$$\|x_i - (x_i^T v_i)v_i\|_2^2 = \|x_i\|^2 - 2(x_i^T v_i)^2 + (x_i^T v)^2 \|v_i\|_2^2 \xrightarrow{\|v_i\|_2 = 1} \|x_i\|_2^2 - (x_i^T v_i)^2$$

$\xrightarrow{\text{با توجه به}}$
$L(v_i; z)$ در

$$L(v_i; z) = \frac{1}{n} \sum_{i=1}^{n} (\|x_i\|_2^2 - (x_i^T v_i)^2) = \frac{1}{n} \sum_{i=1}^{n} \|x_i\|_2^2 - \frac{1}{n} \sum_{i=1}^{n} (x_i^T v_i)^2$$

$$\longrightarrow \frac{1}{n} \sum_{i=1}^{n} \|x_i\|_2^2 \quad \text{یک مقدار ثابت است} = K$$

$$L(v_i; z) = K - \frac{1}{n} \sum_{i=1}^{n} (x_i^T v_i)^2$$

$$\text{Var}(\{x_i^T v_i\}_i) = \frac{1}{n} \sum_{i=1}^{n} (x_i^T v_i)^2 - \left(\frac{1}{n} \sum_{i=1}^{n} x_i^T v_i\right)^2 \longrightarrow \quad \text{از میانگین نرمال بین صفر می‌باشد}$$

$$\text{Var}(\{x_i^T v_i\}_i) = \frac{1}{n} \sum_{i=1}^{n} (x_i^T v_i)^2$$

$$\longrightarrow \quad \text{جایگذاری} \quad L(v_i; z) = K - \text{Var}(\{x_i^T v_i\}_i)$$
در معادله