Two statistical problems for multivariate mixture distributions

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We start by showing that for multivariate mixture of Gaussian or $t$ distributions two such mixtures can be distinguished by projecting them onto a certain predetermined finite set of lines, the number of lines depending only on the total number of Gaussian or $t$-distributions involved and on the ambient dimension. Next we address the following two important statistical problems: that of testing and measuring the agreement between two different random partitions, and that of estimating for mixtures of multivariate normal distributions and mixtures of $t$-distributions based of univariate projections. We also compare our proposal with robust versions of the expectation-maximization method EM. In each case, we present algorithms for effecting the task, and compare them with existing methods by carrying out some simulations.