random_forest

May 29, 2023

1 PREDICTION WITH RANDOM FOREST REGRESSOR

[95]:

```
import numpy as np
import matplotlib.pyplot as plt
import pandas as pd
from math import sqrt
from sklearn.metrics import mean_squared_error
from sklearn.ensemble import RandomForestRegressor
```

[2]:

```
# read dataset may2023
df = pd.read_pickle("../../data/20230319_RTU_Dataset_PPC-Lab/combined_may2023.
 ↪pkl")
```

[3]:

```
df
```

[3]:

```
      MEM_USAGE  CPU_USAGE     PS1_V    TEMP
0     35.555417  27.343750  5.435294  28.687
1     35.555417   6.367041  5.435294  28.687
2     35.555417   7.142857  5.435294  28.687
3     35.555417  27.306273  5.435294  28.687
4     35.555417   5.639098  5.435294  28.687
…           …          …         …       …
3798  25.962425   8.396947  5.383530  29.562
3799  25.962425   6.766917  5.383530  29.562
3800  25.962425   6.000000  5.383530  29.562
3801  25.962425   8.045977  5.383530  29.562
3802  25.962425  13.229572  5.383530  29.562

[3733 rows x 4 columns]
```

[96]:

```
def mean_absolute_percentage_error(y_true, y_pred):
    y_true, y_pred = np.array(y_true), np.array(y_pred)
    return np.mean(np.abs((y_true - y_pred) / y_true)) * 100
```

[97]:

```
training_size = int(len(df) * 0.8)
```

```
x_train = [[i] for i in df["TEMP"]][:training_size]
y_train = [i for i in df["CPU_USAGE"]][:training_size]

x_test = [[i] for i in df["TEMP"]][training_size:]
y_test = [[i] for i in df["CPU_USAGE"]][training_size:]
```

[98]:

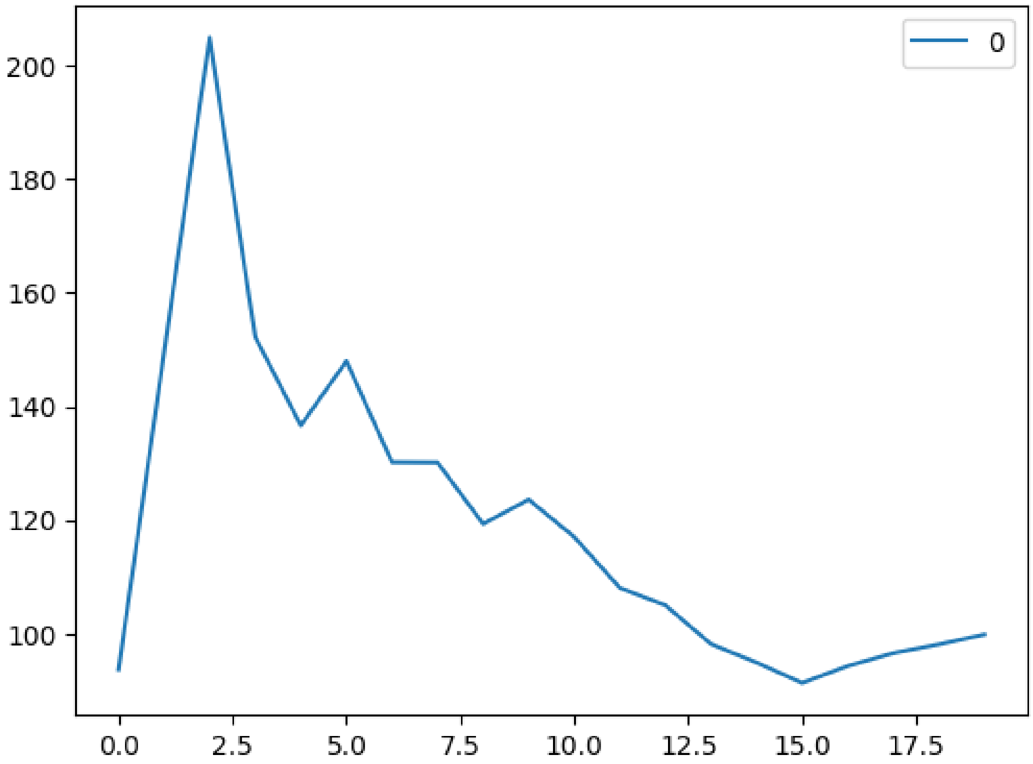
```
rmse_val = [] #to store rmse values for different k
for K in range(20):
    K = K+1
    model = KNeighborsRegressor(n_neighbors = K)

    model.fit(x_train, y_train)  #fit the model
    pred=model.predict(x_test) #make prediction on test set
    error = mean_absolute_percentage_error(y_test,pred)
    rmse_val.append(error) #store rmse values
    print('RMSE value for k= ' , K , 'is:', error)
```

```
RMSE value for k=  1 is: 93.64849627517584
RMSE value for k=  2 is: 149.43362058789134
RMSE value for k=  3 is: 204.96481728343525
RMSE value for k=  4 is: 152.19193914865974
RMSE value for k=  5 is: 136.6376756728446
RMSE value for k=  6 is: 147.96253022570303
RMSE value for k=  7 is: 130.15746358204467
RMSE value for k=  8 is: 130.11200132785677
RMSE value for k=  9 is: 119.30047468679949
RMSE value for k=  10 is: 123.5871463001262
RMSE value for k=  11 is: 116.99588837498796
RMSE value for k=  12 is: 108.03277740077264
RMSE value for k=  13 is: 104.97305754270627
RMSE value for k=  14 is: 98.1456215685375
RMSE value for k=  15 is: 94.88139930747116
RMSE value for k=  16 is: 91.30008472407731
RMSE value for k=  17 is: 94.26809261317557
RMSE value for k=  18 is: 96.55099105720839
RMSE value for k=  19 is: 98.08388156385402
RMSE value for k=  20 is: 99.80810638944537
```

[99]:

```
#plotting the rmse values against k values
curve = pd.DataFrame(rmse_val) #elbow curve
curve.plot()
```

[99]: <Axes: >



[101]:
```
regressor = KNeighborsRegressor(n_neighbors=15)
regressor.fit(x_train, y_train)
```

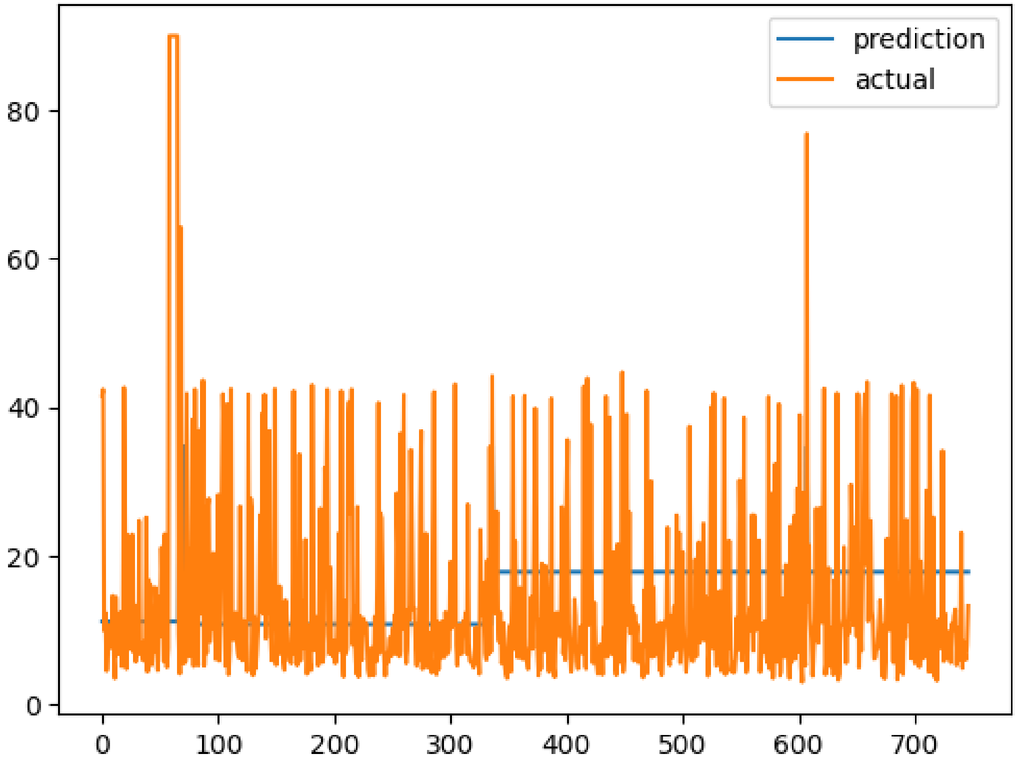
[101]:
```
KNeighborsRegressor(n_neighbors=15)
```

[103]:
```
Y_pred = regressor.predict(x_test)
```

[104]:
```
print(mean_absolute_percentage_error(list(Y_pred), y_test))
```

```
67.37827260056703
```

[105]:
```
import matplotlib.pyplot as plt
import numpy as np

x = range(len(list(Y_pred)))
y_pred = list(Y_pred)
y_actual = y_test

plt.plot(x, y_pred, label="prediction")
plt.plot(x, y_actual, label="actual")
plt.legend()
plt.show()
```



```
[106]: training_size = int(len(df) * 0.8)

       x_train = [[i] for i in df["CPU_USAGE"]][:training_size]
       y_train = [i for i in df["TEMP"]][:training_size]

       x_test = [[i] for i in df["CPU_USAGE"]][training_size:]
       y_test = [[i] for i in df["TEMP"]][training_size:]
```

```
[107]: rmse_val = [] #to store rmse values for different k
       for K in range(20):
           K = K+1
           model = KNeighborsRegressor(n_neighbors = K)

           model.fit(x_train, y_train)  #fit the model
           pred=model.predict(x_test) #make prediction on test set
           error = mean_absolute_percentage_error(y_test,pred)
           rmse_val.append(error) #store rmse values
           print('RMSE value for k= ' , K , 'is:', error)
```

```
RMSE value for k=  1 is: 13.97784303023332
RMSE value for k=  2 is: 13.709050120238789
RMSE value for k=  3 is: 13.819083430856663
RMSE value for k=  4 is: 14.13652181456998
RMSE value for k=  5 is: 14.400728018739983
RMSE value for k=  6 is: 14.522052982691438
RMSE value for k=  7 is: 14.66741197381938
RMSE value for k=  8 is: 14.69189850218369
RMSE value for k=  9 is: 14.648136432594939
RMSE value for k=  10 is: 14.717941745151764
RMSE value for k=  11 is: 14.800498496915674
RMSE value for k=  12 is: 14.892717896201468
RMSE value for k=  13 is: 14.910838825781813
RMSE value for k=  14 is: 14.903825885496207
RMSE value for k=  15 is: 14.978768733036782
RMSE value for k=  16 is: 15.075606875218206
RMSE value for k=  17 is: 15.110539323992409
RMSE value for k=  18 is: 15.162825511717019
RMSE value for k=  19 is: 15.126106246208742
RMSE value for k=  20 is: 15.13997737302094
```

[108]:

```
regressor = KNeighborsRegressor(n_neighbors=15)
regressor.fit(x_train, y_train)
```

[108]:

```
KNeighborsRegressor(n_neighbors=15)
```

[109]:

```
Y_pred = regressor.predict(x_test)
```

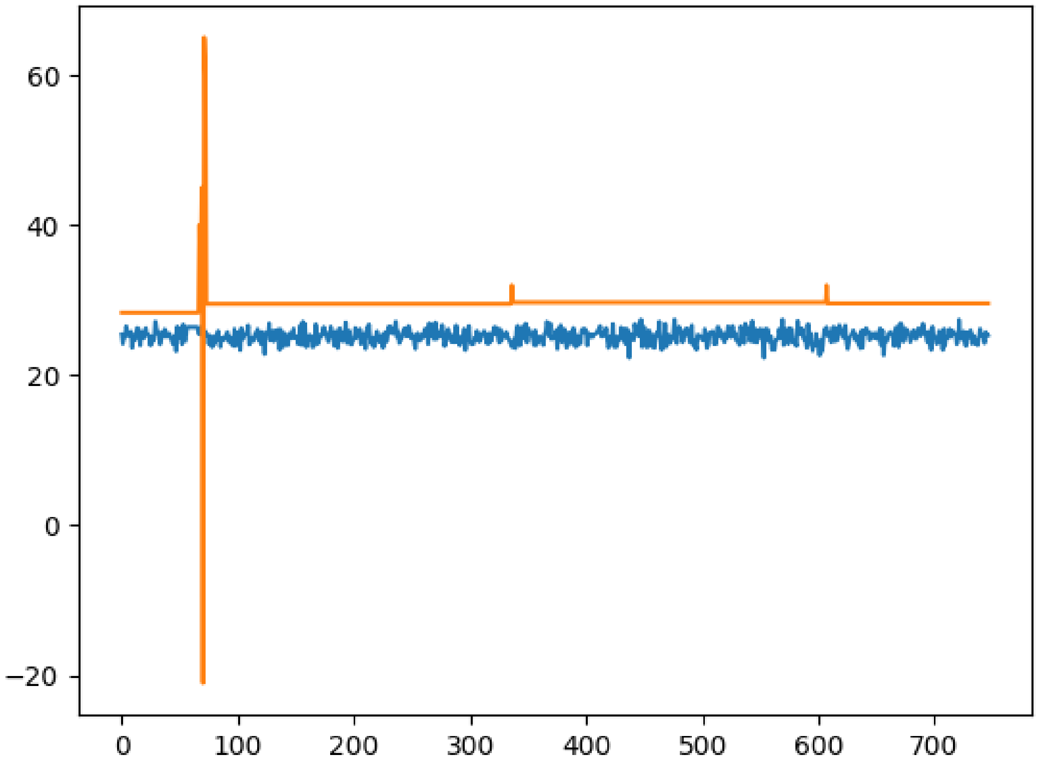
[112]:

```
print(mean_absolute_percentage_error(Y_pred, y_test))
```

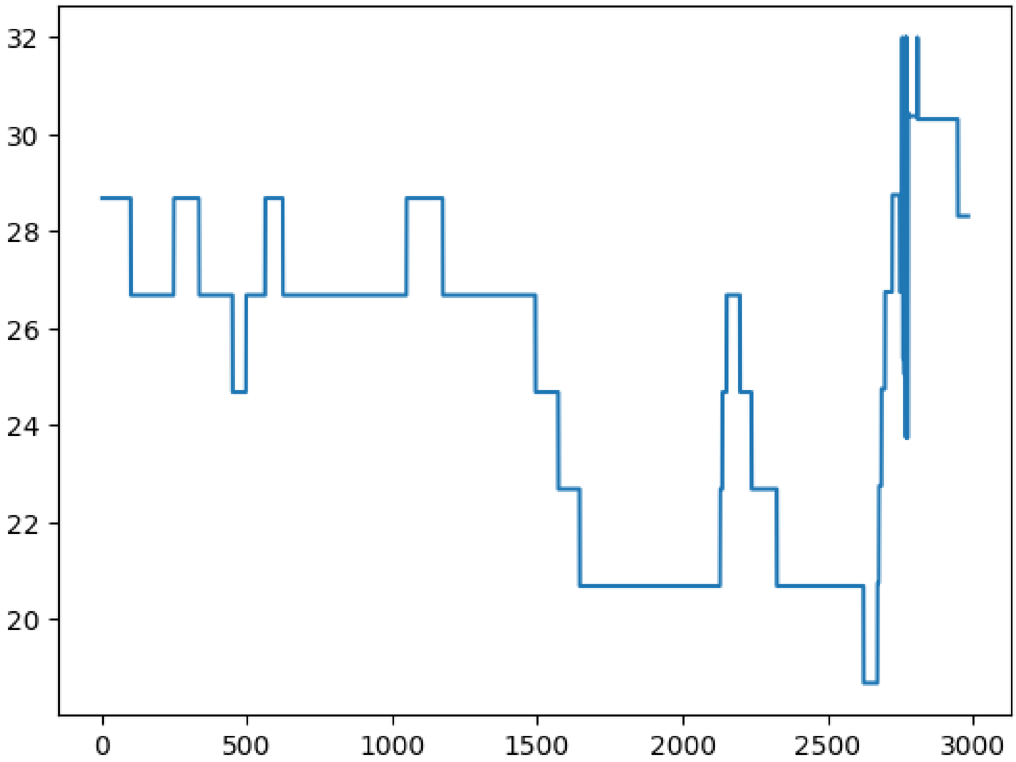
```
17.857738277627416
```

[113]:

```
import matplotlib.pyplot as plt
import numpy as np

x = range(len(list(Y_pred)))
y_pred = list(Y_pred)
y_actual = y_test

plt.plot(x, y_pred)
plt.plot(x, y_actual)
plt.show()
```



[114]:
```
x = range(len(list(y_train)))
y_pred = list(y_train)

plt.plot(x, y_pred)
plt.show()
```


32
30
28
26
24
22
20
0
500
1000
1500
2000
2500
3000