

# Distributions of quadratic forms

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## Abstract

A well known fact is that when testing hypotheses for covariance matrices, distributions of quadratic forms arise. A generalization of the distribution of the multivariate quadratic form  $XAX'$ , where  $X$  is a  $(p \times n)$  normally distributed matrix and  $A$  is a  $(n \times n)$  symmetric real matrix, is presented. It is shown that the distribution of the quadratic form is the same as the distribution of a weighted sum of noncentral Wishart distributed matrices.

Using this characterization of the distribution several properties of the quadratic form  $XAX'$  will be shown.

## Keywords

Quadratic forms, Latent roots, Latent vectors, Noncentral chi-square distribution, Noncentral Wishart distribution.

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