# Midterm Skills Exam: Data Wrangling and Analysis

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**Section**: CPE22S3

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In this activity, you are expected to demonstrate skills learned from concluded modules. Specifically:

- Analyze data using tools such as numpy and pandas for data wrangling tasks;
- Visualize data using pandas and seaborn;
- Perform exploratory data analysis on a complex dataset.

Resources:

- Jupyter Lab / Notebook
- Dataset: https://archive-beta.ics.uci.edu/dataset/20/census+income

Submission Requirements:

- Perform data wrangling on the given dataset.
- Visualize the given dataset.
- Submit pdf of exploratory data analysis.
- Submit pdf of EDA presentation. Sample: https://aseandse.org/asean-dse-storyboard/

```
# Install the ucimlrepo package
!pip install ucimlrepo
```

```
Collecting ucimlrepo
  Downloading ucimlrepo-0.0.6-py3-none-any.whl (8.0 kB)
Installing collected packages: ucimlrepo
Successfully installed ucimlrepo-0.0.6
```

```
# Import the dataset into your code
from ucimlrepo import fetch_ucirepo

# fetch dataset
census_income = fetch_ucirepo(id=20)

# data (as pandas dataframes)
X = census_income.data.features
y = census_income.data.targets

# metadata
print(census_income.metadata)

# variable information
print(census_income.variables)
```

```
{'uci_id': 20, 'name': 'Census Income', 'repository_url': 'https://archive.ics.uci.edu/dataset/20/census+income', 'data_url': 'http
              name     role         type      demographic  \
0              age  Feature      Integer              Age
1        workclass  Feature  Categorical           Income
2           fnlwgt  Feature      Integer             None
3        education  Feature  Categorical  Education Level
4    education-num  Feature      Integer  Education Level
5   marital-status  Feature  Categorical            Other
6       occupation  Feature  Categorical            Other
7     relationship  Feature  Categorical            Other
8             race  Feature  Categorical             Race
9              sex  Feature       Binary              Sex
10    capital-gain  Feature      Integer             None
11    capital-loss  Feature      Integer             None
12  hours-per-week  Feature      Integer             None
13  native-country  Feature  Categorical            Other
14          income   Target       Binary           Income

                                          description units missing_values
0                                                 N/A  None             no
1   Private, Self-emp-not-inc, Self-emp-inc, Feder...  None            yes
2                                                None  None             no
3    Bachelors, Some-college, 11th, HS-grad, Prof-...  None             no
4                                                None  None             no
5   Married-civ-spouse, Divorced, Never-married, S...  None             no
6   Tech-support, Craft-repair, Other-service, Sal...  None            yes
7   Wife, Own-child, Husband, Not-in-family, Other...  None             no
8   White, Asian-Pac-Islander, Amer-Indian-Eskimo,...  None             no
9                                       Female, Male.  None             no
```

```
10                                             None  None             no
11                                             None  None             no
12                                             None  None             no
13  United-States, Cambodia, England, Puerto-Rico,...  None            yes
14                                    >50K, <=50K.  None             no
```

```
# import pandas and numpy
import pandas as pd
import numpy as np

# concatinating the X and y dataframe to form a single dataframe
census_df = pd.concat([X, y], axis=1)
census_df
```

| | age | workclass | fnlwgt | education | education-num | marital-status | occupation | relations |
|---|---|---|---|---|---|---|---|---|
| **0** | 39 | State-gov | 77516 | Bachelors | 13 | Never-married | Adm-clerical | Not-in-fa |
| **1** | 50 | Self-emp-not-inc | 83311 | Bachelors | 13 | Married-civ-spouse | Exec-managerial | Husb |
| **2** | 38 | Private | 215646 | HS-grad | 9 | Divorced | Handlers-cleaners | Not-in-fa |
| **3** | 53 | Private | 234721 | 11th | 7 | Married-civ-spouse | Handlers-cleaners | Husb |
| **4** | 28 | Private | 338409 | Bachelors | 13 | Married-civ-spouse | Prof-specialty | V |
| **...** | ... | ... | ... | ... | ... | ... | ... | |
| **48837** | 39 | Private | 215419 | Bachelors | 13 | Divorced | Prof-specialty | Not-in-fa |
| **48838** | 64 | NaN | 321403 | HS-grad | 9 | Widowed | NaN | Other-rela |
| **48839** | 38 | Private | 374983 | Bachelors | 13 | Married-civ-spouse | Prof-specialty | Husb |
| **48840** | 44 | Private | 83891 | Bachelors | 13 | Divorced | Adm-clerical | Own-c |
| **48841** | 35 | Self-emp-inc | 182148 | Bachelors | 13 | Married-civ-spouse | Exec-managerial | Husb |

48842 rows × 15 columns

Next steps: View recommended plots

```
# creating a function that detects and displays the number of duplicates in the dataframe
def countDuplicate(data):
    if data.duplicated().any():
        count = data.duplicated().sum()
        print(count)
    else:
        return "No Duplicates Found!"
```

```
# checking the number of duplicated
countDuplicate(census_df)
```

```
29
```

```
# dropping duplicates of the dataframe
census_df.drop_duplicates(census_df, inplace=True)
census_df
```

| | age | workclass | fnlwgt | education | education-num | marital-status | occupation | relations |
|---|---|---|---|---|---|---|---|---|
| **0** | 39 | State-gov | 77516 | Bachelors | 13 | Never-married | Adm-clerical | Not-in-fa |
| **1** | 50 | Self-emp-not-inc | 83311 | Bachelors | 13 | Married-civ-spouse | Exec-managerial | Husb |
| **2** | 38 | Private | 215646 | HS-grad | 9 | Divorced | Handlers-cleaners | Not-in-fa |
| **3** | 53 | Private | 234721 | 11th | 7 | Married-civ-spouse | Handlers-cleaners | Husb |
| **4** | 28 | Private | 338409 | Bachelors | 13 | Married-civ-spouse | Prof-specialty | V |
| **...** | ... | ... | ... | ... | ... | ... | ... | |
| **48837** | 39 | Private | 215419 | Bachelors | 13 | Divorced | Prof-specialty | Not-in-fa |
| **48838** | 64 | NaN | 321403 | HS-grad | 9 | Widowed | NaN | Other-rela |
| **48839** | 38 | Private | 374983 | Bachelors | 13 | Married-civ-spouse | Prof-specialty | Husb |
| **48840** | 44 | Private | 83891 | Bachelors | 13 | Divorced | Adm-clerical | Own-c |
| **48841** | 35 | Self-emp-inc | 182148 | Bachelors | 13 | Married-civ-spouse | Exec-managerial | Husb |

48813 rows × 15 columns

Next steps: View recommended plots

```
# confirming that all duplicates have been dropped
countDuplicate(census_df)
```

```
'No Duplicates Found!'
```

```
# displaying the number of nulls for each column in the dataframe
census_df.isnull().sum()
```

```
age                 0
workclass         963
fnlwgt              0
education           0
education-num       0
marital-status      0
occupation        966
relationship        0
race                0
sex                 0
capital-gain        0
capital-loss        0
hours-per-week      0
native-country    274
income              0
dtype: int64
```

```
# checking the frequency of values of each column that contains a null
census_df['workclass'].value_counts()
```

```
workclass
Private             33879
Self-emp-not-inc     3861
Local-gov            3136
State-gov            1981
?                    1836
Self-emp-inc         1694
Federal-gov          1432
Without-pay            21
Never-worked           10
Name: count, dtype: int64
```

```
1 census_df['occupation'].value_counts()
```

```
occupation
Prof-specialty       6167
Craft-repair         6107
Exec-managerial      6084
Adm-clerical         5608
Sales                5504
Other-service        4919
Machine-op-inspct    3019
Transport-moving     2355
Handlers-cleaners    2071
?                    1843
Farming-fishing      1487
Tech-support         1445
Protective-serv       983
Priv-house-serv       240
Armed-Forces           15
Name: count, dtype: int64
```

```
1 census_df['native-country'].value_counts()
```

```
native-country
United-States                 43810
Mexico                          947
?                               582
Philippines                     295
Germany                         206
Puerto-Rico                     184
Canada                          182
El-Salvador                     155
India                           151
Cuba                            138
England                         127
China                           122
South                           115
Jamaica                         106
Italy                           105
Dominican-Republic              103
Japan                            92
Poland                           87
Guatemala                        86
Vietnam                          86
Columbia                         85
Haiti                            75
Portugal                         67
Taiwan                           65
Iran                             59
Greece                           49
Nicaragua                        49
Peru                             46
Ecuador                          45
France                           38
Ireland                          37
Hong                             30
Thailand                         30
Cambodia                         28
Trinadad&Tobago                  27
Laos                             23
Yugoslavia                       23
Outlying-US(Guam-USVI-etc)       23
Scotland                         21
Honduras                         20
Hungary                          19
Holand-Netherlands                1
Name: count, dtype: int64
```

```
1 census_df['income'].value_counts()
```

```
income
<=50K     24698
<=50K.    12430
>50K       7839
>50K.      3846
Name: count, dtype: int64
```

```
1 census_df.isnull().sum()
```

```
age                 0
workclass         963
fnlwgt              0
education           0
education-num       0
marital-status      0
occupation        966
relationship        0
race                0
```

```
sex                 0
capital-gain        0
capital-loss        0
hours-per-week      0
native-country    274
income              0
dtype: int64
```

```python
# replacing all the '?' values with the most frequent data in each columns
# since the value frequency in 'occupation is close to one another, we will use 'ffill' for the missing values
# we will replace '?' to NaN values in order to meet the requirement of 'ffill' method
census_df['workclass'].replace('?', 'Private', inplace=True)
census_df['workclass'].fillna('Private', inplace=True)
census_df['native-country'].replace('?', 'United-States', inplace=True)
census_df['native-country'].fillna('United-States', inplace=True)
census_df['occupation'].replace('?', np.NaN, inplace=True)
```

```python
census_df.replace('<=50K.', '<=50K', inplace=True)
census_df.replace('>50K.', '>50K', inplace=True)
```

```python
# using 'ffill' method to supply the NaN values
census_df = census_df.assign(
    occupation = lambda x: x['occupation'].fillna(method='ffill')
)
```

```python
census_df['workclass'].value_counts()
```

```
workclass
Private             36678
Self-emp-not-inc     3861
Local-gov            3136
State-gov            1981
Self-emp-inc         1694
Federal-gov          1432
Without-pay            21
Never-worked           10
Name: count, dtype: int64
```

```python
census_df['native-country'].value_counts()
```

```
native-country
United-States                 44666
Mexico                          947
Philippines                     295
Germany                         206
Puerto-Rico                     184
Canada                          182
El-Salvador                     155
India                           151
Cuba                            138
England                         127
China                           122
South                           115
Jamaica                         106
Italy                           105
Dominican-Republic              103
Japan                            92
Poland                           87
Guatemala                        86
Vietnam                          86
Columbia                         85
Haiti                            75
Portugal                         67
Taiwan                           65
Iran                             59
Greece                           49
Nicaragua                        49
Peru                             46
Ecuador                          45
France                           38
Ireland                          37
Hong                             30
Thailand                         30
Cambodia                         28
Trinadad&Tobago                  27
Laos                             23
Yugoslavia                       23
Outlying-US(Guam-USVI-etc)       23
Scotland                         21
Honduras                         20
Hungary                          19
Holand-Netherlands                1
Name: count, dtype: int64
```

```
census_df['occupation'].value_counts()
```

```
occupation
Prof-specialty       6553
Craft-repair         6504
Exec-managerial      6456
Adm-clerical         5932
Sales                5813
Other-service        5199
Machine-op-inspct    3223
Transport-moving     2507
Handlers-cleaners    2222
Farming-fishing      1567
Tech-support         1530
Protective-serv      1031
Priv-house-serv       259
Armed-Forces           17
Name: count, dtype: int64
```

```
# checks if there are still remaining nulls in the dataframe
census_df.isnull().sum()
```

```
age               0
workclass         0
fnlwgt            0
education         0
education-num     0
marital-status    0
occupation        0
relationship      0
race              0
sex               0
capital-gain      0
capital-loss      0
hours-per-week    0
native-country    0
income            0
dtype: int64
```

```
# checking all the categorical values
census_df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
Index: 48813 entries, 0 to 48841
Data columns (total 15 columns):
 #   Column          Non-Null Count  Dtype 
---  ------          --------------  ----- 
 0   age             48813 non-null  int64 
 1   workclass       48813 non-null  object
 2   fnlwgt          48813 non-null  int64 
 3   education       48813 non-null  object
 4   education-num   48813 non-null  int64 
 5   marital-status  48813 non-null  object
 6   occupation      48813 non-null  object
 7   relationship    48813 non-null  object
 8   race            48813 non-null  object
 9   sex             48813 non-null  object
 10  capital-gain    48813 non-null  int64 
 11  capital-loss    48813 non-null  int64 
 12  hours-per-week  48813 non-null  int64 
 13  native-country  48813 non-null  object
 14  income          48813 non-null  object
dtypes: int64(6), object(9)
memory usage: 6.0+ MB
```

```
# This is to allow the access for the dataframe in which the int conversion hasn't occurred
census_cat = census_df.copy()
```

```
# transforming categorical values into numerical values is needed
# since education already has an education-num, dropping 'education' would suffice
census_df.drop(columns=['education'], inplace=True)
census_df
```

| | age | workclass | fnlwgt | education-num | marital-status | occupation | relationship | race | sex | capital-gain | capital-loss | hours-per-week | native-country |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 39 | State-gov | 77516 | 13 | Never-married | Adm-clerical | Not-in-family | White | Male | 2174 | 0 | 40 | United-States |
| **1** | 50 | Self-emp-not-inc | 83311 | 13 | Married-civ-spouse | Exec-managerial | Husband | White | Male | 0 | 0 | 13 | United-States |
| **2** | 38 | Private | 215646 | 9 | Divorced | Handlers-cleaners | Not-in-family | White | Male | 0 | 0 | 40 | United-States |
| **3** | 53 | Private | 234721 | 7 | Married-civ-spouse | Handlers-cleaners | Husband | Black | Male | 0 | 0 | 40 | United-States |
| **4** | 28 | Private | 338409 | 13 | Married-civ-spouse | Prof-specialty | Wife | Black | Female | 0 | 0 | 40 | Cuba |
| **...** | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... | ... |
| **48837** | 39 | Private | 215419 | 13 | Divorced | Prof-specialty | Not-in-family | White | Female | 0 | 0 | 36 | United-States |
| **48838** | 64 | Private | 321403 | 9 | Widowed | Prof-specialty | Other-relative | Black | Male | 0 | 0 | 40 | United-States |
| **48839** | 38 | Private | 374983 | 13 | Married-civ-spouse | Prof-specialty | Husband | White | Male | 0 | 0 | 50 | United-States |
| **48840** | 44 | Private | 83891 | 13 | Divorced | Adm-clerical | Own-child | Asian-Pac-Islander | Male | 5455 | 0 | 40 | United-States |
| | | | | | Married- | | | | | | | | |

Next steps: View recommended plots

```
# creating a function that transform categorical values into numerical values
def preprocessing(data, catlist):
    if data[catlist].dtypes == 'object':
        categorical_values = data[catlist].unique()
        range_values = range(1, len(categorical_values)+1)
        map = dict(zip(categorical_values, range_values))
        print(f"{catlist}:", map)
        data[catlist] = data[catlist].map(map)
    return data
for i in census_df.select_dtypes(include=['object']).columns:
    preprocessing(census_df, i)
```

```
workclass: {'State-gov': 1, 'Self-emp-not-inc': 2, 'Private': 3, 'Federal-gov': 4, 'Local-gov': 5, 'Self-emp-inc': 6, 'Without-pay'
marital-status: {'Never-married': 1, 'Married-civ-spouse': 2, 'Divorced': 3, 'Married-spouse-absent': 4, 'Separated': 5, 'Married-AF
occupation: {'Adm-clerical': 1, 'Exec-managerial': 2, 'Handlers-cleaners': 3, 'Prof-specialty': 4, 'Other-service': 5, 'Sales': 6,
relationship: {'Not-in-family': 1, 'Husband': 2, 'Wife': 3, 'Own-child': 4, 'Unmarried': 5, 'Other-relative': 6}
race: {'White': 1, 'Black': 2, 'Asian-Pac-Islander': 3, 'Amer-Indian-Eskimo': 4, 'Other': 5}
sex: {'Male': 1, 'Female': 2}
native-country: {'United-States': 1, 'Cuba': 2, 'Jamaica': 3, 'India': 4, 'Mexico': 5, 'South': 6, 'Puerto-Rico': 7, 'Honduras': 8,
income: {'<=50K': 1, '>50K': 2}
```

```
census_df.head()
```

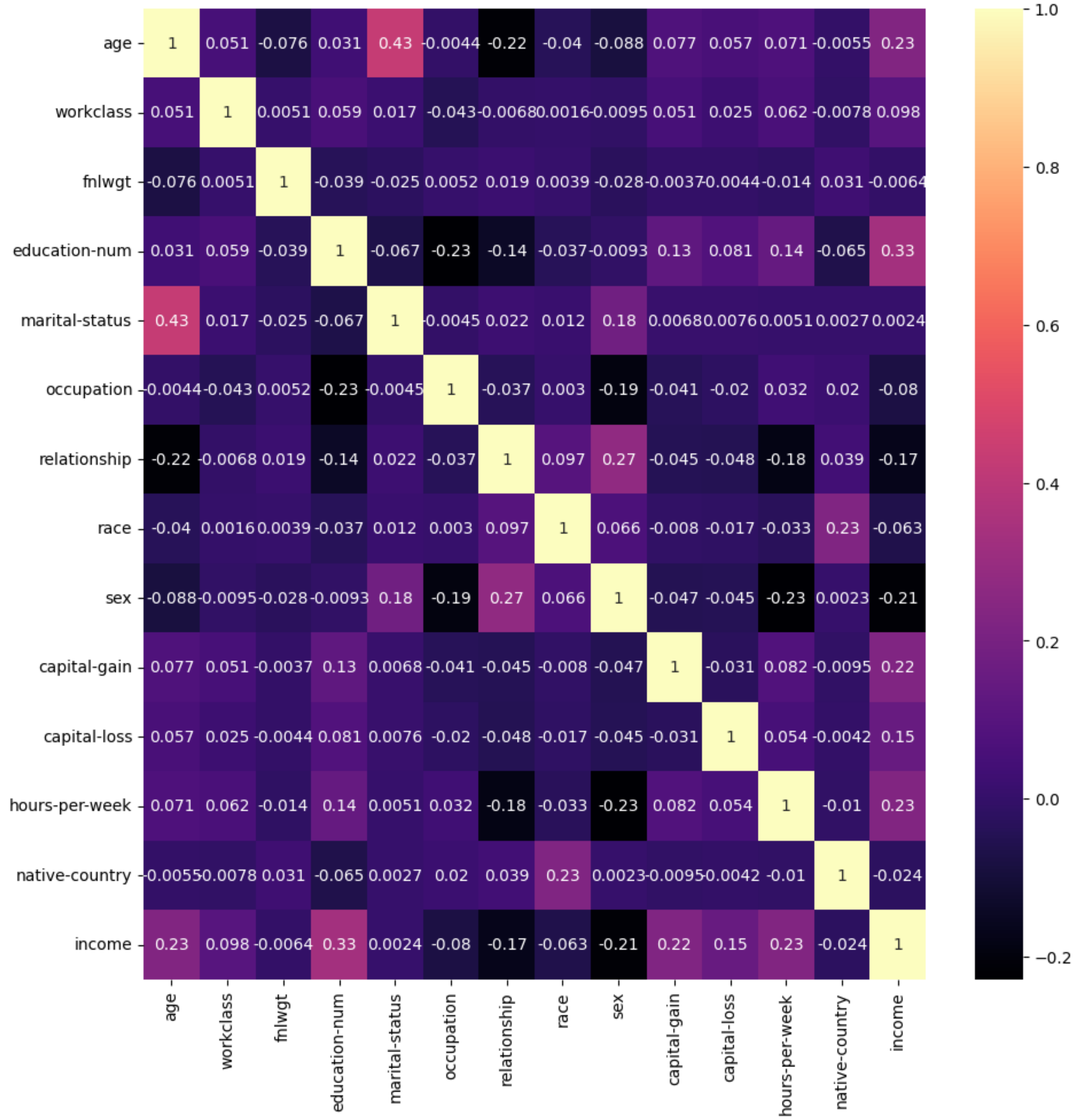
| | age | workclass | fnlwgt | education-num | marital-status | occupation | relationship | race | sex | capital-gain | capital-loss | hours-per-week | native-country | income |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **0** | 39 | 1 | 77516 | 13 | 1 | 1 | 1 | 1 | 1 | 2174 | 0 | 40 | 1 | 1 |
| **1** | 50 | 2 | 83311 | 13 | 2 | 2 | 2 | 1 | 1 | 0 | 0 | 13 | 1 | 1 |
| **2** | 38 | 3 | 215646 | 9 | 3 | 3 | 1 | 1 | 1 | 0 | 0 | 40 | 1 | 1 |
| **3** | 53 | 3 | 234721 | 7 | 2 | 3 | 2 | 2 | 1 | 0 | 0 | 40 | 1 | 1 |
| **4** | 28 | 3 | 338409 | 13 | 2 | 4 | 3 | 2 | 2 | 0 | 0 | 40 | 2 | 1 |

Next steps: View recommended plots

```
# creating a heatmap to check the correlation of each categories between one another
%matplotlib inline
import seaborn as sns
import matplotlib.pyplot as plt

plt.figure(figsize=(11, 11))
sns.heatmap(census_df.corr(), annot=True, cmap='magma')
```

```
<Axes: >
```

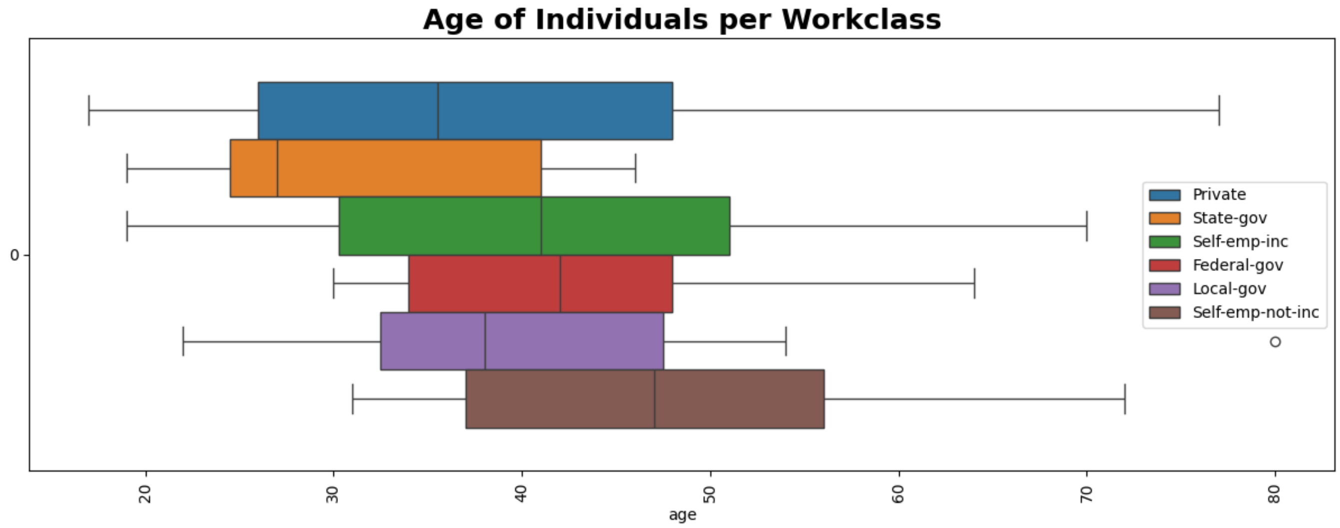



```
# checking the descriptive statistics of the aggregated age and workclass
# used a sample of 300 to make the visualization cleaner
sampl_cen = census_cat.sample(300, random_state=0)
sampl_cen.groupby('workclass')['age'].describe()
```

| workclass | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| Federal-gov | 13.0 | 43.846154 | 11.639345 | 30.0 | 34.00 | 42.0 | 48.0 | 64.0 |
| Local-gov | 15.0 | 41.133333 | 13.907175 | 22.0 | 32.50 | 38.0 | 47.5 | 80.0 |
| Private | 230.0 | 38.265217 | 14.849584 | 17.0 | 26.00 | 35.5 | 48.0 | 77.0 |
| Self-emp-inc | 10.0 | 42.600000 | 16.647990 | 19.0 | 30.25 | 41.0 | 51.0 | 70.0 |
| Self-emp-not-inc | 17.0 | 47.411765 | 11.790138 | 31.0 | 37.00 | 47.0 | 56.0 | 72.0 |
| State-gov | 15.0 | 31.066667 | 9.027471 | 19.0 | 24.50 | 27.0 | 41.0 | 46.0 |

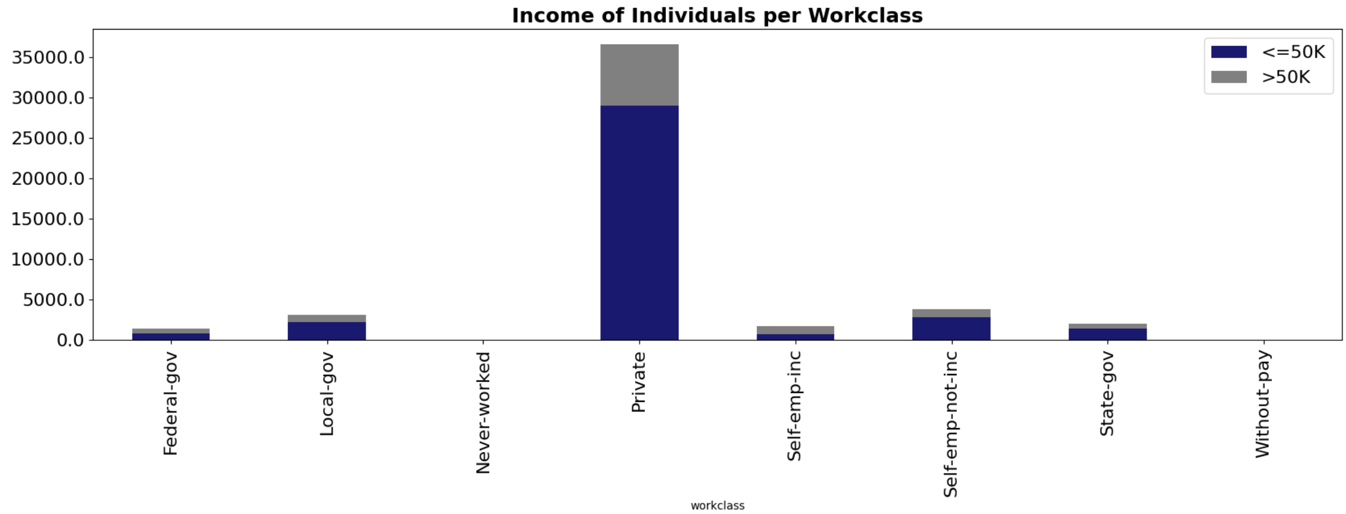
```
# plotting of the age and workclass with the use of boxplot
fig, ax = plt.subplots(figsize=(15,5))
sns.boxplot(x=sampl_cen['age'], hue=sampl_cen['workclass'], ax=ax)
ax.set_title('Age of Individuals per Workclass', fontsize=18, fontweight='bold')
ax.set_xticklabels(ax.get_xticklabels(), fontsize=10, rotation=90)
ax.set_yticklabels(ax.get_yticks(), fontsize=10)
ax.legend(fontsize=10)
```

```
<ipython-input-38-4ebd03fa27da>:5: UserWarning: FixedFormatter should only be used together with FixedLocator
  ax.set_xticklabels(ax.get_xticklabels(), fontsize=10, rotation=90)
<ipython-input-38-4ebd03fa27da>:6: UserWarning: FixedFormatter should only be used together with FixedLocator
  ax.set_yticklabels(ax.get_yticks(), fontsize=10)
<matplotlib.legend.Legend at 0x7c80440dbeb0>
```




```
# plotting of the Income of each individuals per workclass with the use of stacked bar graphs
crosstab = pd.crosstab(census_cat['workclass'], census_cat['income'])
fig, ax = plt.subplots(figsize=(20,5))
crosstab.plot(kind='bar', stacked=True, ax=ax, color=['midnightblue', 'gray'])
ax.set_title('Income of Individuals per Workclass', fontsize=18, fontweight='bold')
ax.set_xticklabels(ax.get_xticklabels(), fontsize=16, rotation=90)
ax.set_yticklabels(ax.get_yticks(), fontsize=16)
ax.legend(fontsize=16)
```

```
<ipython-input-41-3bdbb27cbf36>:7: UserWarning: FixedFormatter should only be used together with FixedLocator
  ax.set_yticklabels(ax.get_yticks(), fontsize=16)
<matplotlib.legend.Legend at 0x7c80511b3c40>
```




```
# checking the descriptive statistics of the aggregated hours-per-week and workclass
sampl_cen.groupby('workclass')['hours-per-week'].describe()
```

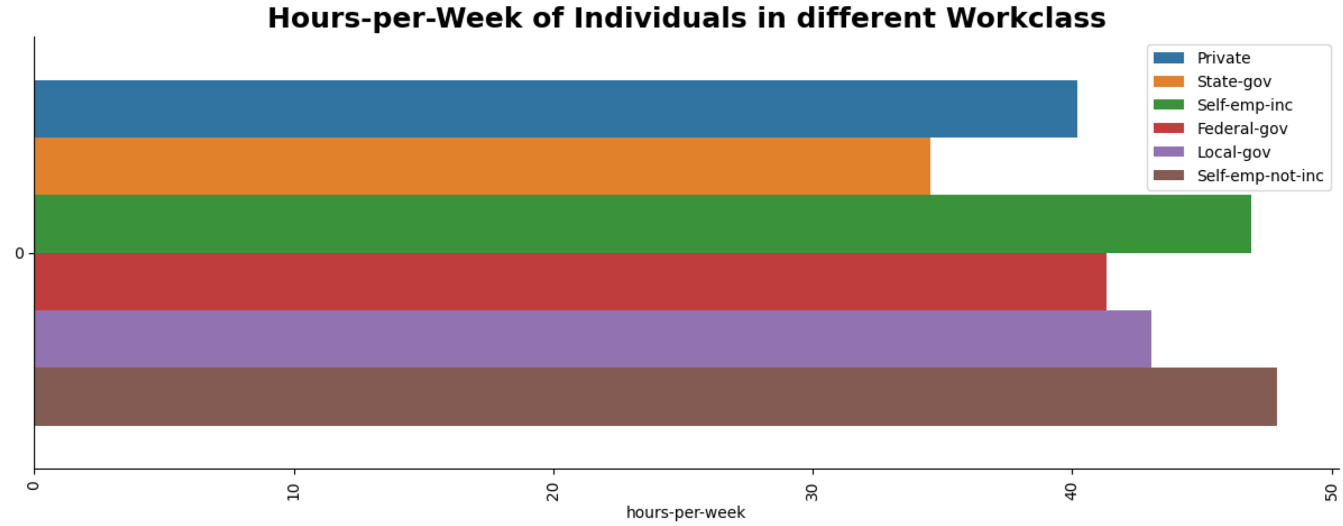
| workclass | count | mean | std | min | 25% | 50% | 75% | max |
|---|---|---|---|---|---|---|---|---|
| **Federal-gov** | 13.0 | 41.307692 | 3.682948 | 40.0 | 40.0 | 40.0 | 40.00 | 53.0 |
| **Local-gov** | 15.0 | 43.066667 | 15.912559 | 20.0 | 40.0 | 40.0 | 50.00 | 80.0 |
| **Private** | 230.0 | 40.221739 | 13.107498 | 6.0 | 40.0 | 40.0 | 45.00 | 99.0 |
| **Self-emp-inc** | 10.0 | 46.900000 | 8.265726 | 35.0 | 40.0 | 47.0 | 53.75 | 60.0 |
| **Self-emp-not-inc** | 17.0 | 47.882353 | 17.898612 | 20.0 | 40.0 | 48.0 | 55.00 | 98.0 |
| **State-gov** | 15.0 | 34.533333 | 18.310289 | 10.0 | 17.5 | 40.0 | 40.00 | 80.0 |

```
# plotting of the hours-per-week of each individuals per workclass with the use of barplot
fig, ax = plt.subplots(figsize=(15,5))
sns.barplot(x=sampl_cen['hours-per-week'], hue=sampl_cen['workclass'], ci=None, ax=ax)
ax.set_title('Hours-per-Week of Individuals in different Workclass', fontsize=18, fontweight='bold')
ax.set_xticklabels(ax.get_xticklabels(), fontsize=10, rotation=90)
ax.set_yticklabels(ax.get_yticks(), fontsize=10)
ax.legend(fontsize=10)
sns.despine()
```

```
<ipython-input-43-cc3f5f7e37b6>:3: FutureWarning:

The `ci` parameter is deprecated. Use `errorbar=None` for the same effect.

  sns.barplot(x=sampl_cen['hours-per-week'], hue=sampl_cen['workclass'], ci=None, ax=ax)
<ipython-input-43-cc3f5f7e37b6>:5: UserWarning: FixedFormatter should only be used together with FixedLocator
  ax.set_xticklabels(ax.get_xticklabels(), fontsize=10, rotation=90)
<ipython-input-43-cc3f5f7e37b6>:6: UserWarning: FixedFormatter should only be used together with FixedLocator
  ax.set_yticklabels(ax.get_yticks(), fontsize=10)
```




```
# checking the frequency of values in each education levels
census_cat['education'].value_counts()
```

```
education
HS-grad         15777
Some-college    10869
Bachelors        8020
Masters          2656
Assoc-voc        2060
11th             1812
Assoc-acdm       1601
10th             1389
7th-8th           954
Prof-school       834
9th               756
12th              656
Doctorate         594
5th-6th           508
1st-4th           245
Preschool          82
Name: count, dtype: int64
```

```
# plotting of the education attainment of each individuals per workclass with the use of stacked bar graphs
crosstab = pd.crosstab(census_cat['education'], census_cat['workclass'])
fig, ax = plt.subplots(figsize=(20,5))
crosstab.plot(kind='bar', stacked=True, ax=ax)
ax.set_title('Education Attainment of Individuals per Workclass', fontsize=18, fontweight='bold')
ax.set_xticklabels(ax.get_xticklabels(), fontsize=16, rotation=90)
ax.set_yticklabels(ax.get_yticks(), fontsize=16)
ax.legend(fontsize=16)
```

```
<ipython-input-37-4e7c8eb87c14>:6: UserWarning: FixedFormatter should only be used together with FixedLocator
  ax.set_yticklabels(ax.get_yticks(), fontsize=16)
<matplotlib.legend.Legend at 0x7c8044ecff10>
```