# Hyperbolic Power Transformation

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## Abstract

Inspired by the hyperbolic tangent function encoded in the analysis of biological neural network, a new power transformation toward normality is proposed. A novel combination of both power (or shape) and scale parameters is implemented in a product of hyperbolic functions to formulate the four essential types of transformations: concave, convex, concave-to-convex, and convex-to-concave functions. In particular, it enables transforming bimodal mixture distributions toward normality. The form of the hyperbolic power transformation effects accurate maximum likelihood estimation of both power and scale parameters using closed-form solutions to the percentile equations as initial estimates.