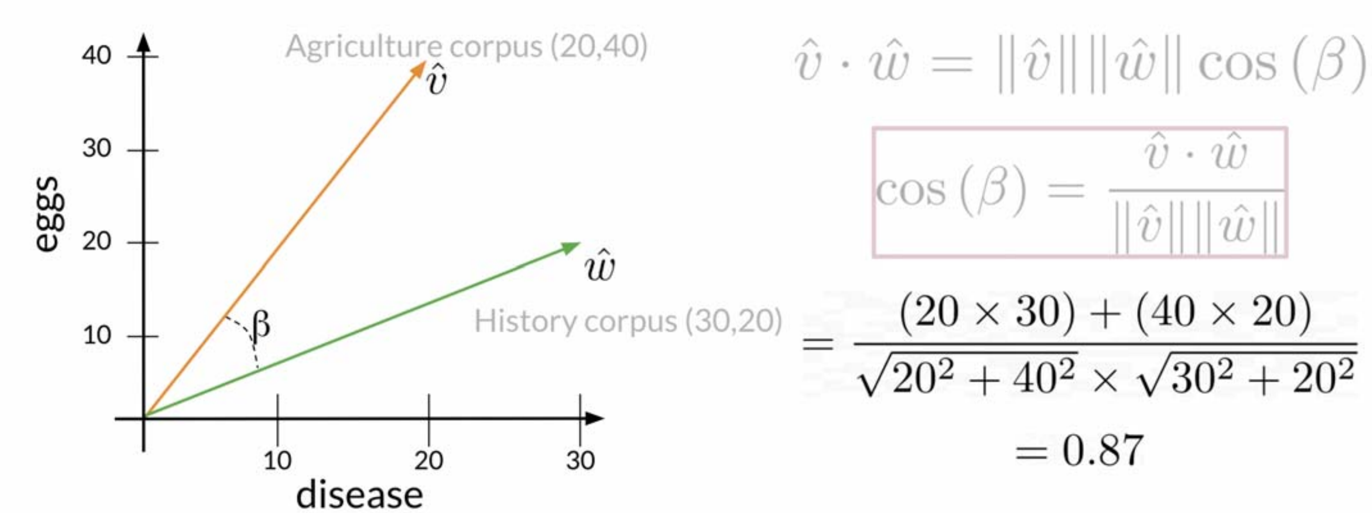
# Cosine Similarity

Before getting into the cosine similarity function remember that the **norm** of a vector is defined as:

$$\|\vec{v}\| = \sqrt{\sum_{i=1}^{n} |v_i|^2}$$

The **dot product** is then defined as:

$$\vec{v} \cdot \vec{w} = \sum_{i=1}^{n} v_i \cdot w_i$$




The following cosine similarity equation makes sense:

$$\cos(\beta) = \frac{\hat{v} \cdot \hat{w}}{\|\hat{v}\| \|\hat{w}\|}$$

If $\hat{v}$ and $\hat{w}$ are the same then you get the numerator to be equal to the denominator. Hence $\beta = 0$. On the other hand, the dot product of two orthogonal (perpendicular) vectors is $0$. That takes place when $\beta = 90$.