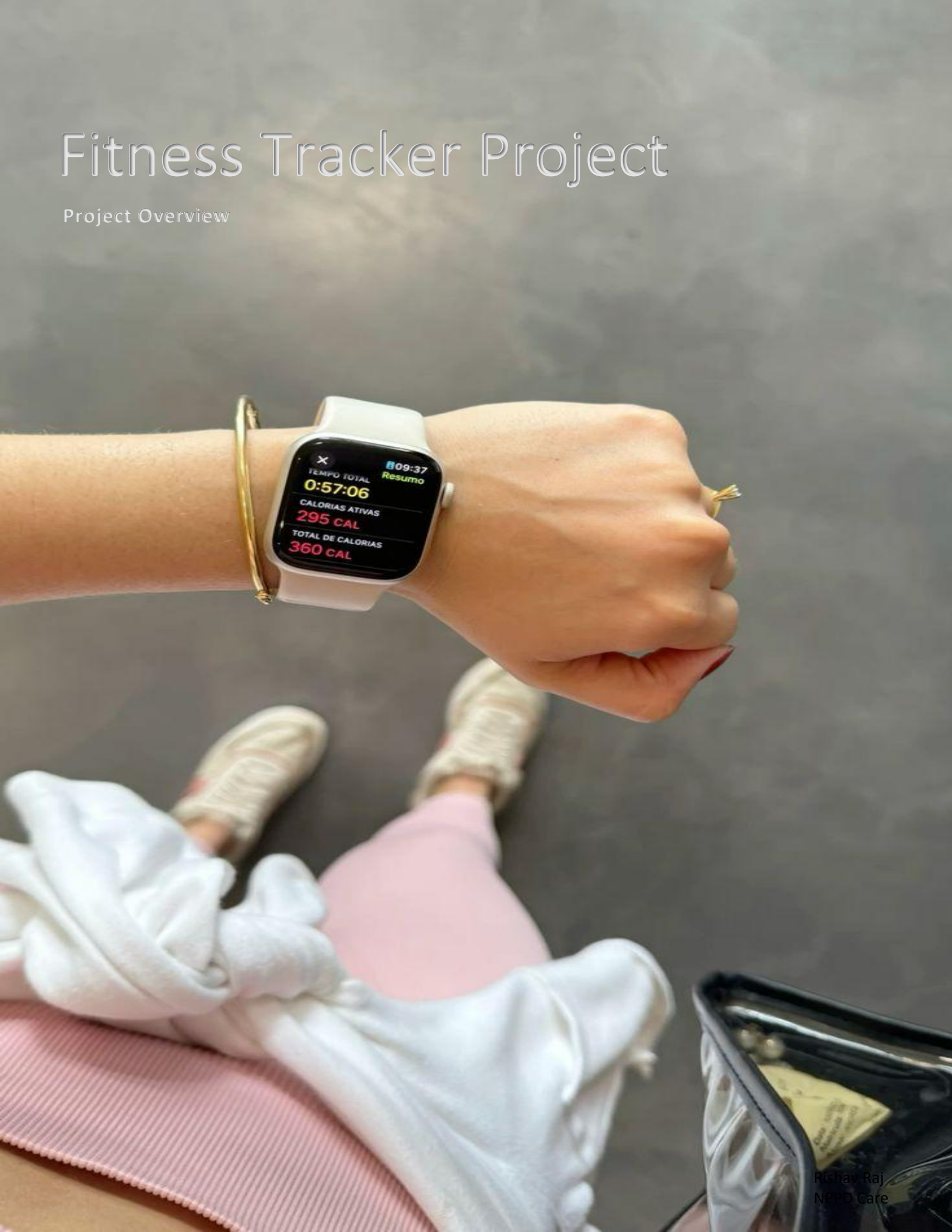
Fitness Tracker Project

Project Overview



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Contents

The quantified self is any individual engaged in the self-tracking of any kind of biological, physical, behavioral, or environmental information. The self-tracking is driven by a certain goal of the individual, with a desire to act upon the collected information — Hoogendoorn, M., & Funk, B. (2018). Machine learning for the quantified self. On the art of learning from sensory data.

- Project from Master Artificial Intelligence (Vrije Universiteit Amsterdam)
- Course — Machine Learning for the Quantified Self (Mark Hoogendoorn)
- Book — https://link.springer.com/book/10.1007/978-3-319-66308-1
- MetaMotion Sensor — https://mbientlab.com/metamotions/
- Original source code: https://github.com/mhoogen/ML4QS/
- Data — collected during gym workouts (by me) where participants (5 total) were performing various barbell exercises

Project Overview

This project focuses on analyzing sensor data to develop a fitness tracking system. The key learning outcomes include data preprocessing, visualization, outlier detection, feature engineering, predictive modeling, and custom algorithm development.

Bench Press | Deadlift | Overhead Press | Barbell Row | Squat

Workflow or Action Plan

Part 1: Introduction

- Understanding the goal of the project
- Introduction to the concept of the quantified self
- Overview of the MetaMotion sensor
- Exploring the dataset

Part 2: Data Preprocessing

- Converting raw sensor data into a structured format
- Reading CSV files and handling missing data
- Splitting data into training and testing sets
- Data cleaning techniques

Part 3: Data Visualization

- Plotting time-series data to identify trends
- Using different visualization techniques for sensor data
- Understanding patterns in fitness movements

Part 4: Outlier Detection

- Identifying anomalies in sensor data
- Applying Chauvenet's criterion for outlier detection
- Using Local Outlier Factor (LOF) for anomaly detection

Part 5: Feature Engineering

- Extracting meaningful features from sensor data
- Applying frequency analysis and low-pass filtering
- Using Principal Component Analysis (PCA) for dimensionality reduction
- Clustering techniques for pattern recognition

Part 6: Predictive Modeling

- Building machine learning models for motion classification
- Implementing Naive Bayes, Support Vector Machines (SVMs), and Random Forest
- Training a neural network for activity recognition

Part 7: Custom Algorithm Development

- Designing an algorithm to count repetitions of movements
- Implementing and optimizing a custom fitness tracking solution

Future Recruitment & Commercial Prospects

This project is developed for commercial purposes, the following aspects should be considered:

- **Scalability**: Ensuring the system can handle large volumes of users and data.
- **User Experience**: Developing an intuitive mobile or web application for fitness tracking.
- **Business Model**: Exploring subscription-based, one-time purchase, or Premium models.
- **Integration**: Connecting with wearable devices, health apps, and cloud storage.
- **Marketing Strategy**: Targeting fitness enthusiasts, gyms, and wellness programs.
- **Regulatory Compliance**: Adhering to data privacy laws and health regulations.
- **Future Hiring**: Recruiting data scientists, app developers, and fitness experts to enhance the product.