Discrete Fourier Transform

$$X_k = \sum_{n=0}^{N-1} x_n \cdot e^{-\frac{i \cdot 2\pi}{N} \cdot kn}$$

$$= \sum_{n=0}^{N-1} x_n \cdot \left[\cos\left(\frac{2\pi}{N} kn\right) - i \cdot \sin\left(\frac{2\pi}{N} kn\right) \right]$$

x_n is the signal

$\frac{2\pi . i}{N}$ is each of the frequencies

X_k is the weight of each frequency

Singular Value Decomposition

$$M = U \Sigma V^T$$

U is a matrix whose columns represent the eigenvectors of $M^T M$.

Σ is a diagonal matrix of the singular values (square-root of eigen values)

V is a matrix whose columns are the eigenvectors of $M M^T$

$$\omega = U^T M$$

U is the matrix that represents the weights for a linear combination in the eigenvector space.

$$\delta_k = \| \omega_{test_k} - \omega_{train_k} \|^2$$

δ_k is the Euclidean distance for a single sample.
ω_{test} is the weights of the test image set
ω_{train} is the weights of the train image set