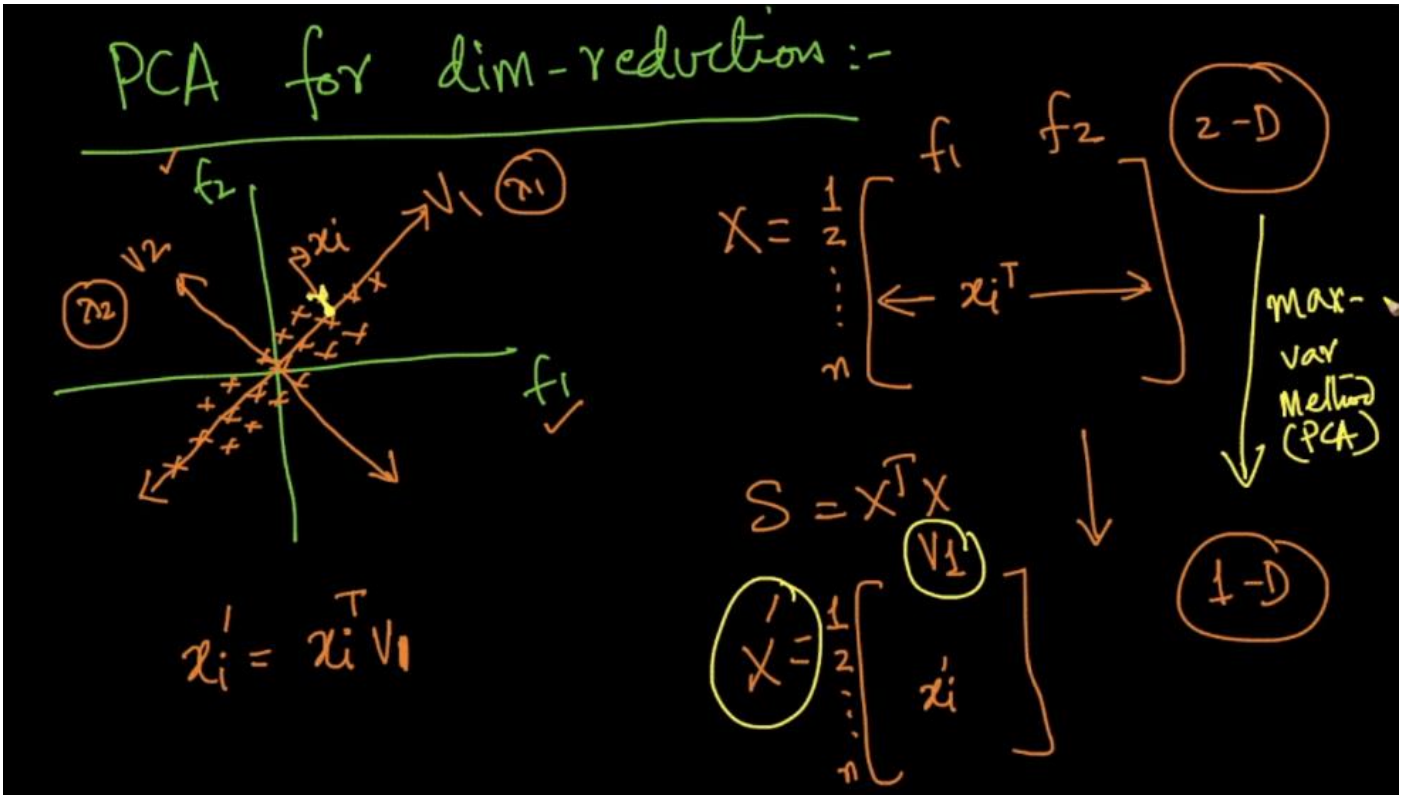
How we use PCA for dimensionality reduction:

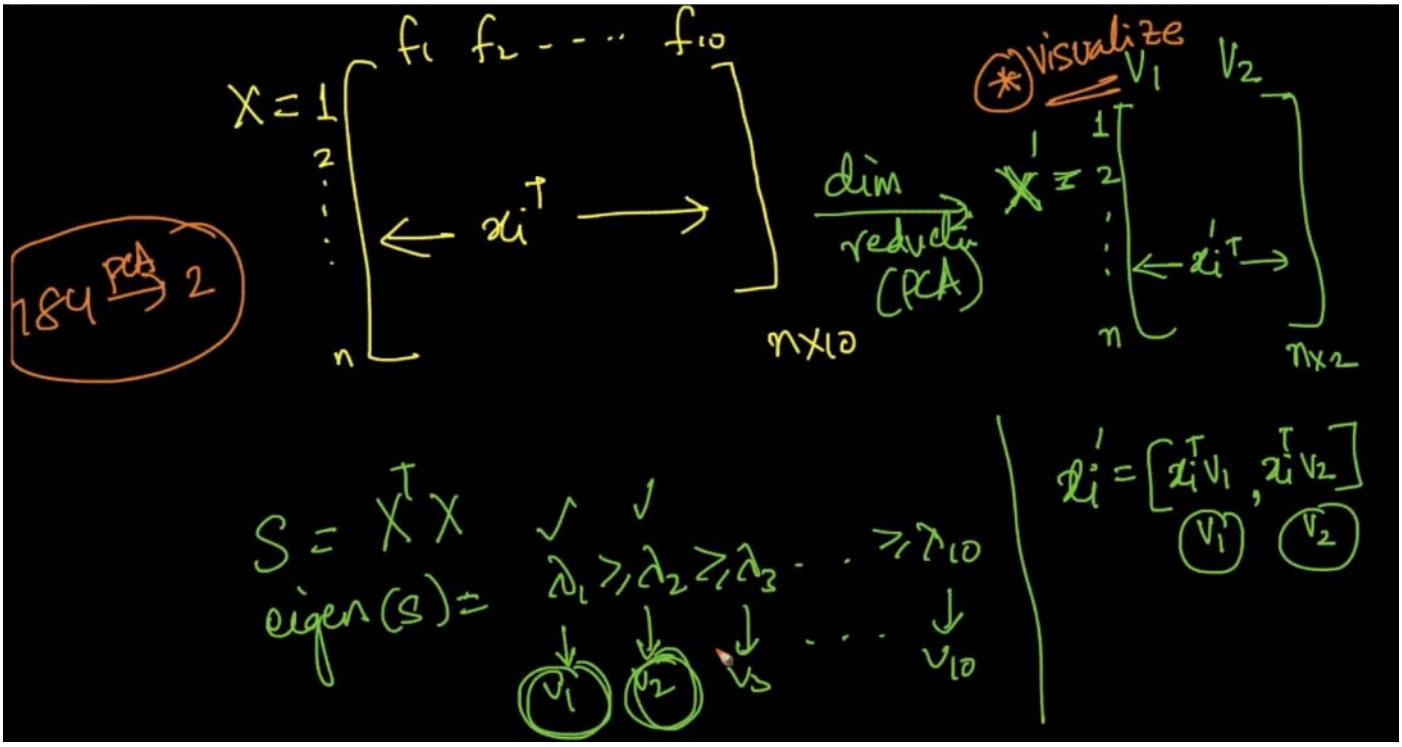
Since earlier we see that eigen vector (V_1) is the dimension at which we have maximum variance among all.

So for dimensionality reduction of 2-D into 1-D we will just project each x_i on V_1(eigen vector) to obtain new feature x_i' which is dot product of transpose of x_i and V_1 ie:

$x_i' = x_i^T . V_1$

Why we are picking V_1, because it has maximum variance.



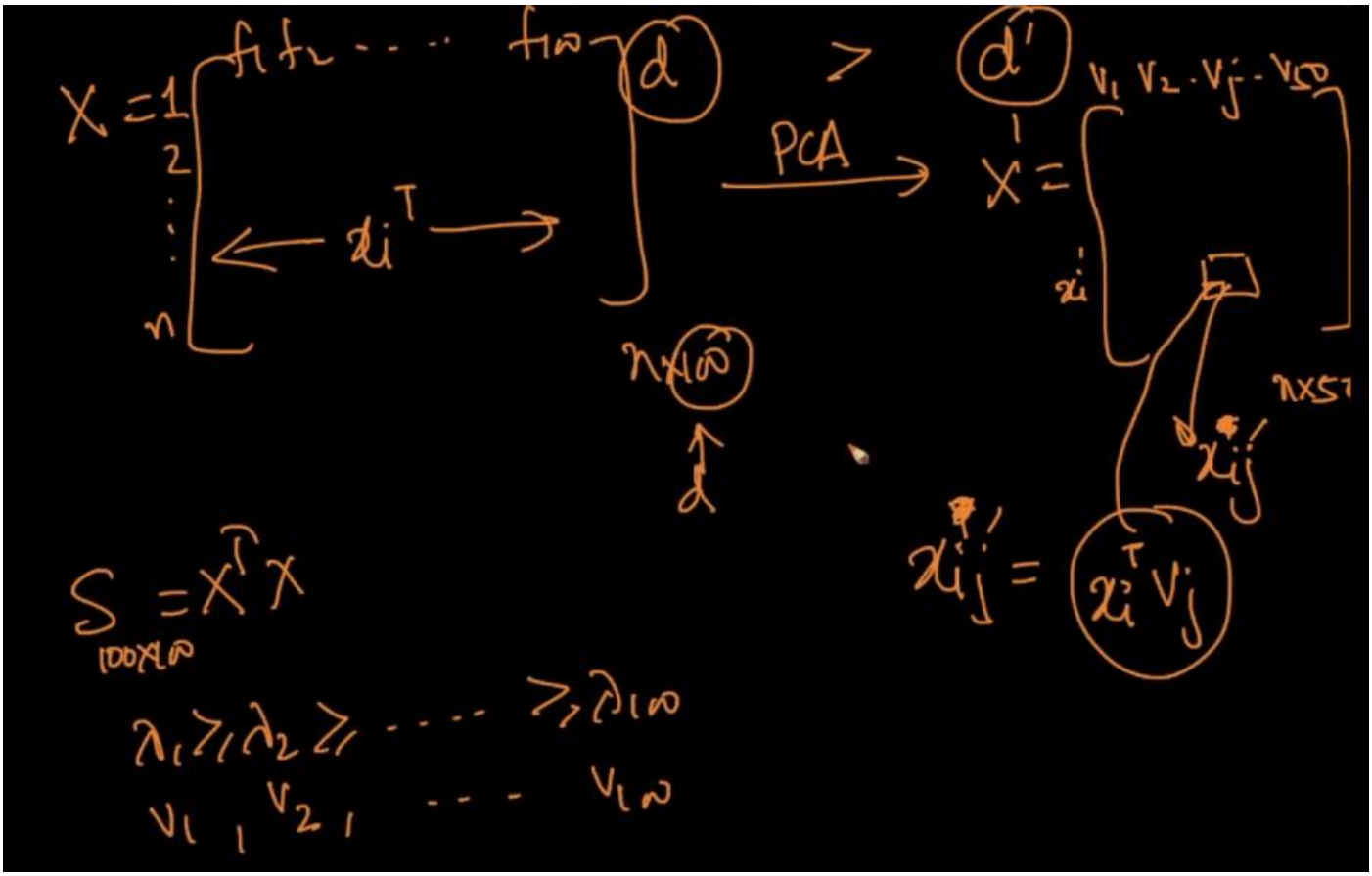


Now what if we have 100 D and want to convert it into 50 dimensions.

As for 2D to 1D we took V_1, therefore for 100D to 50D, we will take $V_1, V_2, \ldots\ldots\ldots, V_{50}$.

So any particular element in new data-matrix let's say at i^{th} row and j^{th} column will be

$X_{ij}' = x_i^T.V_j$ as it's result is scalar.



we can also perform dimensionality reduction in a way as suppose we want 99% of the preservence of variance, now whether it will achieve with 50 V or 60 V, will choose that number of eigen vectors, who will preserve 99% of the variance.