Assignment #7: From Principal Components to Factor Analysis (50 points)

Data: The data for this assignment come from the metadata relating to time-use surveys conducted across various countries in the mid 1970s. Along with a few demographic descriptors for the twenty-eight groups, these data represent the average number of minutes spent in a fixed-time observation period of 40 hours. Activities are grouped into ten general categories. We call this study the "time-use case." The original data were presented in 1974 in the French journal *Revue de Statistique Appliquée,* available online at http://www.numdam.org/article/RSA_1976__24_2_45_0.pdf

Assignment Instructions:

In this assignment we summarize the time-use case study data using principal components and factor analysis.

(1) Review Sample Data and Exploratory Data Analysis

- Describe and plot the data for the ten time-use variables. Review scatter plots for pairs of time-use variables.

(2) Principal Component Analysis — Original/Unrotated

- Compute principal components for the time-use variables. Interpret the original principal components.

(3) Principal Components Analysis — Rotated

- Select a subset of two or three principal components and rotate the solution. Interpret the rotated principal components, which might be referred to as principal axes.

(4) Factor Analysis

- Consider alternative renderings of these data through manipulation of the original correlation matrix, such as modifying the diagonal so that it represents common variance rather than total variance.

(5) Model Comparison and Recommendation

- Select the rotated principal components or factor analytic solution that you find easiest to interpret. How does this solution compare with the original principal components solution? Imagine that management is interested in understanding consumer groups for future target marketing. Which solution would you present to management, and why?

Assignment Document:

All assignment reports should conform to the standards and style of the report template provided to you. Results should be presented and discussed in an organized manner with the discussion in close proximity of the results. The report should not contain unnecessary results or information. The document should be submitted in pdf format. Name your file **Assignment7_YourLastName.pdf**

The assignment pdf file and accompanying plain text files for Python programs should be included in a zip archive using standard zip compression with the name **Assignment7_YourLastName.zip**

Here is a reasonable section outline for this assignment report.

Section 1: Review Sample Data and Exploratory Data Analysis

Section 2: Principal Component Analysis — Original/Unrotated

Section 3: Principal Components Analysis — Rotated

Section 4: Factor Analysis

Section 5: Model Comparison and Recommendation