

Robust Statistical Modeling Using the Skew t-Distributions

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Abstract

In this study we explore the ability of models based on the skew t- and the skew generalized t-distributions to deal with heavy-tailedness, skewness, and multimodality in a wide range of settings. Our strategy is based on the maximum likelihood estimation for a general model with the skew (generalized) t- distributed errors. This strategy is applied to a number of problems, including the simple location and scale estimation of a univariate data set, the location and scatter estimation of a multivariate data set, the regression estimation, and the empirical density estimation.

Lange et al. (1989) state that modeling based on the student t distribution is not the solution for all the robustness problems. They point out that data with shorter-than normal tails, or asymmetric error distributions, varying degrees of long-tailedness among the variables, or extreme outliers are not well modeled by the t distribution. We believe that the extensions and generalizations of the t-distribution (the skew t-distributions, the generalized t-distributions and the skew generalized t-distributions) can provide robust alternatives to the classical distributions (e.g. normal and t-distributions) for statistical modeling of data involving errors with longer than or shorter than normal tails, asymmetric, or even multimodal, and hence can handle some of the problems that pointed out by Lange et al.

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