DAT200 CA5 2022

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Imports

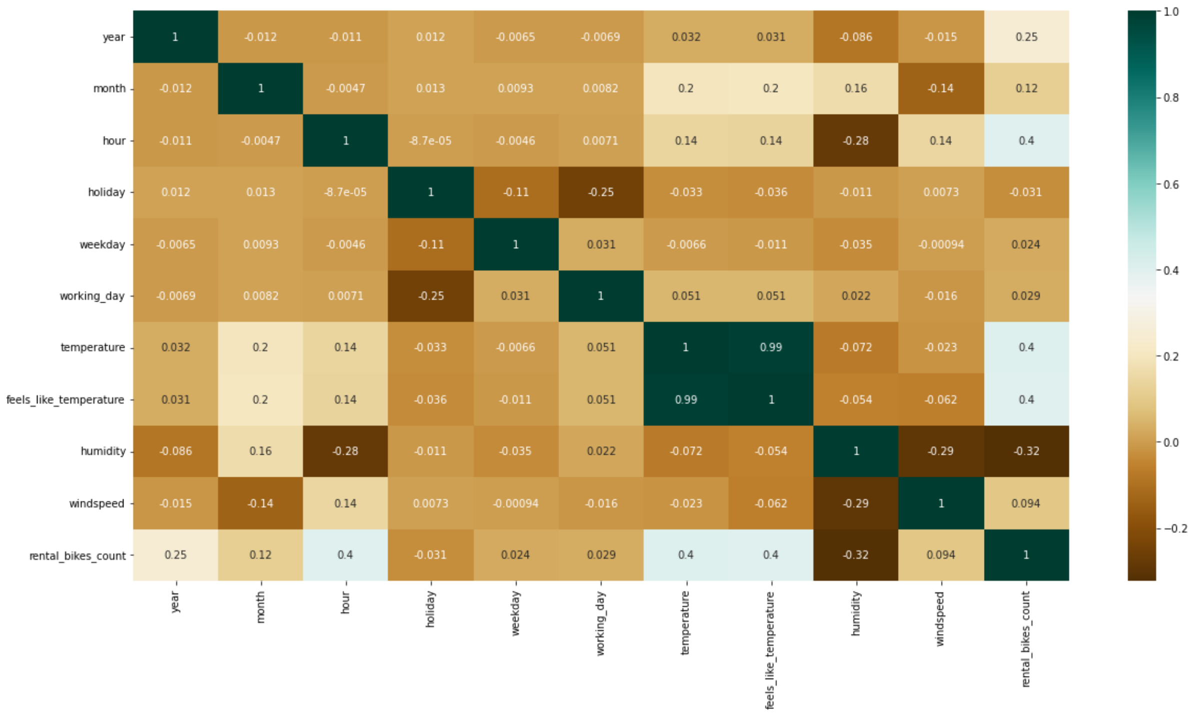
In [159…
```
import pandas as pd
import matplotlib.pyplot as plt
import numpy as np
import re
import seaborn as sns
from sklearn.pipeline import make_pipeline
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import StandardScaler,PolynomialFeatures,MinMaxSc
from sklearn.metrics import accuracy_score,confusion_matrix, classification_
from sklearn.linear_model import LinearRegression,Ridge,ElasticNet,Lasso,Per
from sklearn.feature_selection import SelectKBest, f_regression
from sklearn.svm import SVC,LinearSVC
from sklearn.decomposition import PCA
from sklearn.model_selection import StratifiedKFold,cross_val_score
from sklearn.model_selection import GridSearchCV
from sklearn.tree import DecisionTreeRegressor
from sklearn.ensemble import RandomForestRegressor
from sklearn.linear_model import LogisticRegression
from sklearn.svm import SVC
from sklearn.svm import LinearSVC
from sklearn.neighbors import KNeighborsClassifier
from sklearn.tree import DecisionTreeClassifier
from sklearn.ensemble import RandomForestClassifier
from imblearn.over_sampling import SMOTE
from imblearn.under_sampling import TomekLinks
```

Reading data

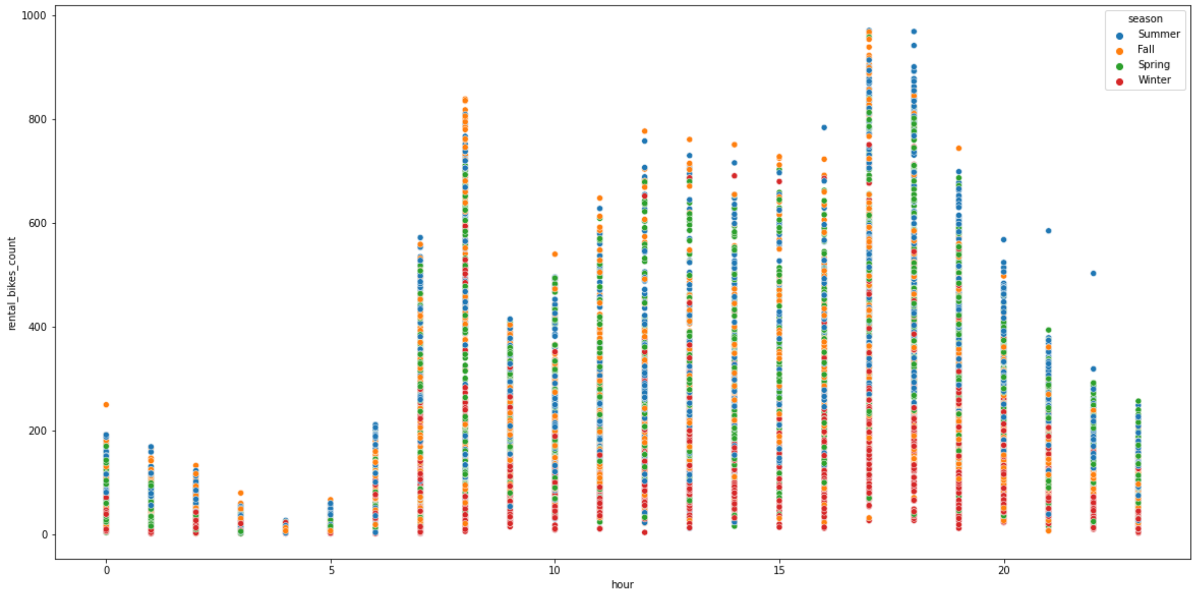
In [160…
```
Tr_data =  pd.read_pickle ('train.pkl')

# Cleaning the column names
columns = Tr_data.columns
for col in columns:
    Tr_data = Tr_data.rename(
        columns={
            # strip out parentheses, and their contents
            col: re.sub(r'\(.*', '', col)
            .strip()
            .replace(' ', '_')
            .replace('-', '_')
            .lower()  # lowercase the column name
        }
    )
df = Tr_data.copy()

# Removal of all values that has missing in to be able to see the visualisat
missing_values = df[df.eq('missing').any(1)]
df = df.drop(df.index[list(missing_values.index)])
```

Data exploration and visualisation

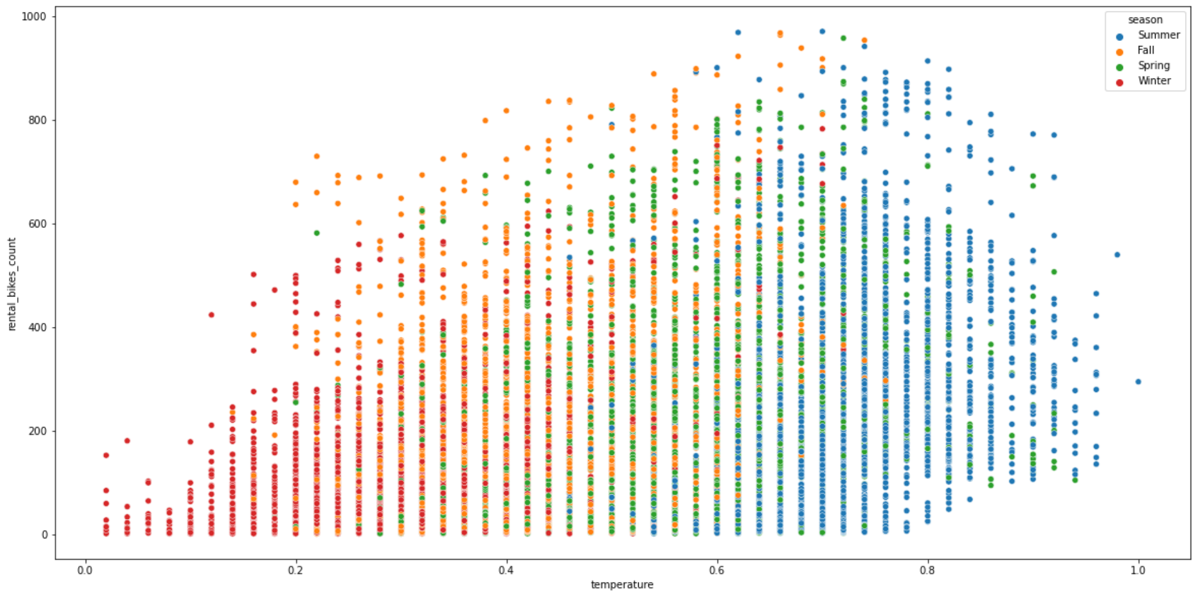
In [161…
```
cat_columns =['year', 'month', 'hour', 'holiday', 'weekday', 'working_day',
        'temperature', 'feels_like_temperature',
        'humidity', 'windspeed', 'rental_bikes_count']
for i in cat_columns:
    df[i] = df[i].astype(float)

corr = df[list(cat_columns)].corr()
plt.figure(figsize= (20,10))
sns.heatmap(corr,annot = True, cmap = 'BrBG')
plt.show()
```



In [162…
```
plt.figure(figsize = (20,10))
sns.scatterplot(x = df['hour'],y = df['rental_bikes_count'],hue = df['season
plt.show()
```



In [163…
```
plt.figure(figsize = (20,10))
sns.scatterplot(x = df['temperature'],y = df['rental_bikes_count'],hue = df[
plt.show()
```



Data cleaning

In [164…

```
# Choose label encoding, since there are multiple columns with the same buil
df = df.replace(to_replace=['Heavy rain, heavy snow or thunderstorm','Light
df = df.replace(to_replace=['Summer','Winter','Fall','Spring'], value = [0,1
```

Data preprocessing

In [165…

```
X,y = df.drop('rental_bikes_count', axis = 1).copy(), df['rental_bikes_count
X_train,X_test,y_train,y_test = train_test_split(X,y,test_size=0.4,random_st

# PIPELINES
DT_regressor = make_pipeline(DecisionTreeRegressor(max_depth=10))
RF_regressor = make_pipeline(RandomForestRegressor(n_estimators=100, random_

# Testign and fitting the split
DT_regressor.fit(X_train,y_train)
RF_regressor.fit(X_train,y_train)

print('Train accuracy DT: {0:.5f}'.format(DT_regressor.score(X_train, y_trai
print('Test accuracy DT: {0:.5f}'.format(DT_regressor.score(X_test, y_test))

print('Train accuracy RF: {0:.5f}'.format(RF_regressor.score(X_train, y_trai
print('Test accuracy RF: {0:.5f}'.format(RF_regressor.score(X_test, y_test))
```

```
Train accuracy DT: 0.93511
Test accuracy DT: 0.88462
Train accuracy RF: 0.99134
Test accuracy RF: 0.93779
```

Bins Model

In [167…

```
# Bins Model
dfc = df.copy()
dfc = pd.get_dummies(dfc, columns = ['hour','month','weekday'])
forest = RandomForestClassifier(criterion='gini',n_estimators=60,random_stat
svm = make_pipeline(SVC(kernel='rbf', C=20, random_state=100))

binned = []
for i in range(2,11):
    y_bin= pd.cut(dfc['rental_bikes_count'], bins= i, labels=False)
    Xc = dfc.drop('rental_bikes_count', axis = 1).copy()
    Xc_train,Xc_test,yc_train,yc_test = train_test_split(Xc,y_bin,test_size=

    forest.fit(Xc_train, yc_train)
    FTrain = forest.score(Xc_train, yc_train)
    FTest  = forest.score(Xc_test, yc_test)

    sc = StandardScaler()
    sc.fit(Xc_train)

    Xc_train_sc = sc.transform(Xc_train)
    Xc_test_sc = sc.transform(Xc_test)


    svm.fit(Xc_train_sc, yc_train)
    svmtrain = svm.score(Xc_train_sc, yc_train)
    svmtest= svm.score(Xc_test_sc, yc_test)

    binned.append ([i,svmtrain,svmtest,FTrain,FTest])

table = pd.DataFrame(binned , columns=['bins number','SVM Train','SVM Test',

table
```

Out[167]:

	bins number	SVM Train	SVM Test	Random Forest Train	Random Forest Test
0	2	0.995464	0.963861	0.999433	0.960459
1	3	0.993622	0.927296	0.992771	0.911139
2	4	0.989086	0.890944	0.986676	0.875850
3	5	0.986393	0.844600	0.981999	0.829294
4	6	0.981715	0.811862	0.975478	0.783163
5	7	0.982282	0.780400	0.981999	0.754464
6	8	0.978313	0.758929	0.973919	0.740009
7	9	0.977746	0.731080	0.972927	0.701956
8	10	0.973777	0.702168	0.975195	0.677934

Kaggle submission

In [ ]:

```
RF_regressor = make_pipeline(RandomForestRegressor(n_estimators=100, random_

kgl_X,kgl_y = df.drop('rental_bikes_count', axis = 1).copy(), df['rental_bik

RF_regressor.fit(kgl_X,kgl_y)
kgl_pred = RF_regressor.predict(df)


output = pd.DataFrame({'idx': df.index,'Rental bikes count': kgl_pred})
output.to_csv('CA5_submission_RF', index = False)


# MY Results were 93.134 using the Random Forest Regressor
```