



A comparative review of generalizations of the extreme value distribution

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The extreme value distribution, also known as the Gumbel distribution, is widely applied for extreme value analysis but has certain drawbacks in practice because it is a non heavy-tailed distribution and is characterized by constant skewness and kurtosis. Our goal is to present a literature review of the distributions that contain the extreme value distribution embedded in them and to identify those that have flexible skewness and kurtosis and those that are heavy-tailed. The generalizations of the extreme value distribution are described and compared using an application to a wind speed data set and Monte Carlo simulations. We show that some distributions suffer from overparameterization and coincide with other generalized Gumbel distributions with a smaller number of parameters, i.e., are non-identifiable. Our study suggests that the generalized extreme value distribution and a mixture of two extreme value distributions should be considered in practical applications.

Keywords: Generalized extreme value distribution; Gumbel distribution; Heavy-tailed distribution; Mixture of extreme value distributions.