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(Empowered Autonomous)

Programme: MSc. (Statistics)   **Part-1**   **Semester-2**

Practical based on Multivariate Analysis & its application
Factor Analysis

1) The sample correlation matrix is as follows –

$$R = \begin{bmatrix} 1 & 0.676 & 0.875 \\ 0.676 & 1 & 0.699 \\ 0.875 & 0.699 & 1 \end{bmatrix}$$

Obtain 1st & 2nd principal components and find the proportion of variation explained by them. Assuming an $m = 1$ and $m = 2$ factor model, calculate the loading matrix L and matrix of specific variances φ using the principal component method.

2) The correlation matrix for chicken – bone measurements is –

1					
0.505	1				
0.569	0.422	1			
0.602	0.467	0.926	1		
0.621	0.482	0.877	0.874	1	
0.603	0.45	0.878	0.894	0.937	1

   i)   Find the factor loadings by principal component method and maximum likelihood method.
   ii)   Find the specific variances.
   iii) Find the communalities.
   iv)   Find the proportion of variances explained by each factor.
   v)   Find the residual matrix by principal component method and maximum likelihood method and compare it.
   vi)   Find rotated factor loadings using Varimax method.

3) The covariance matrix is as follows $\rho = \begin{bmatrix} 1 & 0.63 & 0.45 \\ 0.63 & 1 & 0.35 \\ 0.45 & 0.35 & 1 \end{bmatrix}$

      i)   Calculate communalities and interpret these quantities.

      ii)   Calculate correlation for i = 1,2,3. Which variable might carry the greatest weight in naming the common factor? Why?

4) Ranks in performance of 16 individuals in test on mathematics, Physics, Literature, Music, Table Tennis and Car Racing are given in following table. Rank 1 means highest performance in the subject.

Individuals	Mathematics	Physics	Literature	Music	Table Tennis	Car Racing
1	1	6	9	8	8	7
2	2	5	11	10	14	11
3	3	3	14	16	16	13
4	4	2	10	9	15	14
5	5	1	12	11	1	1
6	6	4	13	15	2	6
7	7	8	15	14	6	5
8	8	7	16	13	7	16
9	9	9	6	12	9	9
10	10	10	8	7	10	8
11	11	11	7	5	11	10
12	12	13	4	2	13	15
13	13	12	5	6	12	12
14	14	15	1	4	4	3
15	15	14	3	3	5	4
16	16	16	2	1	3	2

      i)   Find the correlation matrix and obtain unrotated factors loadings by principal component method and maximum likelihood method (MLE).

      ii)   Plot Scree plot and extract significant factors.

      iii)   Obtain rotated factor loadings by Varimax method and interpret the result.

      iv)   Obtain factor score.

5) Case Study