Formulas

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Welford's method (modified)

Here we modify Welford's method when data are not added one by one, but in blocks. Let us assume that m_k and S_k are the mean and the (mean-subtracted) sum of squares after adding k blocks of data, based on n observations altogether. Let us assume that the new block has sample size m, mean $\bar{x}_{n+1}$ and sum of sq. s_{n+1}. Then modified Welford's method gives

$$m_{n+1} = m_n + \frac{m}{m+n}\left(\bar{x}_{n+1} - m_n\right)$$
$$S_{n+1} = S_n + s_{n+1} + \frac{mn}{m+n}\left(\bar{x}_{n+1} - m_n\right)^2$$