PROJECT REPORT
BURN SMART

(Predicting Calorie Burn During Workouts)

UNDER GUIDANCE OF

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PROJECT OVERVIEW

Introduction

Our project aims to develop machine learning models that can accurately predict calorie burn during workouts.

By taking into account various factors such as heart rate, duration, body temperature, and individual characteristics like age, weight, height, and gender, we hope to provide users with a more personalized and accurate estimate of their calorie burn.

Project	Project Goals
Develop	Develop machine learning models that accurately predict calorie burn during workouts.
Incorporate	Incorporate factors such as heart rate, duration, body temperature, and individual characteristics like age, weight, height, and gender into the models. Compare the performance of different machine learning models.
Optimize	Optimize the best performing model to improve accuracy. Present the results and discuss future work.

FACTORS AFFECTING

- **Heart Rate**

  The higher the heart rate during a workout, the more calories burned.

- **Duration**

  The longer the duration of a workout, the more calories burned.

- **Body Temperature**

  Higher body temperature may increase calorie burn during a workout.

- **Individual Characteristics**

  Age, weight, height, and gender can all impact calorie burn during a workout.

Predicting Calorie Burn: A Machine Learning Approach

Machine learning Models: Utilizing machine learning algorithms to predict calorie burn.

Data Collection and Analysis: Collecting and analyzing data on physical activity and calorie burn.

Model Training and Evaluation

Training and evaluating the machine learning models for calorie burn prediction

PROJECT DETAIL

Innovative Tools for Understanding Physical Activity

- Wearable Devices
- Utilizing wearable devices to track physical activity and collect data.
- Mobile Applications
- Developing mobile apps to record and analyze physical activity.
- Sensor Technology
- Exploring sensor technology for accurate measurement of physical activity.

FEATURE SELECTION AND DATA PREPROCESSING

- Feature Importance

  Identifying the most influential features for calorie burn prediction.

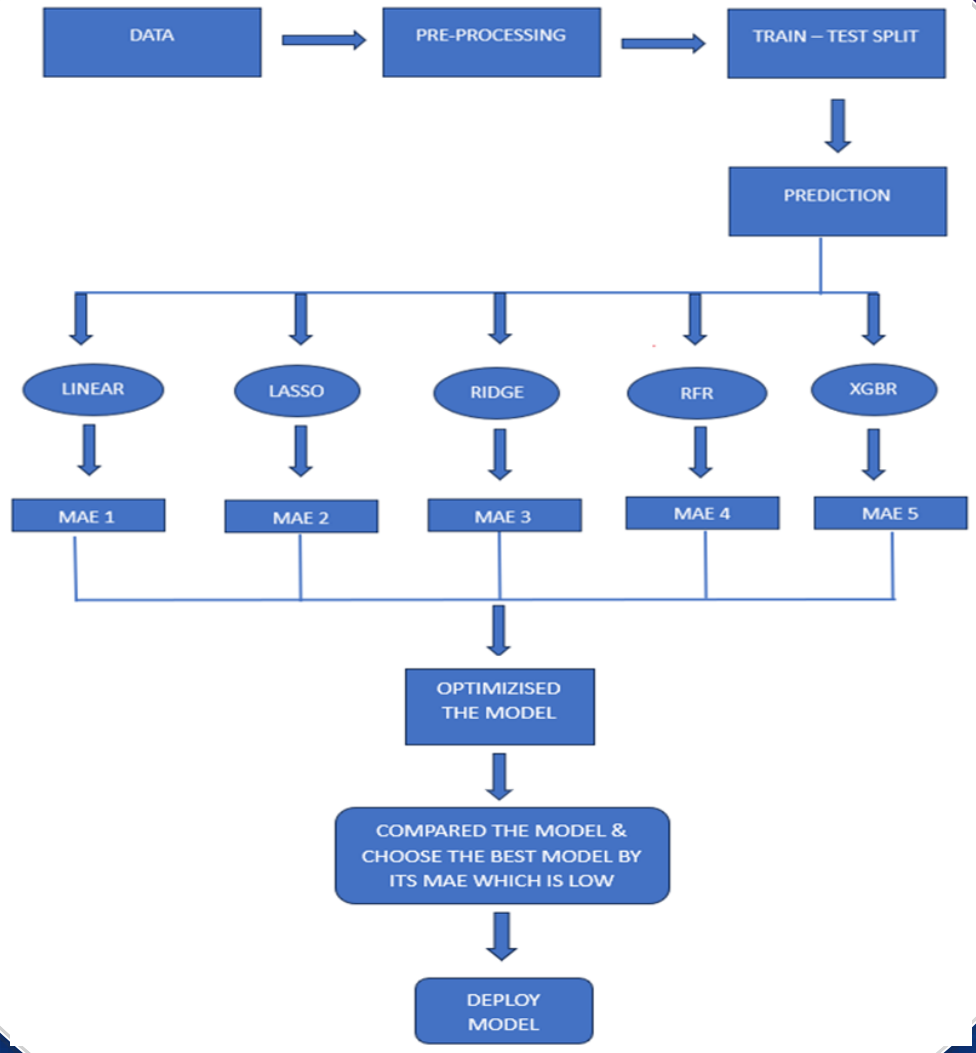
- Handling Missing Data

  Dealing with missing data through imputation or elimination.

- Normalization

  Applying normalization techniques to preprocess the data.

SYSTEM ARCHITECTURE



MACHINE LEARNING MODELS

Machine Learning Models for Predicting Calorie Burn:

Regression Models:

Using regression models to predict calorie burn based on various factors.

- LINEAR REGRESSION
- LASSO REGRESSION
- RIDGE REGRESSION

Ensemble Models:

Employing ensemble models to improve the accuracy of calorie burn prediction.

- RANDOM FOREST REGRESSOR
- XGB REGRESSOR

```
LinearRegression() :
Training Error :  8.332985229896742
Validation Error :  8.385188053147179

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 :  0.9322033420062313
Validation Error :  1.4833678883314132

Lasso() :
Training Error :  9.049658999072935
Validation Error :  8.989469141792506

RandomForestRegressor() :
Training Error :  0.6865499999999999
Validation Error :  1.6871166666666664

Ridge() :
Training Error :  8.332695704014442
Validation Error :  8.38482196600372
```

COMPARING MACHINE LEARNING ALGORITHMS FOR CALORIE BURN PREDICTION

MODEL OPTIMIZATION

```
LinearRegression() :
Training Error :  8.306790197742497
Validation Error :  8.441513553849703

Ridge(alpha=10) :
Training Error :  8.304994376664778
Validation Error :  8.438993797246134

Lasso(alpha=0.05) :
Training Error :  8.302465721352533
Validation Error :  8.442647976630964

RandomForestRegressor() :
Training Error :  0.6698925
Validation Error :  1.7103733333333335

/usr/local/lib/python3.10/dist-packages/xgboost/core.py:160: UserWarning: [16:26:49]
  warnings.warn(smsg, UserWarning)
XGBRegressor(base_score=None, booster=None, callbacks=None,
             colsample_bylevel=None, colsample_bynode=None,
             colsample_bytree=0.7, 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=0.07, max_bin=None,
             max_cat_threshold=None, max_cat_to_onehot=None,
             max_delta_step=None, max_depth=5, max_leaves=None,
             min_child_weight=4, missing=nan, monotone_constraints=None,
             multi_strategy=None, n_estimators=500, n_jobs=None, nthread=4,
             num_parallel_tree=None, ...) :
Training Error :  0.7825378867114584
Validation Error :  1.005842310667038
```

EVALUATING PERFORMANCE OF ML ALGORITHMS AFTER OPTIMIZATION

BEST ALGORITHM

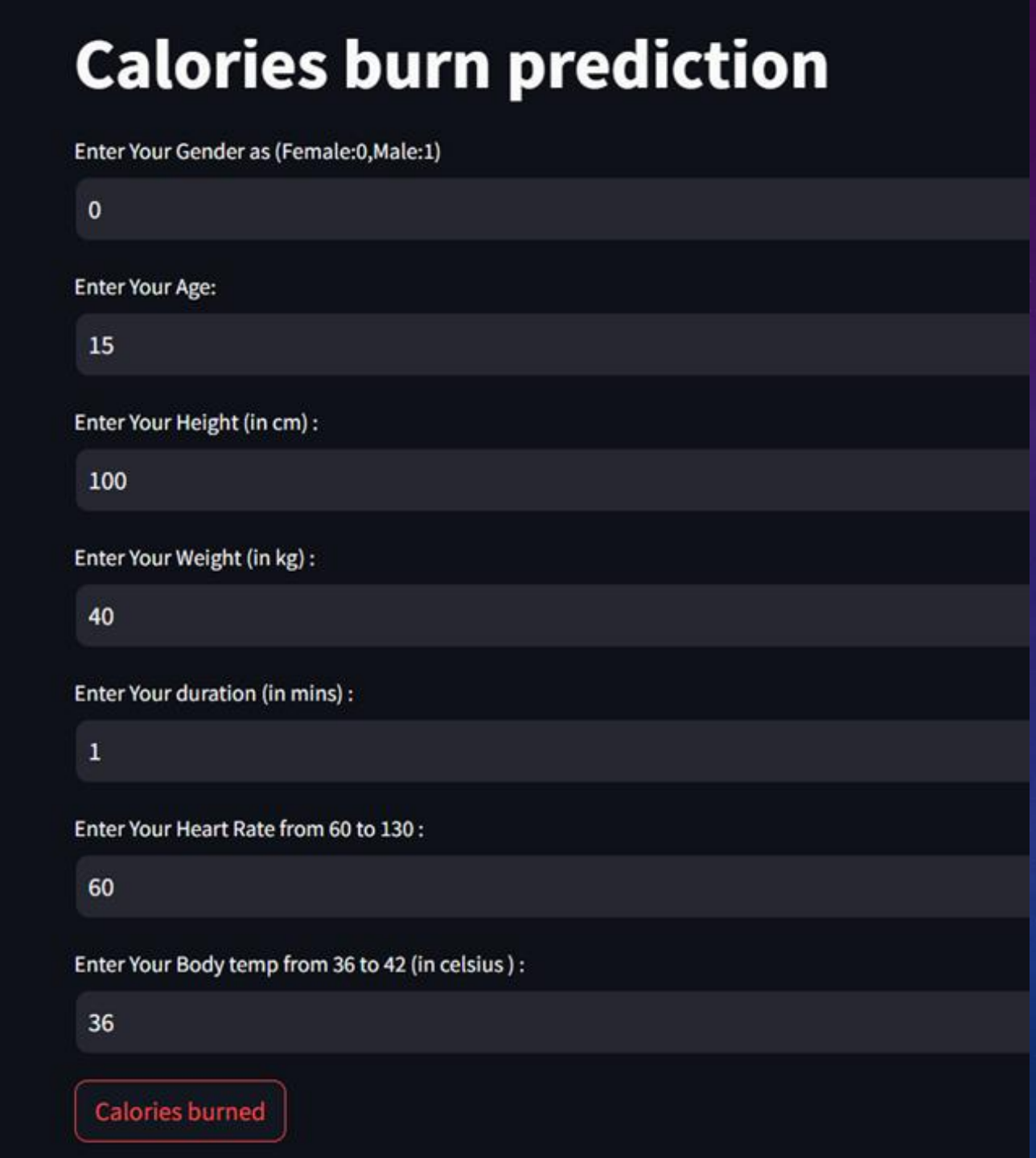
XGB REGRESSOR

Achieving the lowest MAE and highest accuracy for calorie burn prediction.

Model Deployment

Implementing the best performing algorithm in practical applications.

After testing multiple machine learning models, we found that the XGB REGRESSOR performed the best in predicting calorie burn during workouts. This model had an MAE of 1.0005, indicating a strong correlation between the predicted and actual calorie burn values.



WEB APPLICATION

Developing a user-friendly web interface to access predictive models.

CONCLUSION

We have proposed a system for predicting the number of calories burned during physical activity that takes into account all of the relevant variables, including age, gender, height, weight, body temperature, heart rate, and the length of the activity. We have compared the accuracy of various regression models, including Random Forest, Ridge Regression, Lasso Regression, and XGBoost. Our system achieves the highest accuracy by using a combination of these models.

In addition to being accurate, our system is also user-friendly. We have developed a webpage for our system that allows users to easily make predictions, receive recommendations, and personalize their experience. The webpage also includes anomaly detection capabilities to identify unusual activity patterns.

THANK YOU

Take control of your workout and optimize your burning calories!