

Quiz 2

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Prove

$$v = \frac{1}{n-1} \sum_{i=1}^n (x_i - \mu)^2 = \frac{1}{n-1} \left[\sum_{i=1}^n x_i^2 - n\mu^2 \right] \quad (1)$$

Solution:

$$\begin{aligned} v &= \frac{1}{n-1} \sum_{i=1}^n (x_i - \mu)^2 \\ &= \frac{1}{n-1} \left(\sum_{i=1}^n (x_i^2 - 2x_i\mu + \mu^2) \right) \\ &= \frac{1}{n-1} \left(\sum_{i=1}^n x_i^2 - 2\mu \sum_{i=1}^n x_i + n\mu^2 \right) \\ &= \frac{1}{n-1} \left(\sum_{i=1}^n x_i^2 - 2n\mu^2 + n\mu^2 \right) \\ &= \frac{1}{n-1} \left(\sum_{i=1}^n x_i^2 - n\mu^2 \right) \end{aligned}$$

error(va) :0.000000000010231815394945442677

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error(vairiance):0.00000000000000000000000000000000
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The better approximation is

$$v = \frac{1}{n-1} \sum_{i=1}^n (x_i - \mu)^2$$