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**Nail that Distribution:
Linear Weighted Moments for Identifying the
Form of Reaction Time Distributions Generated by
Perceptual, Cognitive and Decision Tasks**

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Identifying the form of reaction time distributions (gamma, lognormal, ex-Gaussian, normal mixtures etc.) is a hoary, but important problem in mathematical psychology. So far its solution has proved elusive (Luce, 1986). This is because current methods need 1000s of observations per distribution, are prone to statistical 'mimicry' problems (Van Zandt & Ratcliff, 1995), and can only combine data across people and treatments by introducing many additional (improbable) assumptions. Linear weighted moments based parameters (Hosking, 1990) (second linear moment for spread; linear skew for asymmetry; and linear kurtosis for high-tailedness) can overcome these difficulties. Theoretically, the relations among these parameters distinguish among statistical distributions - as with conventional methods. However with linear weighted moment methods sampling variance is low enough to avoid mimicry problems, and sampling bias is low enough to allow combining distributions with minimal (testable) assumptions. The methods are illustrated with data from signal detection, mental arithmetic, sequential keying and visual search.

Hosking, J. R. M. (1990). L-moments: analysis and estimation of distributions using linear combinations of order statistics. *Journal of the Royal Statistical Society, B*, 52, 105-124.

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Van Zandt, T. & Ratcliff, R. (1995). Statistical mimicking of reaction time data: single process models, parameter variability and mixtures. *Psychonomic Bulletin and Review*, 2, 20-51.