TÉCNICO LISBOA

Intelligent Systems

Mechanical Engineering

Class Assignment 1

Author:

Diogo João Mendes Pereira (ISTID 87172)
diogojmpereira@tecnico.ulisboa.pt

2025/2026 – 1º Semester, P1

Contents

1 Dataset 1: Diabetes Dataset (Regression)

Fuzzy C-Means Clustering was applied with a range of values for the number of clusters of 2 to 10 with an increment of 1 and the fuzziness coefficient was varied between 1.5 and 2.5 with an increment of 0.1. The results were evaluated using the Fuzzy Partition Coefficient (FPC) and culminated in a number of 2 clusters and a fuzziness coefficient of 1.5 achieving a FPC of 0.939724280208228.

The resulting TSK model achieved a MSE of 2534.134033203125.

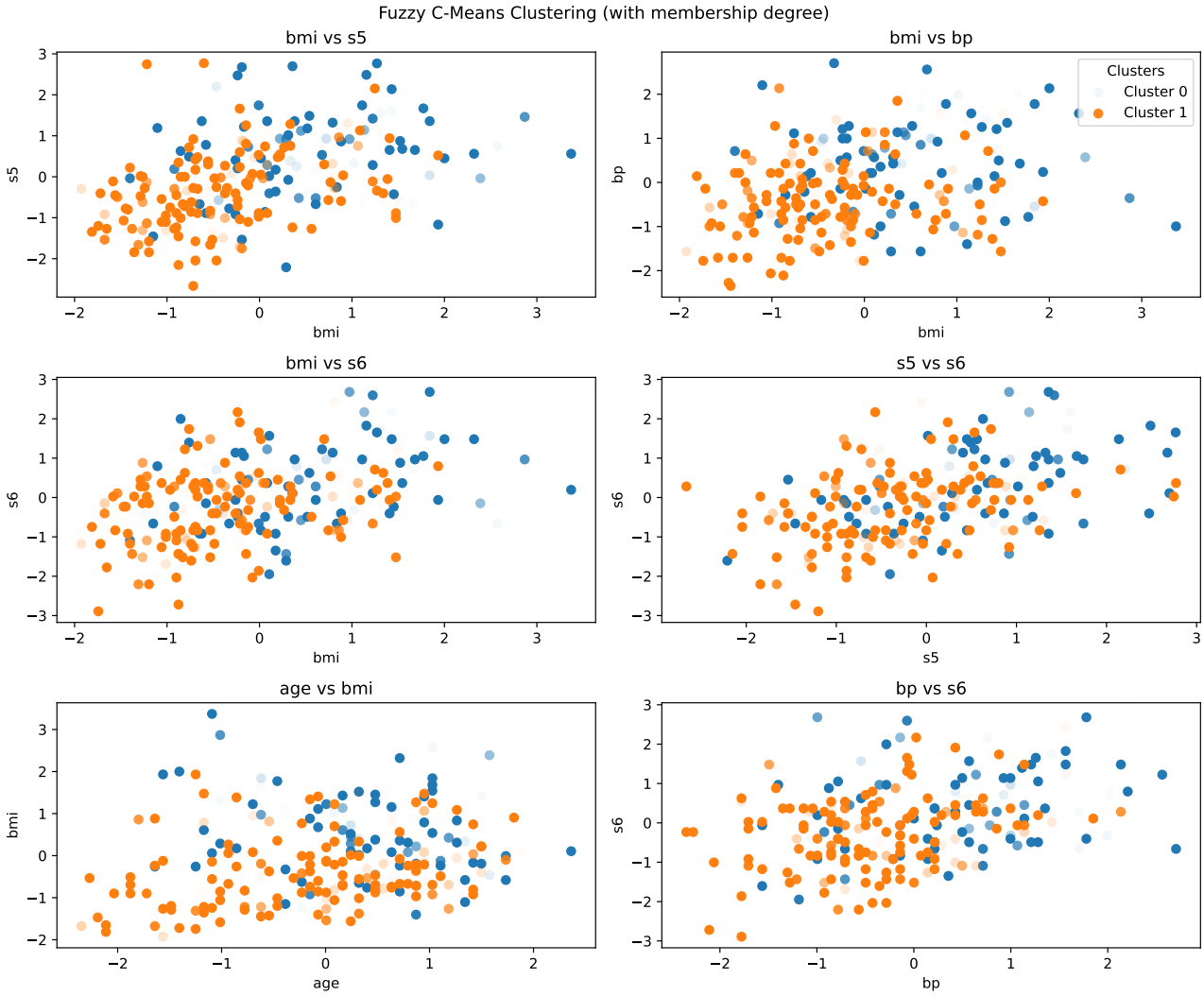

Figure 1: Fuzzy C-Means Clustering (with membership degree)

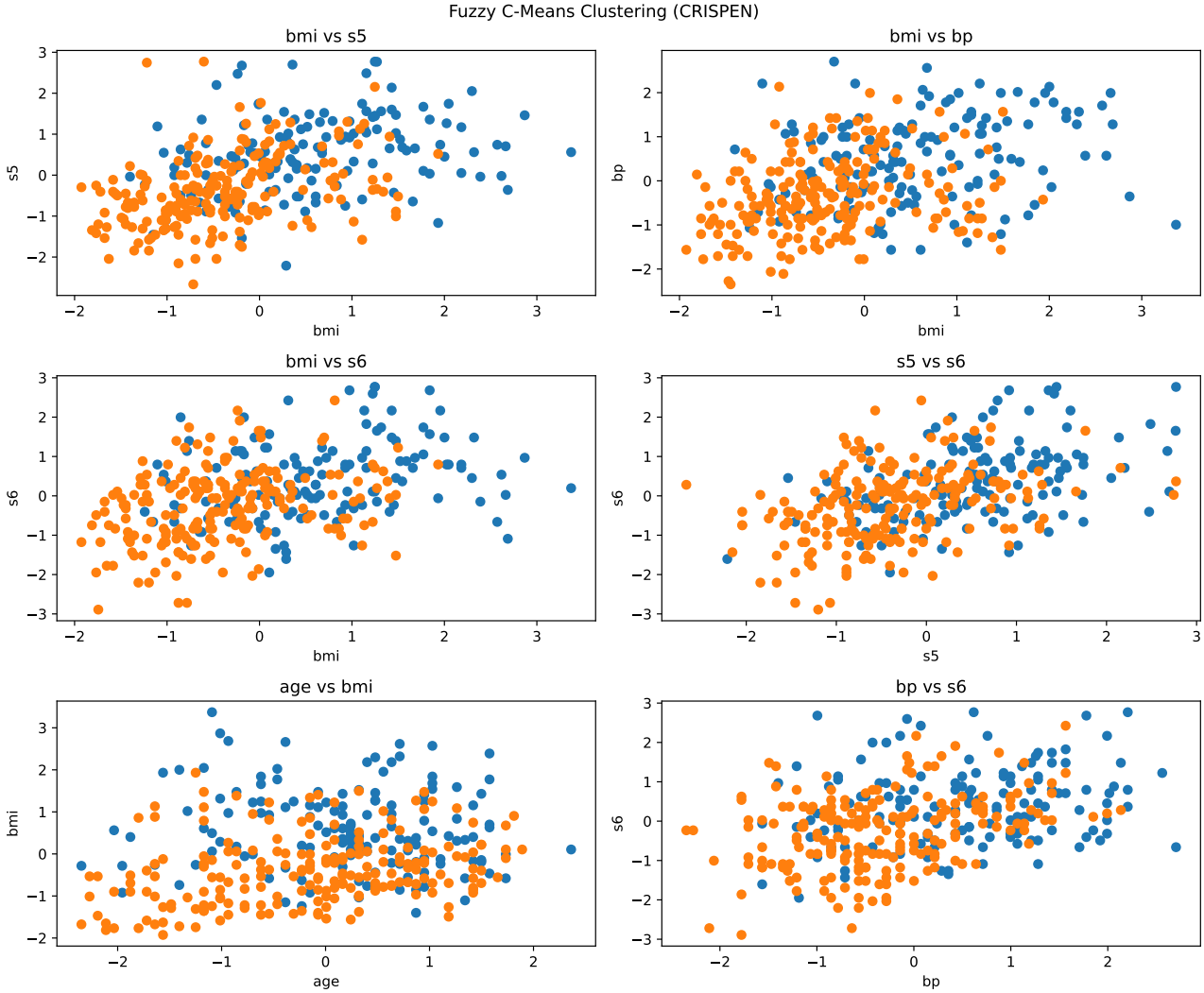

Figure 2: Fuzzy C-Means Clustering (CRISPEN)

2 Dataset 2: Pima Indians Diabetes Dataset (Classification)

Regarding data processing, several things were done to improve the dataset. Firstly the target variable was converted from text strings to binary. The *Skin Thickness* and *Insulin* features lacked many rows of measurements, as such these were discarded. Despite this some measurements had 0 values that were equivalent to impossible, the rows containing these were discarded. the remaining data processing tasks were already implemented. The performance metrics improved after these measures were implemented.

Fuzzy C-Means Clustering was applied with a range of values for the number of clusters of 2 to 10 with an increment of 1 and the fuzziness coefficient was varied between 1.5 and 2.5 with an increment of 0.1. The results were evaluated using the Fuzzy Partition Coefficient (FPC) and culminated in a number of 2 clusters and a fuzziness coefficient of 1.5 achieving a FPC of 0.7231894414858948.

The resulting TSK model achieved an ACC of 0.8.

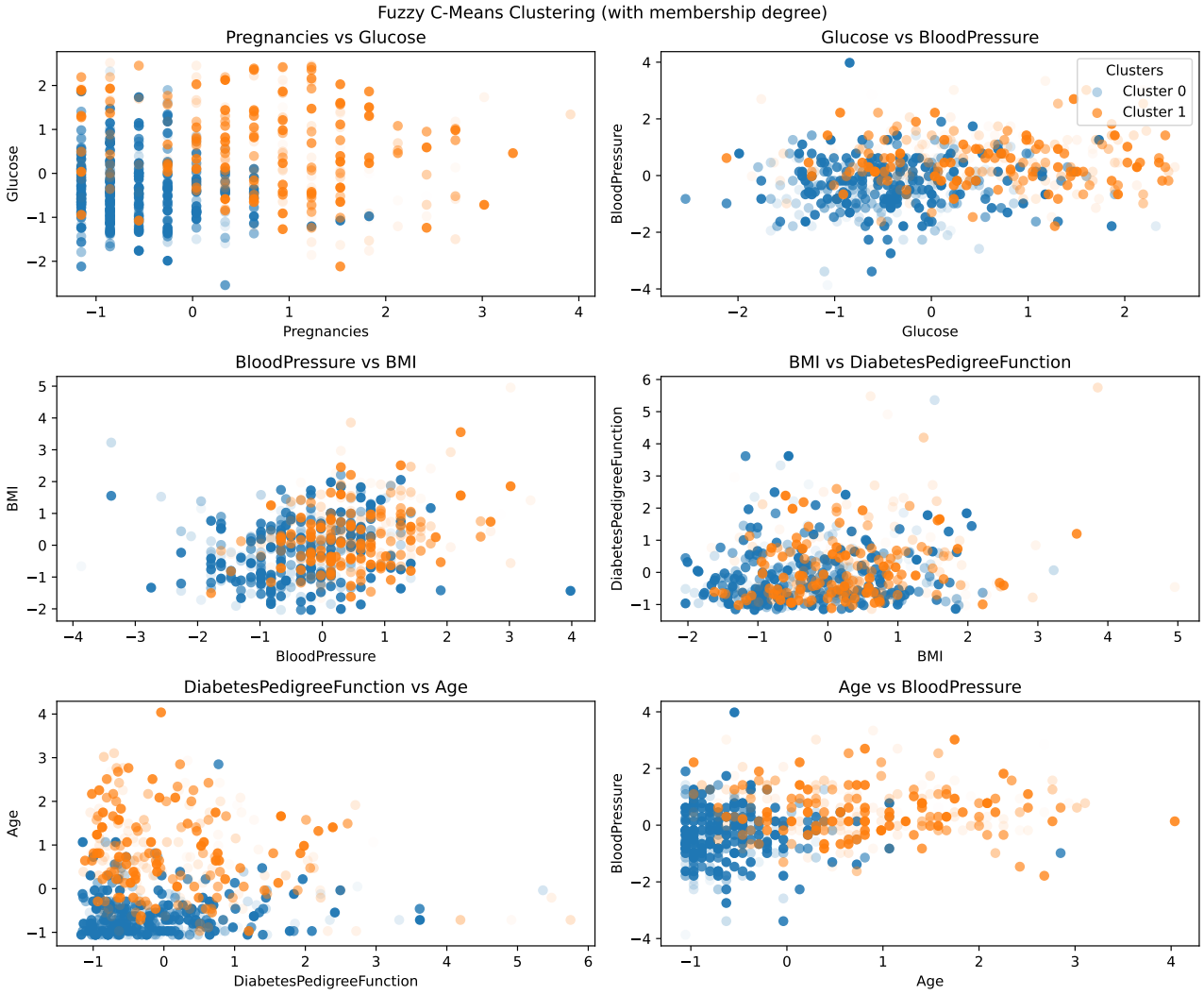

Figure 3: Fuzzy C-Means Clustering (with membership degree)

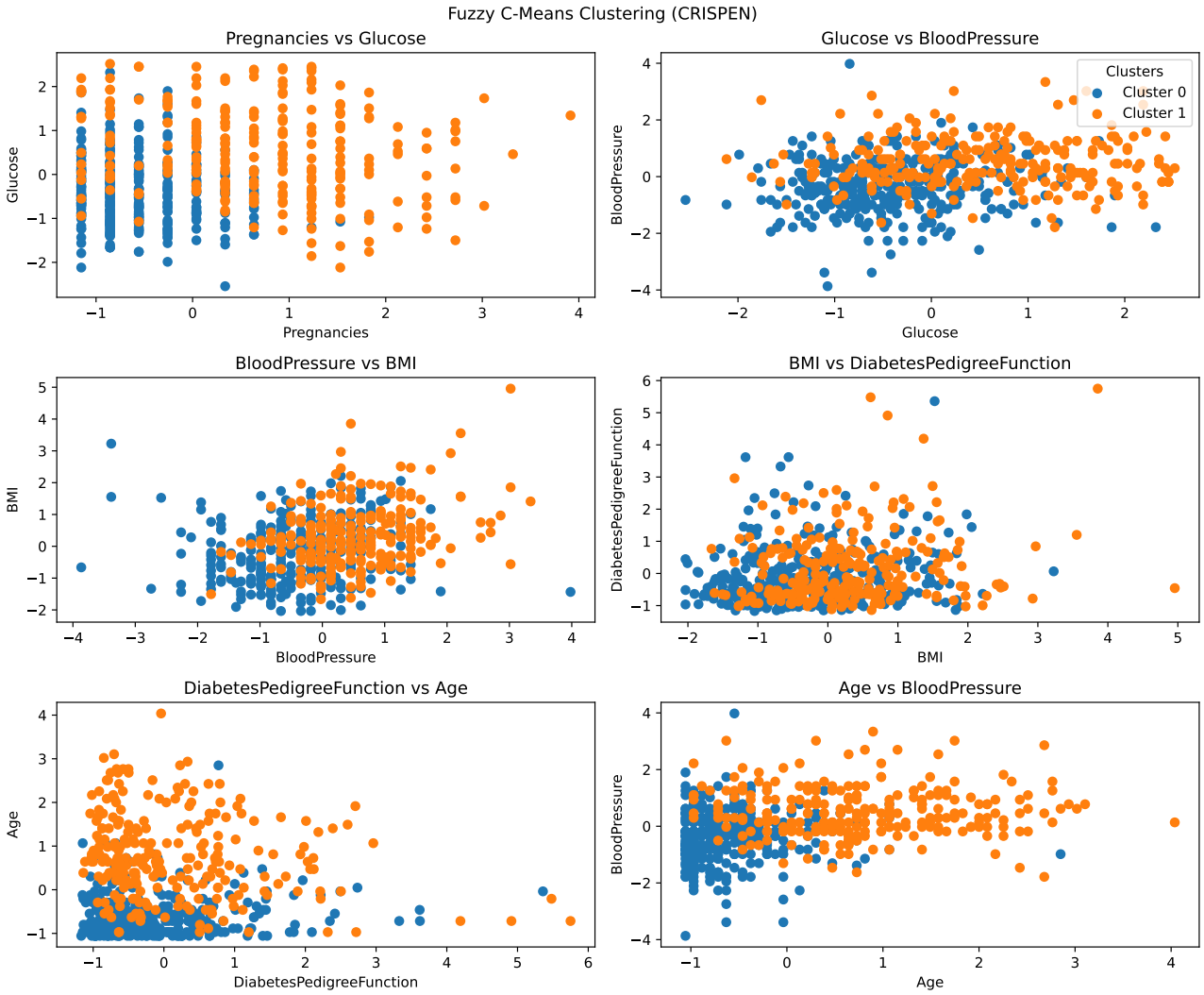

Figure 4: Fuzzy C-Means Clustering (CRISPEN)