanie danych z plików CSV,

• Obliczanie podstawowych statystyk,

• Radzenie sobie z brakującymi danymi,

• Wykrywanie wartości odstających,

• Analiza zależności miedzy zmiennymi,

Manipulacja i przekształcanie danych7. Global Burden of Disease Study 2019 (GBD 2019) Smoking Tobacco Use Prevalence 1990-2019 http://ghdx.healthdata.org/record/ihme-data/gbd-2019-smoking-tobacco-use-prevalence-1990-2019

2. Opis programu opracowanego (kody źródłowe, rzuty ekranu)

GitHub: https://github.com/TomekPietrzyk/NOD_I_2024_NS.git

In [1]:
```
import pandas as pd

df = pd.read_csv('IHME_GBD_2019_SMOKING_TOB_1990_2019_NUM_SMOKERS_Y2021M05D27.CSV')

print(df.head())
```

```
        measure_name  location_id location_name  sex_id sex_name  \
0  Number of Smokers            1        Global       1     Male
1  Number of Smokers            1        Global       2   Female
2  Number of Smokers            1        Global       3     Both
3  Number of Smokers            1        Global       1     Male
4  Number of Smokers            1        Global       2   Female

   age_group_id age_group_name  year_id         val         upper  \
0            29      15+ years     1990  803101467.1  8.096221e+08
1            29      15+ years     1990  189148834.0  1.930929e+08
2            29      15+ years     1990  992250301.2  1.000161e+09
3            29      15+ years     1991  813897216.4  8.200339e+08
4            29      15+ years     1991  190537545.1  1.944249e+08

         lower
0  795908635.8
1  185559469.9
2  984788043.8
3  806951447.9
4  186974424.5
```

In [2]:
```
print(df.info())
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 20970 entries, 0 to 20969
Data columns (total 11 columns):
 #   Column          Non-Null Count  Dtype
---  ------          --------------  -----
 0   measure_name    20970 non-null  object
 1   location_id     20970 non-null  int64
 2   location_name   20970 non-null  object
 3   sex_id          20970 non-null  int64
 4   sex_name        20970 non-null  object
 5   age_group_id    20970 non-null  int64
 6   age_group_name  20970 non-null  object
 7   year_id         20970 non-null  int64
 8   val             20970 non-null  float64
 9   upper           20970 non-null  float64
 10  lower           20970 non-null  float64
dtypes: float64(3), int64(4), object(4)
memory usage: 1.8+ MB
None
```

In [3]:
```
print(df.describe())
```

```
       location_id        sex_id  age_group_id       year_id           val  \
count  20970.000000  20970.000000       20970.0  20970.000000  2.097000e+04
mean     131.111588      2.000000          29.0   2004.500000  1.242807e+07
std       95.055111      0.816516           0.0      8.655648  6.489191e+07
min        1.000000      1.000000          29.0   1990.000000  6.345717e+01
25%       61.000000      1.000000          29.0   1997.000000  8.201065e+04
50%      119.000000      2.000000          29.0   2004.500000  5.777123e+05
75%      177.000000      3.000000          29.0   2012.000000  2.901197e+06
max      522.000000      3.000000          29.0   2019.000000  1.144819e+09

              upper         lower
count  2.097000e+04  2.097000e+04
mean   1.269088e+07  1.217241e+07
std    6.555971e+07  6.421446e+07
min    7.868296e+01  5.029157e+01
25%    9.576943e+04  6.875439e+04
50%    6.278332e+05  5.329521e+05
75%    3.070281e+06  2.742651e+06
max    1.157286e+09  1.131582e+09
```

In [4]:
```
mean_val = df['val'].mean()
print(f'średnia ilość palaczy to {mean_val}')

mediane_yearid = df['year_id'].median()
print(f'mediana wieku id to {mediane_yearid}')

std_yearid = df['year_id'].std()
print(f'odchylenie standardowe wieku id to {std_yearid}')
```

```
średnia ilość palaczy to 12428071.383604305
mediana wieku id to 2004.5
odchylenie standardowe wieku id to 8.65564783254382
```

In [5]:
```
missing_values = df.isnull().sum()
print("Brakujące wartości w kazdej kolumnie:")
print(missing_values)
```

```
Brakujące wartości w kazdej kolumnie:
measure_name      0
location_id       0
location_name     0
sex_id            0
sex_name          0
age_group_id      0
age_group_name    0
year_id           0
val               0
upper             0
lower             0
dtype: int64
```

In [6]:
```
df['sex_id'].fillna(int(df['sex_id'].mean()), inplace=True)
```

In [7]:
```
df.dropna(subset=['val'], inplace = True)
```

In [8]:
```
Q1 = df['val'].quantile(0.25)
Q3 = df['val'].quantile(0.75)
IQR = Q3 - Q1

outliers = df[(df['val'] < (Q1 - 1.5 * IQR)) | (df['val'] < (Q3 + 1.5 * IQR))]
print("wartości odstające:")
print(outliers)
```

```
wartości odstające:
           measure_name  location_id                          location_name  \
360    Number of Smokers            7  Democratic People's Republic of Korea
361    Number of Smokers            7  Democratic People's Republic of Korea
362    Number of Smokers            7  Democratic People's Republic of Korea
363    Number of Smokers            7  Democratic People's Republic of Korea
364    Number of Smokers            7  Democratic People's Republic of Korea
...                  ...          ...                                    ...
20965  Number of Smokers          522                                  Sudan
20966  Number of Smokers          522                                  Sudan
20967  Number of Smokers          522                                  Sudan
20968  Number of Smokers          522                                  Sudan
20969  Number of Smokers          522                                  Sudan

       sex_id sex_name  age_group_id age_group_name  year_id           val  \
360         1     Male            29      15+ years     1990  3.242740e+06
361         2   Female            29      15+ years     1990  3.206584e+05
362         3     Both            29      15+ years     1990  3.563399e+06
363         1     Male            29      15+ years     1991  3.340434e+06
364         2   Female            29      15+ years     1991  3.325348e+05
...       ...      ...           ...            ...      ...           ...
20965       2   Female            29      15+ years     2018  2.435999e+05
20966       3     Both            29      15+ years     2018  2.610672e+06
20967       1     Male            29      15+ years     2019  2.439150e+06
20968       2   Female            29      15+ years     2019  2.500800e+05
20969       3     Both            29      15+ years     2019  2.689230e+06

              upper         lower
360    3.448785e+06  3.048076e+06
361    4.155816e+05  2.449067e+05
362    3.796075e+06  3.358840e+06
363    3.546428e+06  3.142120e+06
364    4.271068e+05  2.538479e+05
...             ...           ...
20965  3.286166e+05  1.752508e+05
20966  2.833943e+06  2.409108e+06
20967  2.656579e+06  2.236450e+06
```

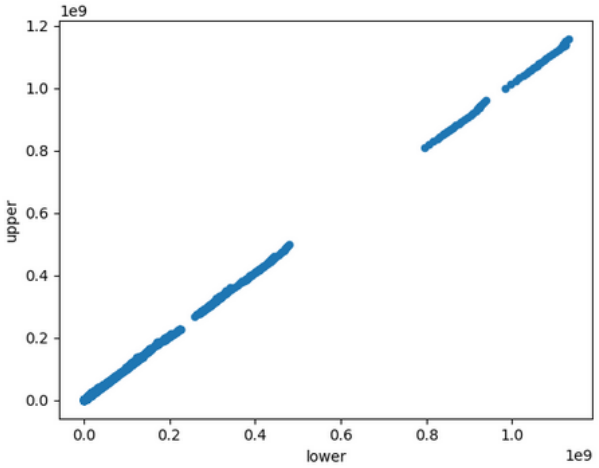
In [9]:
```
correlation_matrix = df.corr(numeric_only = True)
print("macierz korelacji:")
print(correlation_matrix)

df.plot.scatter(x='lower',y='upper')
```

```
macierz korelacji:
               location_id        sex_id  age_group_id       year_id  \
location_id   1.000000e+00  4.129324e-15           NaN -5.810115e-13
sex_id        4.129324e-15  1.000000e+00           NaN -4.450544e-17
age_group_id           NaN           NaN           NaN           NaN
year_id      -5.810115e-13 -4.450544e-17           NaN  1.000000e+00
val          -1.592398e-01  2.164982e-02           NaN  7.720502e-03
upper        -1.597180e-01  2.181495e-02           NaN  8.004704e-03
lower        -1.587740e-01  2.148802e-02           NaN  7.421082e-03

                   val     upper     lower
location_id  -0.159240 -0.159718 -0.158774
sex_id        0.021650  0.021815  0.021488
age_group_id       NaN       NaN       NaN
year_id       0.007721  0.008005  0.007421
val           1.000000  0.999976  0.999977
upper         0.999976  1.000000  0.999907
lower         0.999977  0.999907  1.000000
```

Out[9]: <Axes: xlabel='lower', ylabel='upper'>



In [10]:
```
df['LowerRangeTolerance']=df['lower'] - df['val']
print(df)
```

```
           measure_name  location_id location_name  sex_id sex_name  \
0      Number of Smokers            1        Global       1     Male
1      Number of Smokers            1        Global       2   Female
2      Number of Smokers            1        Global       3     Both
3      Number of Smokers            1        Global       1     Male
4      Number of Smokers            1        Global       2   Female
...                  ...          ...           ...     ...      ...
20965  Number of Smokers          522         Sudan       2   Female
20966  Number of Smokers          522         Sudan       3     Both
20967  Number of Smokers          522         Sudan       1     Male
20968  Number of Smokers          522         Sudan       2   Female
20969  Number of Smokers          522         Sudan       3     Both

       age_group_id age_group_name  year_id           val         upper  \
0                29      15+ years     1990  8.031015e+08  8.096221e+08
1                29      15+ years     1990  1.891488e+08  1.930929e+08
2                29      15+ years     1990  9.922503e+08  1.000161e+09
3                29      15+ years     1991  8.138972e+08  8.200339e+08
4                29      15+ years     1991  1.905375e+08  1.944249e+08
...             ...            ...      ...           ...           ...
20965            29      15+ years     2018  2.435999e+05  3.286166e+05
20966            29      15+ years     2018  2.610672e+06  2.833943e+06
20967            29      15+ years     2019  2.439150e+06  2.656579e+06
20968            29      15+ years     2019  2.500800e+05  3.345384e+05
20969            29      15+ years     2019  2.689230e+06  2.918332e+06

             lower  LowerRangeTolerance
0      7.959086e+08        -7.192831e+06
1      1.855595e+08        -3.589364e+06
2      9.847880e+08        -7.462257e+06
3      8.069514e+08        -6.945768e+06
4      1.869744e+08        -3.563121e+06
...             ...                  ...
20965  1.752508e+05        -6.834910e+04
20966  2.409108e+06        -2.015640e+05
20967  2.236450e+06        -2.026999e+05
20968  1.816686e+05        -6.841138e+04
20969  2.480656e+06        -2.085735e+05

[20970 rows x 12 columns]
```

In [11]:
```
grouped = df.groupby('location_name')['val'].mean()
grouped
```

Out[11]:
```
location_name
Afghanistan                 7.178958e+05
Albania                     4.011131e+05
Algeria                     2.582208e+06
American Samoa              8.169698e+03
Andean Latin America        2.377826e+06
                                ...
Western Europe              6.476573e+07
Western Sub-Saharan Africa  9.184475e+06
Yemen                       1.488955e+06
Zambia                      6.662353e+05
Zimbabwe                    7.167678e+05
Name: val, Length: 231, dtype: float64
```

In [12]:
```
df_sorted = df.sort_values(by='val')
df_sorted.head(20)
```

Out[12]:

	measure_name	location_id	location_name	sex_id	sex_name	age_group_id	age_group_name	year_id	val	upper	lower	L
20572	Number of Smokers	413	Tokelau	2	Female	29	15+ years	2007	63.457166	78.682957	50.291565	
20575	Number of Smokers	413	Tokelau	2	Female	29	15+ years	2008	63.730688	79.472611	50.462818	
20569	Number of Smokers	413	Tokelau	2	Female	29	15+ years	2006	64.929999	80.772113	51.303621	
20578	Number of Smokers	413	Tokelau	2	Female	29	15+ years	2009	65.197998	81.576212	51.185326	
20581	Number of Smokers	413	Tokelau	2	Female	29	15+ years	2010	67.277366	83.817868	52.910362	
20566	Number of Smokers	413	Tokelau	2	Female	29	15+ years	2005	68.832209	86.262158	54.075288	
20584	Number of Smokers	413	Tokelau	2	Female	29	15+ years	2011	68.910776	85.482803	54.302381	

3. Wnioski

Biblioteka Pandas pozwala w bardzo łatwy sposób wykonywać zaawansowane operacje na dużych zbiorach danych, przetwarzać je, modyfikować zgodnie z zapotrzebowaniem.