Group 2 Presentation

Body Fat Project

Introduction

Estimating body fat percentage is one of the crucial components in assessing an individual's health and risk for various diseases.

The traditional method is to weigh them on dry land and then weigh them while submerged in water(Inconvenient).

Our Goal: Establish a simple, robust, and accurate model to estimate body fat percentage by using data such as age, weight, height, BMI, and body circumference measurements.

Data Cleaning

- We impute **one individual** due to 0% of Body Fat Percentage

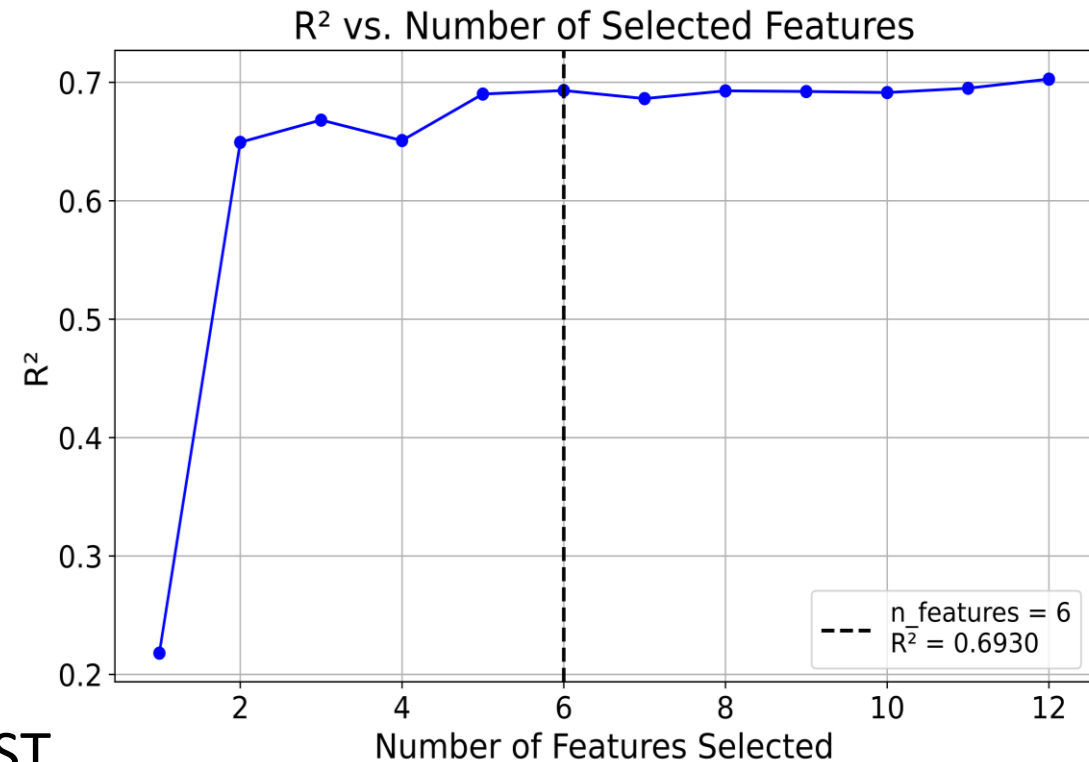| Individual (IDNO)	Original Obs.	Imputed Obs.	Imputation Method
182	0	4.42	Estimated by popular model from internet

- We deleted **one individual (INDO 216)** due to extremely high Body-Fat%

- IQR(Interquartile Range Method)

| Individual (IDNO)	Original Obs.
216	45.1

- <u>Final Cleaned Data</u>: **n=251** (from n=252) with p = 6 predictors
  - Predictors: ADIPOSITY, NECK, ABDOMEN, HIP, BICEPS, WRIST

Feature Selection

- Method： Recursive Feature Elimination
  (RFE)

- Trade-Offs： Accuracy or Simplicity ?

- Y ~ADIPOSITY, NECK, ABDOMEN, HIP, BICEPS, WRIST

R² vs. Number of Selected Features

Results of Final Model


Actual vs. Predicted Bodyfat Percentage
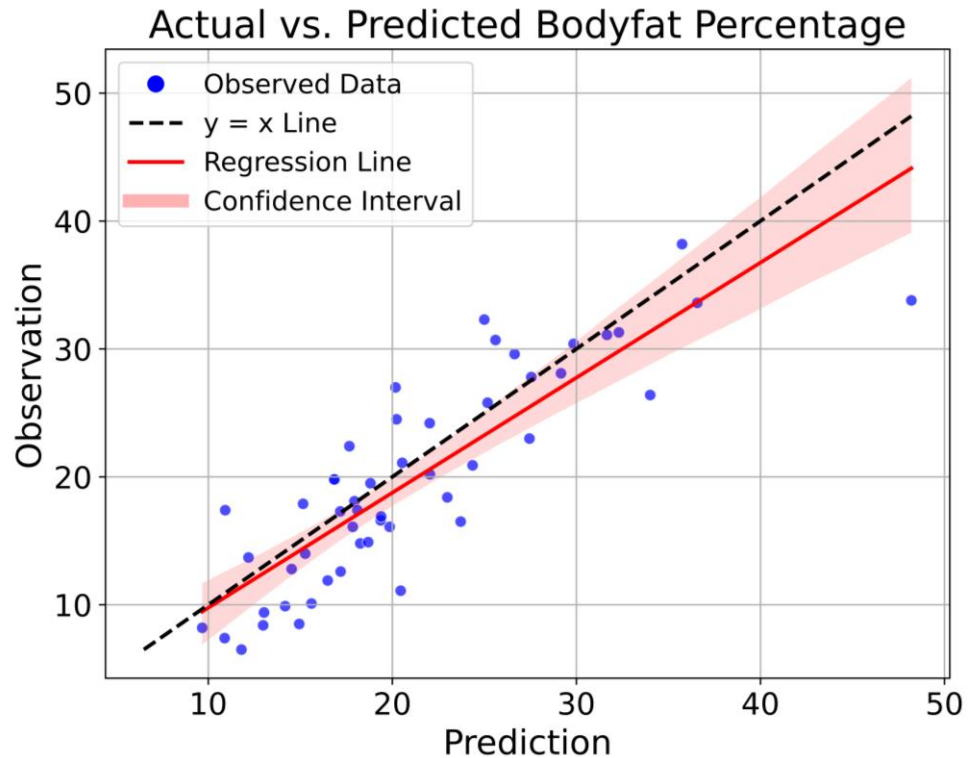
- Model: Y ~ADIPOSITY, NECK, ABDOMEN, HIP, BICEPS, WRIST

- Metrics： R^2 ---   0.6930

              RMSE --- 4.4288

Model Diagnostics

Assumptions of MLP:

- Independence: The residuals (errors) should be independent of each other.

- Linearity: Relationship between the independent variables (predictors) and the dependent variable should be linear.

- Homoscedasticty: The variance of residuals should be consistent across all levels of the independent variables.

- Normal Distribution: The residuals should follow a normal distribution.

Visualization
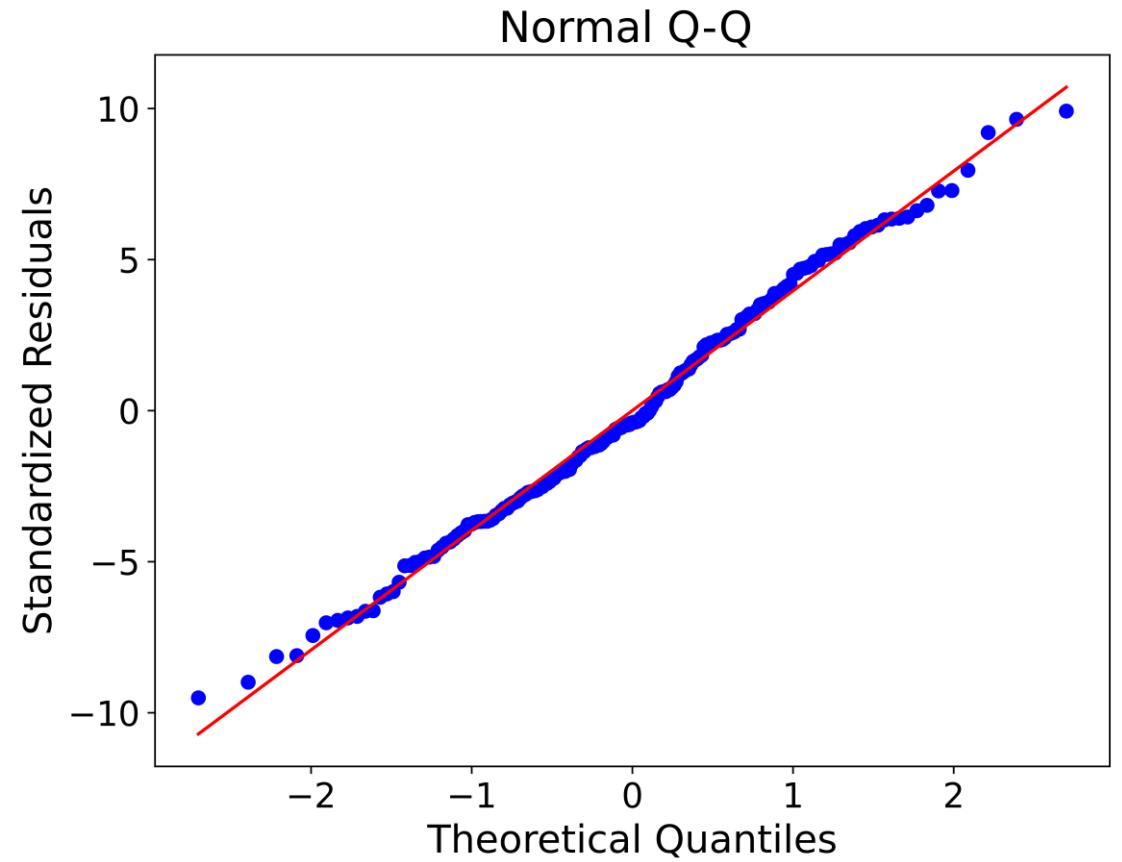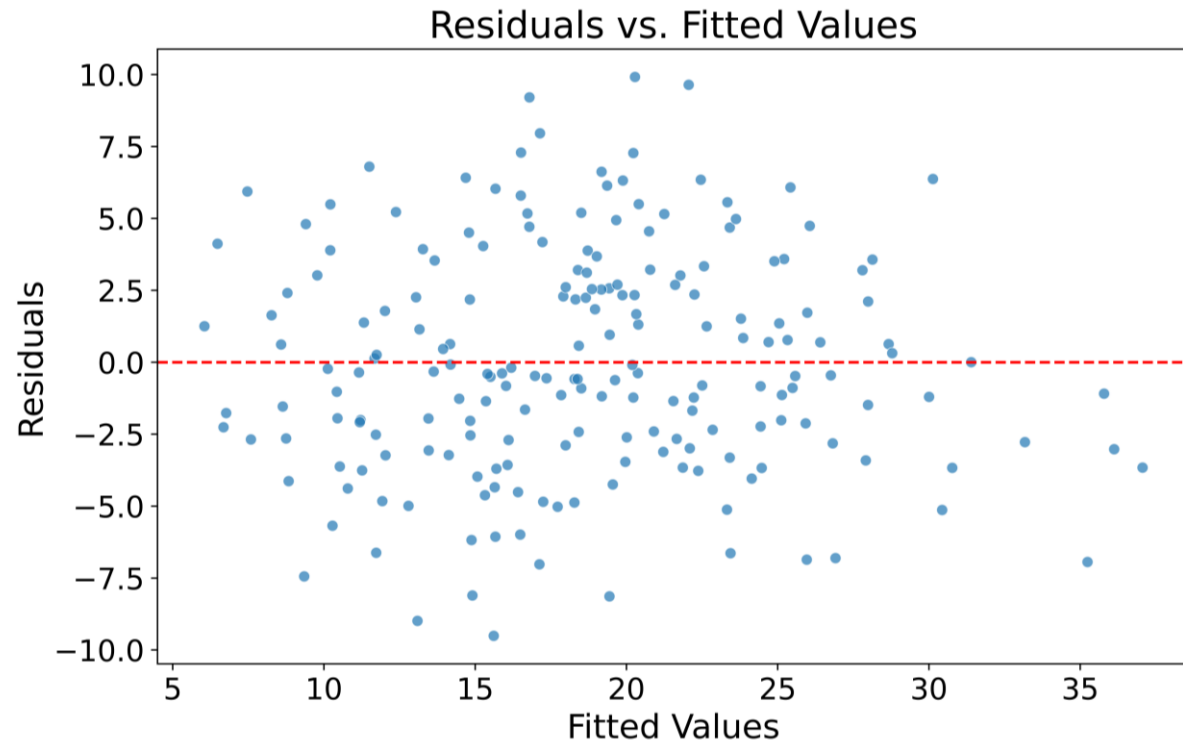
Model Strengths and Weaknesses

Strengths:

- Simplicity and Interpretability

- Moderate Predictive Power

- Effective Feature Selection

Weekness

- Slight Heteroscedasticity and mild heavy tails

- Potential Limitations in Generalization

- Too simple?

Shiny App

- Link: https://jirenlu.shinyapps.io/01-basic-app/

Calculate Bodyfat!

Adiposity (BMI)

23.5

Neck circumference (cm)

38.5

Chest circumference (cm)

85

Hip circumference (cm)

100

Biceps (extended) circumference (cm)

30

Wrist circumference (cm)

1000 ⚠

Wrist circumference should be between 10 and 25

Calculate Bodyfat!

Bodyfat: -1672.8

If you have any question, please contact: jlu@wisc.edu