In CF vectors, the correct formula is

$$R = \sqrt{\frac{1}{N}\sum_{i=1}^{N}(x_i - x_0)^2} \Longrightarrow \sqrt{\frac{SS}{N} - \left(\frac{LS}{N}\right)^2}$$

LS not SS (as in the slides)

Proof

$$R^2 = \underbrace{\frac{1}{N}\sum_{i=1}^{N} x_i^2}_{A} - \underbrace{\frac{2}{N}\sum_{i=1}^{N} x_i x_0}_{B} + \underbrace{\frac{1}{N}\sum_{i=1}^{N} x_0^2}_{C}$$

A: $\frac{1}{N}\sum_{i=1}^{N} X^2 = \frac{1}{N}\cdot SS = \frac{SS}{N}$

B: $\frac{2}{N}\cdot\sum_{i=1}^{N} x_i x_0 = \frac{2}{N}\sum_{i=1}^{N} x_i\cdot\left(\frac{\sum_{i=1}^{N} x_i}{N}\right) = \frac{2}{N^2}\sum_{i=1}^{N} x_i\left(\sum_{i=1}^{N} x_i\right)$

$$= \frac{2}{N^2}\cdot\sum_{i=1}^{N} x_i\cdot\sum_{i=1}^{N} x_i = \frac{2\left(\sum_{i=1}^{N} x_i\right)^2}{N^2} = 2\left(\frac{\sum_{i=1}^{N} x_i}{N}\right)^2$$

C: $\frac{1}{N}\sum_{i=1}^{N} x_0^2 = \frac{1}{N}\sum_{i=1}^{N}\left(\frac{\sum_{i=1}^{N} x_i}{N}\right)^2 = \frac{1}{N^3}\cdot\sum_{i=1}^{N}\left(\sum_{i=1}^{N} x_i\right)^2 =$

$$= \frac{N}{N^3}\cdot\left(\sum x_i\right)^2 = \frac{\left(\sum x_i\right)^2}{N^2} = \left(\frac{\sum x_i}{N}\right)^2$$

$$A - B + C = \frac{SS}{N} - 2\left(\frac{\sum x_i}{N}\right)^2 + \left(\frac{\sum x_i}{N}\right)^2$$

$$= \frac{SS}{N} - \left(\frac{\sum x_i}{N}\right)^2 = \frac{SS}{N} - \left(\frac{LS}{N}\right)^2$$