

Multivariate Statistics, MSC Exam questions (2017)

1. Definition of the multivariate normal distribution, deriving its probability density function, properties and level surfaces.
2. Deriving the characteristic function of the multivariate normal distribution, and characterization of the multivariate normality via the distribution of the linear combinations of its components.
3. State the multivariate central limit theorem and prove the asymptotic χ^2 distribution of the χ^2 statistic.
4. The definition and application of the Wishart distribution and proof of the multivariate form of the Lukács theorem. Sufficient statistics and Fisher information matrix for multidimensional parameter spaces.
5. Maximum likelihood estimation of the parameters of the multivariate normal distribution based on a sample, the properties of the estimates and the Wishart density.
6. Testing statistical hypotheses for the expectation vector of the multivariate normal distribution in case of known and unknown covariance matrices in one- and two-sample situations.
7. Fisher–Cochran theorem and Analysis of Variance.
8. Principal component and factor analysis.
9. Multivariate regression analysis and the linear model (with deterministic measurement points), Gauss–Markov theorem.

References

- Bolla M., Krámli A., Statisztikai következtetések elmélete, Typotex, Budapest (2005), 5-7. fejezet
- Mardia, K. V., Kent, J. T., Bibby, J. M., Multivariate Analysis, Academic Press, Elsevier Science (1979, 2003)
- Lessons in English on the homepage of the subject (Bolla Marianna).