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**Department of Computer Science & Engineering**

Report on Mini Project  
**Analysis and Prediction of Calories Burnt  
Dataset**

Course Code : CS2003-1

Course Name : Machine Learning

Semester: VI SEM

Section: C

**Submitted To:**

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**Date of submission:**

09/04/2025

Signature of Course Instructor

```
In [ ]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sb
from sklearn.model_selection import train_test_split
from sklearn.preprocessing import LabelEncoder, StandardScaler
from sklearn import metrics
from sklearn.svm import SVC
from xgboost import XGBRegressor
from sklearn.linear_model import LinearRegression, Lasso, Ridge
from sklearn.ensemble import RandomForestRegressor

import warnings
warnings.filterwarnings('ignore')
```

```
In [ ]: df = pd.read_csv('calories.csv')
df.head()
```

Out[ ]:

	User_ID	Gender	Age	Height	Weight	Duration	Heart_Rate	Body_Temp	Calories
0	14733363	male	68	190.0	94.0	29.0	105.0	40.8	231.0
1	14861698	female	20	166.0	60.0	14.0	94.0	40.3	66.0
2	11179863	male	69	179.0	79.0	5.0	88.0	38.7	26.0
3	16180408	female	34	179.0	71.0	13.0	100.0	40.5	71.0
4	17771927	female	27	154.0	58.0	10.0	81.0	39.8	35.0

```
In [ ]: df.shape
```

Out[ ]: (15000, 9)

```
In [ ]: df.info()
```

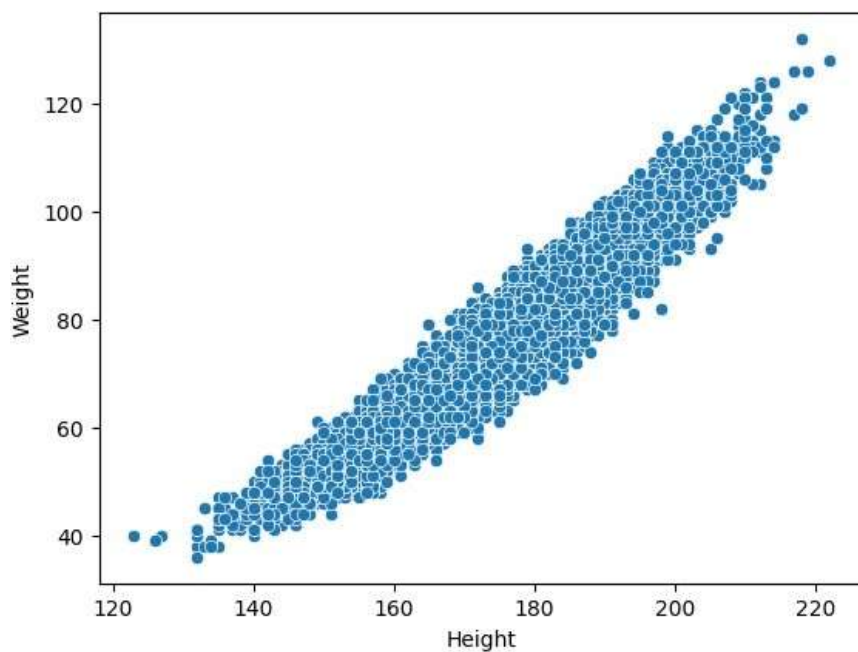
```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 15000 entries, 0 to 14999
Data columns (total 9 columns):
#   Column      Non-Null Count  Dtype
---  -
0   User_ID     15000 non-null  int64
1   Gender      15000 non-null  object
2   Age         15000 non-null  int64
3   Height      15000 non-null  float64
4   Weight      15000 non-null  float64
5   Duration    15000 non-null  float64
6   Heart_Rate  15000 non-null  float64
7   Body_Temp   15000 non-null  float64
8   Calories    15000 non-null  float64
dtypes: float64(6), int64(2), object(1)
memory usage: 1.0+ MB
```

```
In [ ]: df.describe()
```

Out[ ]:

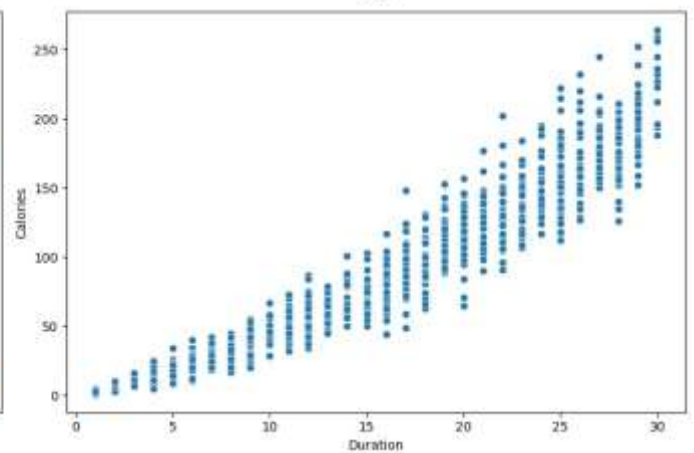
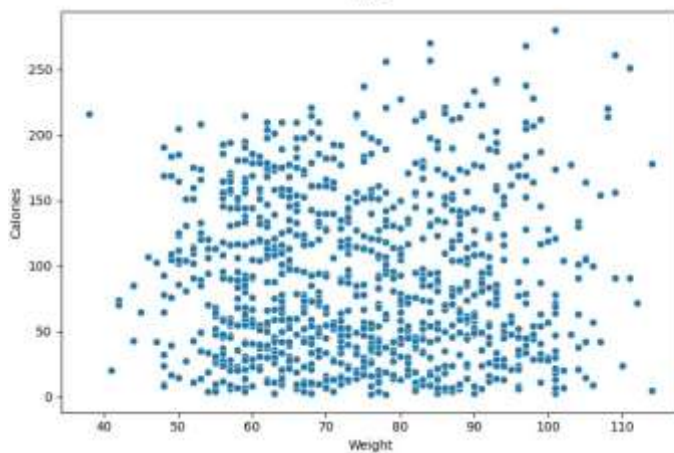
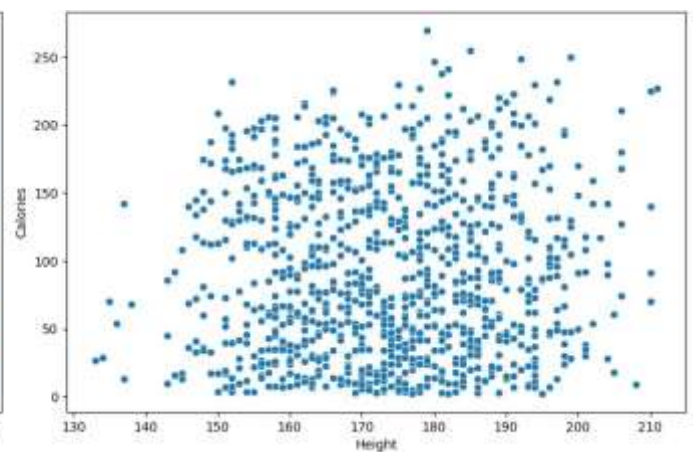
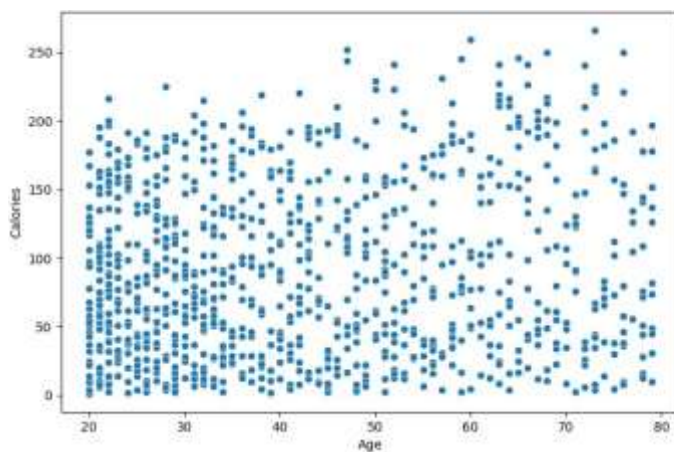
	User_ID	Age	Height	Weight	Duration	Heart_Rate	Body_Temp	Calories
count	1.500000e+04	15000.000000	15000.000000	15000.000000	15000.000000	15000.000000	15000.000000	15000.000000
mean	1.497736e+07	42.789800	174.465133	74.966867	15.530600	95.518533	40.025453	89.539533
std	2.872851e+06	16.980264	14.258114	15.035657	8.319203	9.583328	0.779230	62.456978
min	1.000116e+07	20.000000	123.000000	36.000000	1.000000	67.000000	37.100000	1.000000
25%	1.247419e+07	28.000000	164.000000	63.000000	8.000000	88.000000	39.600000	35.000000
50%	1.499728e+07	39.000000	175.000000	74.000000	16.000000	96.000000	40.200000	79.000000
75%	1.744928e+07	56.000000	185.000000	87.000000	23.000000	103.000000	40.600000	138.000000
max	1.999965e+07	79.000000	222.000000	132.000000	30.000000	128.000000	41.500000	314.000000

```
In [ ]: sb.scatterplot(x='Height', y='Weight', data=df)
plt.show()
```



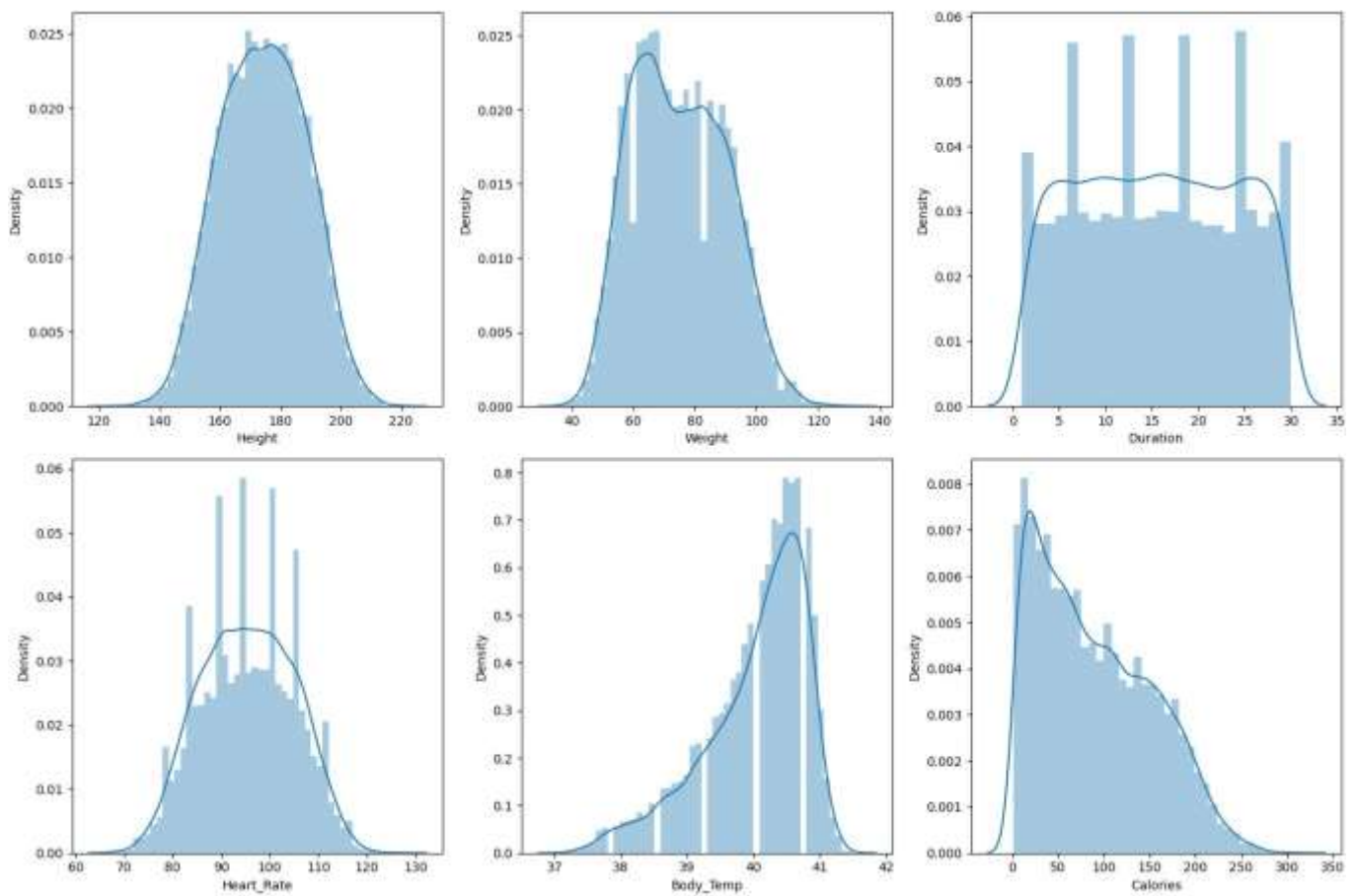
```
In [ ]: features = ['Age', 'Height', 'Weight', 'Duration']

plt.subplots(figsize=(15, 10))
for i, col in enumerate(features):
    plt.subplot(2, 2, i + 1)
    x = df.sample(1000)
    sb.scatterplot(x=col, y='Calories', data=x)
plt.tight_layout()
plt.show()
```



```
In [ ]: features = df.select_dtypes(include='float').columns

plt.subplots(figsize=(15, 10))
for i, col in enumerate(features):
    plt.subplot(2, 3, i + 1)
    sb.distplot(df[col])
plt.tight_layout()
plt.show()
```



```
In [ ]: df.replace({'male': 0, 'female': 1},
                    inplace=True)
df.head()
```

```
Out[ ]:
```

	User_ID	Gender	Age	Height	Weight	Duration	Heart_Rate	Body_Temp	Calories
0	14733363	0	68	190.0	94.0	29.0	105.0	40.8	231.0
1	14861698	1	20	166.0	60.0	14.0	94.0	40.3	66.0
2	11179863	0	69	179.0	79.0	5.0	88.0	38.7	26.0
3	16180408	1	34	179.0	71.0	13.0	100.0	40.5	71.0
4	17771927	1	27	154.0	58.0	10.0	81.0	39.8	35.0

```
In [ ]: plt.figure(figsize=(8, 8))
sb.heatmap(df.corr() > 0.9,
            annot=True,
            cbar=False)
plt.show()
```

User_ID	1	0	0	0	0	0	0	0	0
Gender	0	1	0	0	0	0	0	0	0
Age	0	0	1	0	0	0	0	0	0
Height	0	0	0	1	1	0	0	0	0
Weight	0	0	0	1	1	0	0	0	0
Duration	0	0	0	0	0	1	0	1	1
Heart_Rate	0	0	0	0	0	0	1	0	0
Body_Temp	0	0	0	0	0	1	0	1	0
Calories	0	0	0	0	0	1	0	0	1
	User_ID	Gender	Age	Height	Weight	Duration	Heart_Rate	Body_Temp	Calories

```
In [ ]: to_remove = ['Weight', 'Duration']
df.drop(to_remove, axis=1, inplace=True)
```

```
In [ ]: features = df.drop(['User_ID', 'Calories'], axis=1)
target = df['Calories'].values

X_train, X_val, \
    Y_train, Y_val = train_test_split(features, target,
                                      test_size=0.1,
                                      random_state=22)

X_train.shape, X_val.shape
```

```
Out[ ]: ((13500, 5), (1500, 5))
```

```
In [ ]: # Normalizing the features for stable and fast training.
scaler = StandardScaler()
X_train = scaler.fit_transform(X_train)
X_val = scaler.transform(X_val)
```

```
In [ ]: from sklearn.metrics import mean_absolute_error as mae
models = [LinearRegression(), XGBRegressor(),
          Lasso(), RandomForestRegressor(), Ridge()]

for i in range(5):
    models[i].fit(X_train, Y_train)

    print(f'{models[i]} : ')

    train_preds = models[i].predict(X_train)
    print('Training Error : ', mae(Y_train, train_preds))

    val_preds = models[i].predict(X_val)
    print('Validation Error : ', mae(Y_val, val_preds))
    print()
```

```
LinearRegression() :  
Training Error : 17.893463692619434  
Validation Error : 18.007896272831253
```

```
XGBRegressor(base_score=None, booster=None, callbacks=None,  
              colsample_bylevel=None, colsample_bynode=None,  
              colsample_bytree=None, device=None, early_stopping_rounds=None,  
              enable_categorical=False, eval_metric=None, feature_types=None,  
              gamma=None, grow_policy=None, importance_type=None,  
              interaction_constraints=None, learning_rate=None, max_bin=None,  
              max_cat_threshold=None, max_cat_to_onehot=None,  
              max_delta_step=None, max_depth=None, max_leaves=None,  
              min_child_weight=None, missing=nan, monotone_constraints=None,  
              multi_strategy=None, n_estimators=None, n_jobs=None,  
              num_parallel_tree=None, random_state=None, ...) :  
Training Error : 7.89463304294701  
Validation Error : 10.12050432946533
```

```
Lasso() :  
Training Error : 17.915089584958036  
Validation Error : 17.995033362288662
```

```
RandomForestRegressor() :  
Training Error : 3.9877936746031746  
Validation Error : 10.451300301587302
```

```
Ridge() :  
Training Error : 17.893530494767777  
Validation Error : 18.00781790803129
```