Support Vector Regression

```
# from google.colab import files
# up = files.upload()
```

import dataset

```
import pandas as pd
df = pd.read_csv('dataset.csv')
df.head(3)
```

	A	B	C	T
0	2.0	4	8.5	196
1	2.4	4	9.6	221
2	1.5	4	5.9	136

```
df = df[['A', 'T']]
df.head(3)
```

	A	T
0	2.0	196
1	2.4	221
2	1.5	136

cleaning

```
# clean the data
```

encoding

```
# encode the data
```

define x , y

x and y must be define as 2D

```
import numpy as np
x = np.array(df[['A']])
y = np.array(df[['T']])
```

train test split

```
### finding best random state

# from sklearn.model_selection import train_test_split
# from sklearn.preprocessing import StandardScaler
# from sklearn.svm import SVR
# from sklearn.metrics import r2_score

# import time
# t1 = time.time()
# lst = []
# for i in range(1,10):
#     x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.25, random_state=i)
```

```
#     sc_x = StandardScaler().fit(x_train)
#     sc_y = StandardScaler().fit(y_train)
#     x_train = sc_x.transform(x_train)
#     x_test = sc_x.transform(x_test)
#     y_train = sc_y.transform(y_train)
#     y_test = sc_y.transform(y_test)
#     y_train = np.ravel(y_train)
#     y_test = np.ravel(y_test)
#     svr = SVR()
#     svr.fit(x_train, y_train)
#     yhat_test = svr.predict(x_test)
#     r2 = r2_score(y_test, yhat_test)
#     lst.append(r2)
# t2 = time.time()
# print(f"run time: {round((t2 - t1) / 60 , 0)} min")
# print(f"r2_score: {round(max(lst), 2)}")
# rs = np.argmax(lst) + 1
# print(f"random_state: {rs}")

from sklearn.model_selection import train_test_split
x_train, x_test, y_train, y_test = train_test_split(x, y, test_size=0.25, random_state=42)


y_train[:5]
```

```
array([[258],
       [212],
       [317],
       [308],
       [301]])
```

feature scaling

```
from sklearn.preprocessing import StandardScaler
sc_x = StandardScaler().fit(x_train)
sc_y = StandardScaler().fit(y_train)

x_train = sc_x.transform(x_train)
x_test = sc_x.transform(x_test)

y_train = sc_y.transform(y_train)
y_test = sc_y.transform(y_test)

y_train = np.ravel(y_train)
y_test = np.ravel(y_test)


y_train[:5]
```

```
array([ 0.02336012, -0.70701586,  0.96014671,  0.81724706,  0.70610289])
```

fit train data

```
### K-fold cross validation

# from sklearn.svm import SVR
# from sklearn.model_selection import GridSearchCV

# parameters = {
#     '': [],
#     '': []
# }

# sv = SVR()
# gs = GridSearchCV(estimator=sv, param_grid=parameters, cv=5)

# gs.fit(x_train, y_train)
```

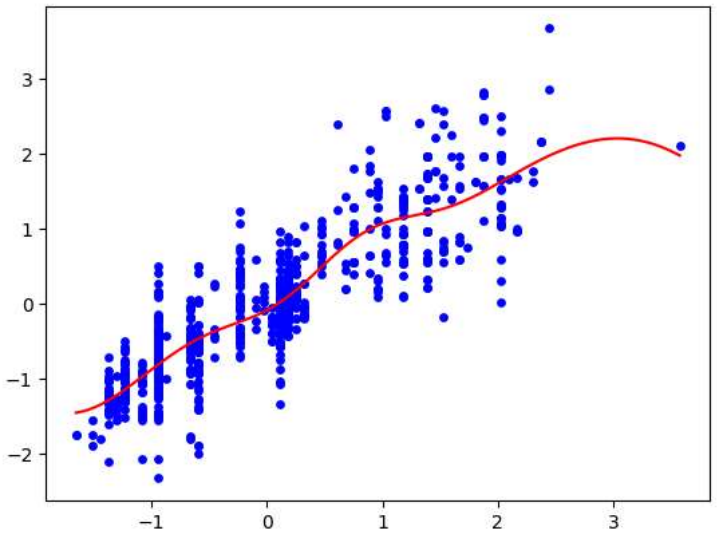
```
# best_params = gs.best_params_
# print(best_params)

# def param
# kernel='rbf', degree=3, gamma='scale', coef0=0.0, tol=0.001, C=1.0
# epsilon=0.1, shrinking=True, cache_size=200, verbose=False, max_iter=-1

from sklearn.svm import SVR
svr = SVR()
svr.fit(x_train, y_train)
```

```
SVR()
```

```
import matplotlib.pyplot as plt
plt.scatter(x_train, y_train, color='b', s=15)
xx = np.arange(np.min(x_train), np.max(x_train), 0.01).reshape(-1, 1)
plt.plot(xx, svr.predict(xx), color='r')
plt.show()
```



predict test data

```
yhat_test = svr.predict(x_test)
```

```
yhat_test[:5]
```

```
array([ 1.04715456,  0.02256772,  0.10044186, -0.24290104, -0.81385553])
```

evaluating the model

```
from sklearn.metrics import r2_score
print("r2-score (train data): %0.4f" % r2_score(y_train, svr.predict(x_train)))
print("r2-score (test data): %0.4f" % r2_score(y_test, yhat_test))
```

```
r2-score (train data): 0.7706
r2-score (test data): 0.7757
```

```
from sklearn.metrics import mean_squared_error
from sklearn.metrics import mean_absolute_error
print(f"MSE (train data): {mean_squared_error(y_train, svr.predict(x_train))}")
print(f"MAE (train data): {mean_absolute_error(y_train, svr.predict(x_train))}")
print(f"MSE (test data): {mean_squared_error(y_test, yhat_test)}")
print(f"MAE (test data): {mean_absolute_error(y_test, yhat_test)}")
```

```
MSE (train data): 0.22937182968223632
MAE (train data): 0.36253405954006285
MSE (test data): 0.23454665529487734
MAE (test data): 0.37469159511941635
```

predict new data

```
sc_y.inverse_transform(svr.predict(sc_x.transform([[5.5]])).reshape(-1, 1))
```

```
array([[336.4709594]])
```

save the model

```
# import joblib
# joblib.dump(svr, 'svr_model.pkl')
```

load the model

```
# import joblib
# svr = joblib.load('svr_model.pkl')
```