```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import matplotlib.ticker as ticker
import seaborn as sns
%matplotlib inline
plt.style.use('seaborn-whitegrid')
sns.set_context("poster")

dataset = pd.read_csv("adult.csv")

from sklearn.discriminant_analysis import LinearDiscriminantAnalysis
from sklearn.ensemble import RandomForestClassifier
from sklearn.linear_model import LogisticRegression
from sklearn.ensemble import RandomForestClassifier
from sklearn.neural_network import MLPClassifier
from sklearn.tree import DecisionTreeClassifier

from sklearn.model_selection import cross_val_score, StratifiedKFold, train_test_split, KFold
from sklearn.metrics import classification_report
from sklearn.metrics import accuracy_score

from xgboost import XGBClassifier
```

```
dataset.head(5)
```

	age	workclass	fnlwgt	education	education.num	marital.status	occupation	relationship	race	
0	90	?	77053	HS-grad	9	Widowed	?	Not-in-family	White	Fe
1	82	Private	132870	HS-grad	9	Widowed	Exec-managerial	Not-in-family	White	Fe
2	66	?	186061	Some-college	10	Widowed	?	Unmarried	Black	Fe
							Machine-			

```
dataset.isnull().sum()
#checking for missing values
```

```
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
```

```
#Object in the case = Text
#Int64 = Numbers
dataset.dtypes
```

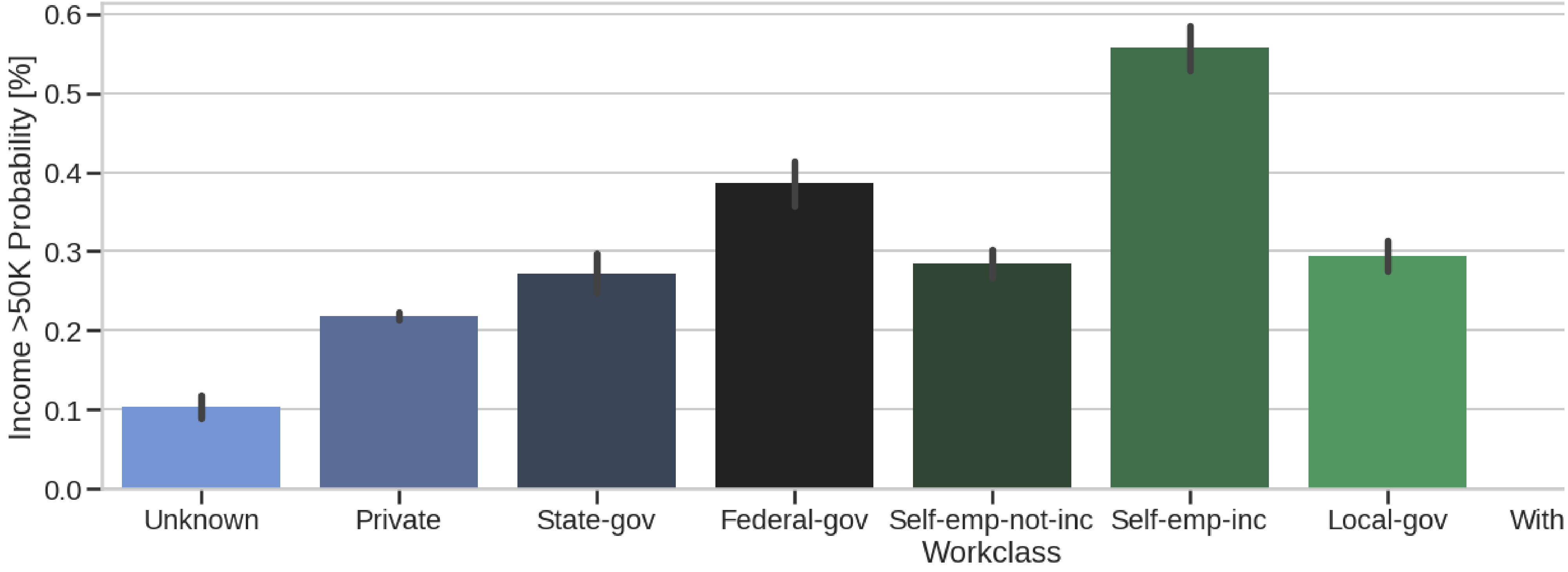
```
    age                int64
    workclass         object
    fnlwgt             int64
    education         object
    education.num      int64
    marital.status    object
    occupation        object
    relationship      object
    race              object
    sex               object
    capital.gain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

```
dataset['income']=dataset['income'].map({'<=50K': 0, '>50K': 1})
dataset["workclass"] = dataset["workclass"].replace(["?"],'Unknown')
fig, ax = plt.subplots(figsize=(25,7))
sns.set_context("poster")
current_palette = sns.diverging_palette(255, 133, l=60, n=7, center="dark")

fig = sns.barplot(x='workclass',y='income',data=dataset,palette=current_palette)

fig.set_ylabel("Income >50K Probability [%]")
fig.set_xlabel("Workclass")
```

```
Text(0.5, 0, 'Workclass')
```



```
fig, ax = plt.subplots(figsize=(25,7))
sns.set_context("poster")
current_palette = sns.color_palette("Blues")

fig = sns.barplot(x='relationship',y='income',data=dataset, order=['Own-child','Other-relative','Unmarried','Not-in-family','Husband','Wife'], palette=current_palet

fig.set_ylabel("Income >50K Probability [%]")
fig.set_xlabel("Relationship")
```

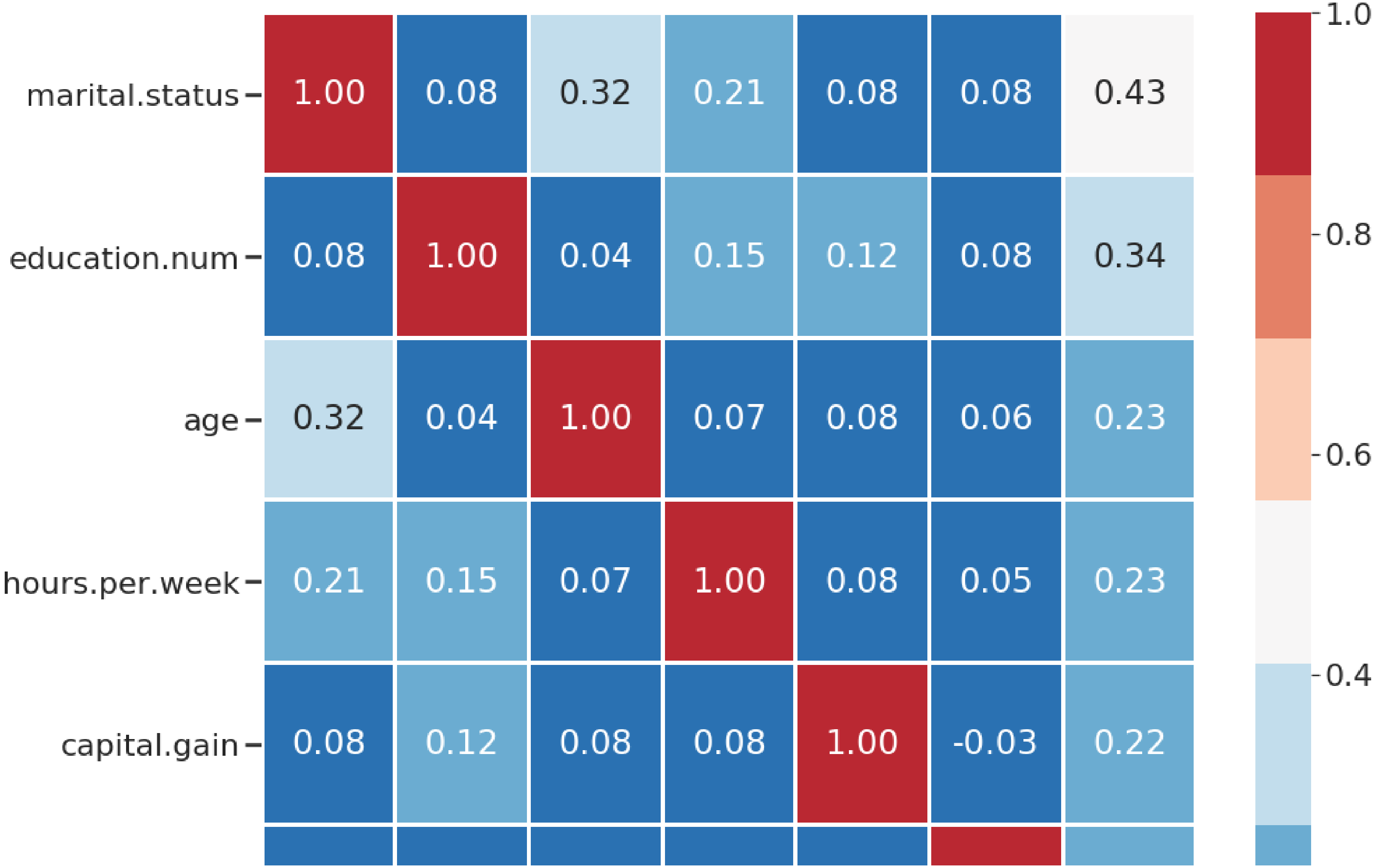
```
Text(0.5, 0, 'Relationship')
```

0.5
0.4
0.3
0.2
50K Probability [%]

```
numeric_columns = ['marital.status','education.num','age','hours.per.week','capital.gain','capital.loss','income']

fig, axe = plt.subplots(figsize=(15,15))
sns.set_context("poster")
sns.set(font_scale=2)
map1 = sns.color_palette("RdBu_r", 7)
sns.heatmap(datasetCopy[numeric_columns].corr(),annot=True, fmt='.2f',linewidths=2,cmap = map1)
```

```
<matplotlib.axes._subplots.AxesSubplot at 0x7f24c857def0>
```



4. Modeling

```
# drop any categorical data and convert the one's we want to keep into binary:: Yes (1) or No (0)
dataset["marital.status"] = dataset["marital.status"].replace(['Married-civ-spouse','Married-spouse-absent','Married-AF-spouse'], 'Married')
dataset["marital.status"] = dataset["marital.status"].replace(['Never-married','Divorced','Separated','Widowed'], 'Single')
dataset["marital.status"] = dataset["marital.status"].map({"Married":0, "Single":1})
```

```
dataset["marital.status"] = dataset["marital.status"]
dataset['income']=dataset['income'].map({'<=50K': 0, '>50K': 1})
dataset.drop(labels=["sex","workclass","education","occupation","relationship","race","native.country"], axis = 1, inplace = True)

dataset.head(5)
```

	age	fnlwgt	education.num	marital.status	capital.gain	capital.loss	hours.per.week	income
0	90	77053	9	1	0	4356	40	0
1	82	132870	9	1	0	4356	18	0
2	66	186061	10	1	0	4356	40	0
3	54	140359	4	1	0	3900	40	0
4	41	264663	10	1	0	3900	40	0

```
numeric_columns = ['marital.status','age','fnlwgt','education.num','capital.gain','capital.loss','hours.per.week']
X=dataset[numeric_columns]
Y=dataset.income
train_X, val_X, train_y, val_y = train_test_split(X,Y,test_size=0.21,random_state=0)

outcome = []
Modelnames = []
models = []
models.append(('Random Forest Classifier', RandomForestClassifier(n_estimators=50, max_features=4)))
models.append(('Linear Discriminant Analysis', LinearDiscriminantAnalysis()))
models.append(('Decision Tree Classifier', DecisionTreeClassifier()))
models.append(('Logistic Regression', LogisticRegression(solver='lbfgs')))

kfoldCV = StratifiedKFold(n_splits=5, random_state=0)
xgb_model = XGBClassifier(n_estimators=250)
results = cross_val_score(xgb_model, train_X, train_y, cv=kfoldCV)
print("XGBClassifier: %.2f%% (%.2f%%)" % (results.mean()*100, results.std()*100))
outcome.append(results)
Modelnames.append("XGBClassifier")

for name, model in models:
    kfoldCV = KFold(n_splits=5, random_state=0)
    cv_r = cross_val_score(model, train_X, train_y, cv=kfoldCV, scoring='accuracy')
    outcome.append(cv_r)
    Modelnames.append(name)
    print("%s: %.2f%% (%.2f%%)" % (name, cv_r.mean()*100, cv_r.std()*100))
```

```
XGBClassifier: 86.21% (0.50%)
Random Forest Classifier: 83.68% (0.48%)
Linear Discriminant Analysis: 83.10% (0.77%)
Decision Tree Classifier: 80.29% (0.59%)
Logistic Regression: 79.64% (0.67%)
```