

# Fitness AI: Machine Learning for Personalized Workout Recommendations

## Mini Projet Machine Learning

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### Abstract

This project develops an AI system for personalized workout recommendations. Three ML models were trained and evaluated for weight prediction: Gradient Boosting ( $R^2=-0.19$ ), Linear Regression ( $R^2=-0.06$ ), and SVM ( $R^2=-0.03$ ). The system is deployed via Flask API on Hugging Face Spaces for real-time predictions.

## Introduction

Modern fitness applications lack true personalization. This project addresses this gap by building ML models to:

- Predict weight evolution over 30 days
- Recommend exercises based on user goals
- Estimate calories burned during workouts

## Methodology

- Data cleaning with NaN imputation and feature engineering
- Models tested: Gradient Boosting, Linear Regression, SVM
- Evaluation metrics:  $R^2$ , RMSE, MAE
- Deployment: Flask API on Hugging Face Spaces

## Results

Model	$R^2$ Score	RMSE	MAE
SVM	-0.0335	328.76	265.04
Linear Regression	-0.0589	332.77	262.64
Gradient Boosting	-0.1885	352.56	289.09

Table 1: Model Performance Comparison (Weight Prediction)

## Detailed Model Performance

### Gradient Boosting Results:

MSE: 124,297.29 RMSE: 352.56

MAE: 289.09  $R^2$ : -0.1885

### Linear Regression Results:

MSE: 110,737.12 RMSE: 332.77

MAE: 262.64  $R^2$ : -0.0589

### SVM Results:

MSE: 108,081.99 RMSE: 328.76

MAE: 265.04  $R^2$ : -0.0335

## Data Analysis

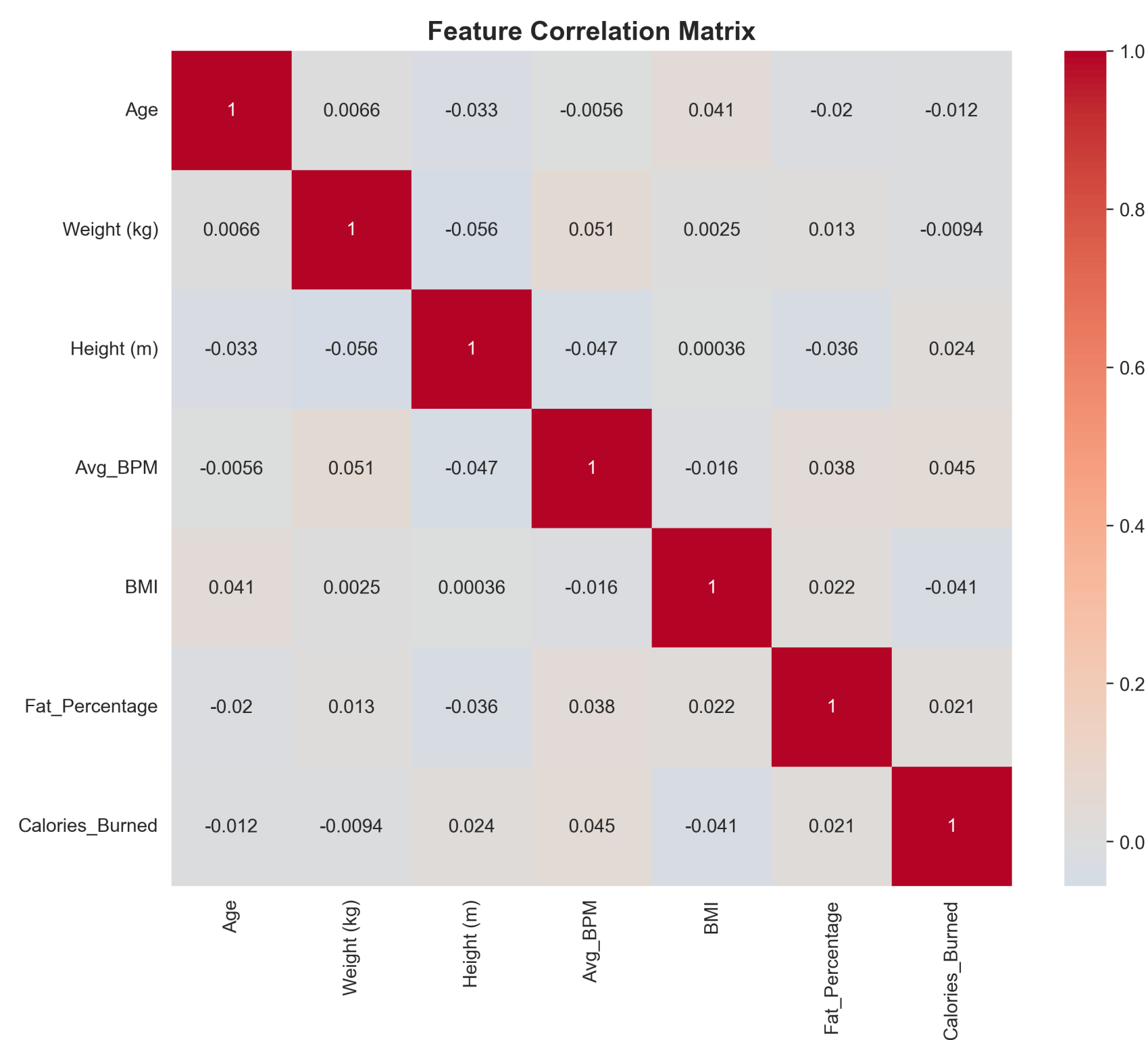


Figure 1: Feature Correlation Matrix

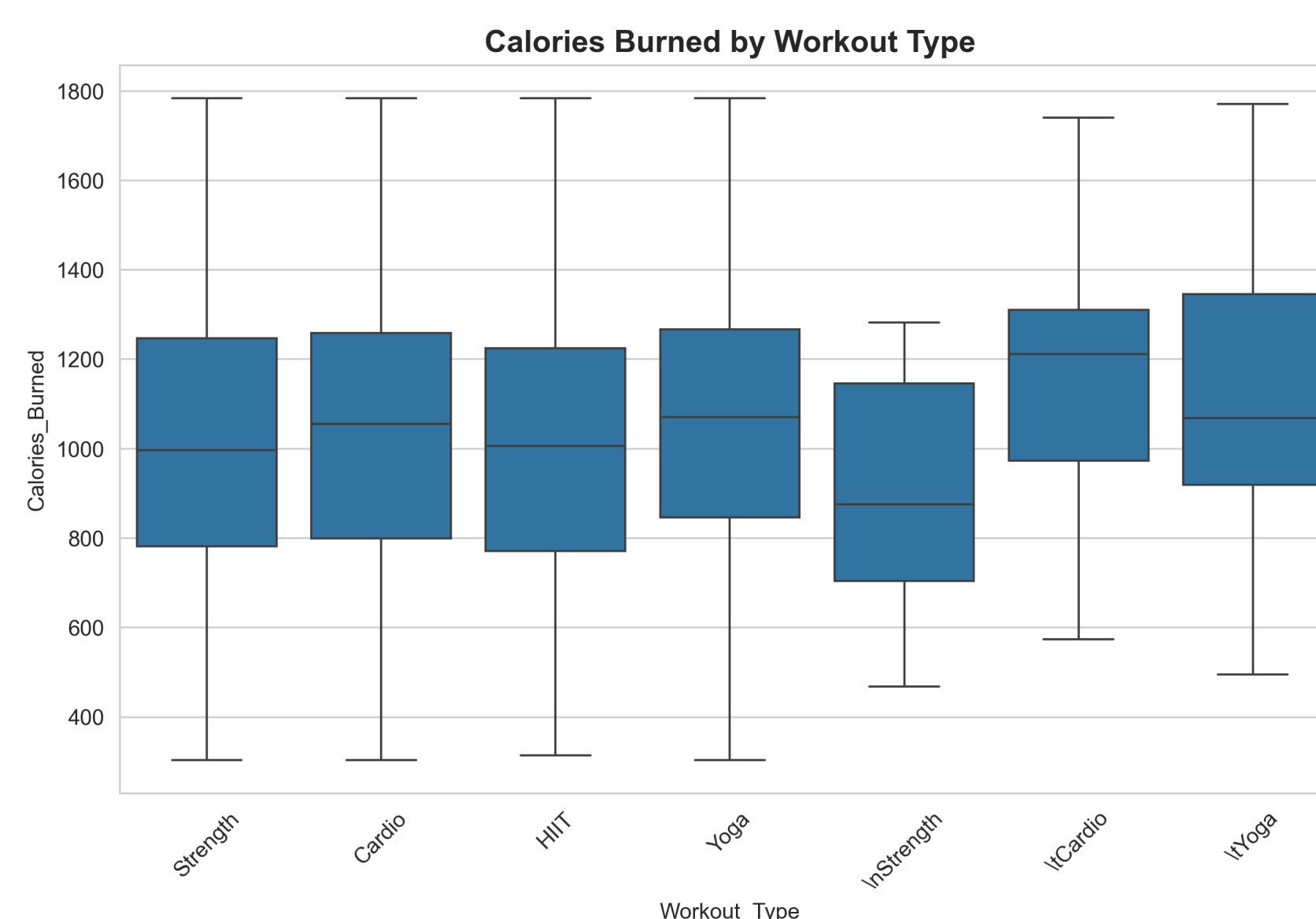


Figure 2: Calorie Distribution by Exercise Type

## Deployment & Demonstration

Live API: <https://huggingface.co/spaces/Hushfire/fitness-ai>



Figure 3: QR Code - Scan to Test the API

## Conclusions & Future Work

- Achievements:** Three ML models implemented and deployed for weight prediction
- Limitations:** Negative  $R^2$  scores indicate models underperform baseline; synthetic data used
- Future Work:** Collect real-world data, feature engineering improvement, model hyperparameter tuning, mobile app integration

*This project demonstrates the practical application of ML in personalized fitness, despite current model limitations.*

## References

- GitHub: [github.com/akramnemri/ML\\_Fitness\\_Project](https://github.com/akramnemri/ML_Fitness_Project)
- Hugging Face: [huggingface.co/spaces/Hushfire/fitness-ai](https://huggingface.co/spaces/Hushfire/fitness-ai)
- Dataset: Gym Tracking Data (Synthetic)