Politecnico di Milano
Scuola di Ingegneria Industriale e dell'Informazione
Applied Statistics
January 17th, 2024

Problem 1: Blueland Sharks in the Abyssal Haven

In the remote depths of the North Atlantic and Arctic Oceans, lies an area known as the *Abyssal Haven*, home to the enigmatic *Blueland Shark*, which can live in very deep waters and up to 400 years, due to a very slow growth rate. This region has been subject to various environmental changes, including seismic activities, affecting Blueland Sharks populations. The file `sharks.txt` contains data on 130 individual Blueland Sharks, specifically detailing their lengths and body circumferences (in meters).

a) Conduct a cluster analysis of the Blueland Sharks using a hierarchical clustering method (Euclidean distance and Average linkage). Report the number of clusters you deem appropriate to represent the data, the centroids of the clusters, and their size.

   Additionally, provide a possible interpretation regarding the possible number of seismic events that affected the *Abyssal Haven* in the last four centuries.

b) Calculate Bonferroni intervals at a global significance level of 90% for both the mean and the variances of the body circumferences within each of the clusters identified in (a). Introduce and verify the appropriate assumptions.

Upload your results here: `https://forms.office.com/e/fkGx1qawGw`