

- Dimensionality Reduction Technique.
- Higher dimensional space to a lower dimensional space.

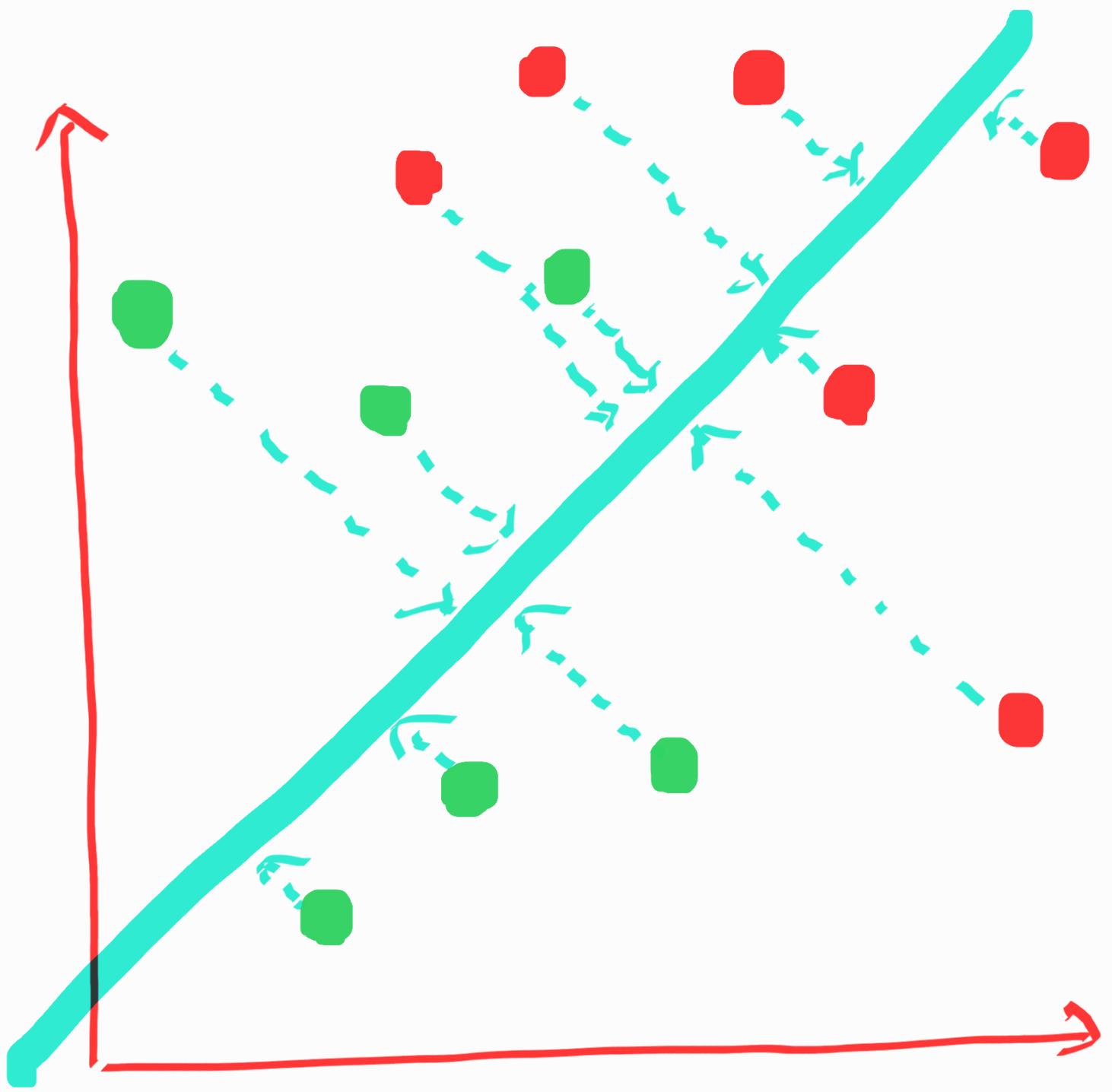
### Advantages

- Obtain critical features from the data
- For visualization of dataset.

- Computational efficiency when the data is large.

## Aim

- Minimize the Inter-Class Variability.
  - Finding all similar points in a class.
  - ensures less no of misclassifications.
- Maximize Distance between the Mean of Clans
  - To ensure high confidence during prediction.
- Reducing maximum no of dimension while keeping maximum information.



- Projects the data onto this new axis in a way to minimize the separation of two categories.

- Fisher's discriminant is used as a scoring matrix.

Fisher Score  $P(x) =$

$\frac{(\text{difference of means})^2}{\text{sum of variances}}$

Sum of variances

- Maximizing Fisher's Score

→ Maximizing the distance

between means and minimizing the inter-class variability.

- Eigen vectors and Eigen values are calculated.
- Fischer's score is used to reduce the dimensions of

Input data -

- Fischer's score is computed using covariance matrices.
- Eigen vectors of covariance matrix of variables are used to construct the discriminant

functions -

- Eigen values provide a measure of variance explained by each discriminant function.
- Eigen vectors corresponding to the largest eigen values are chosen as the direction in which the data vary the most.
- These directions are used to project the data onto to a

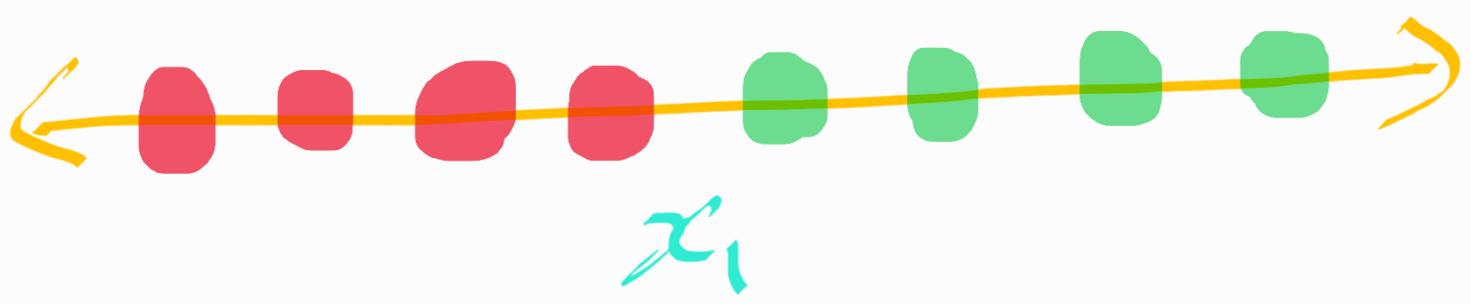
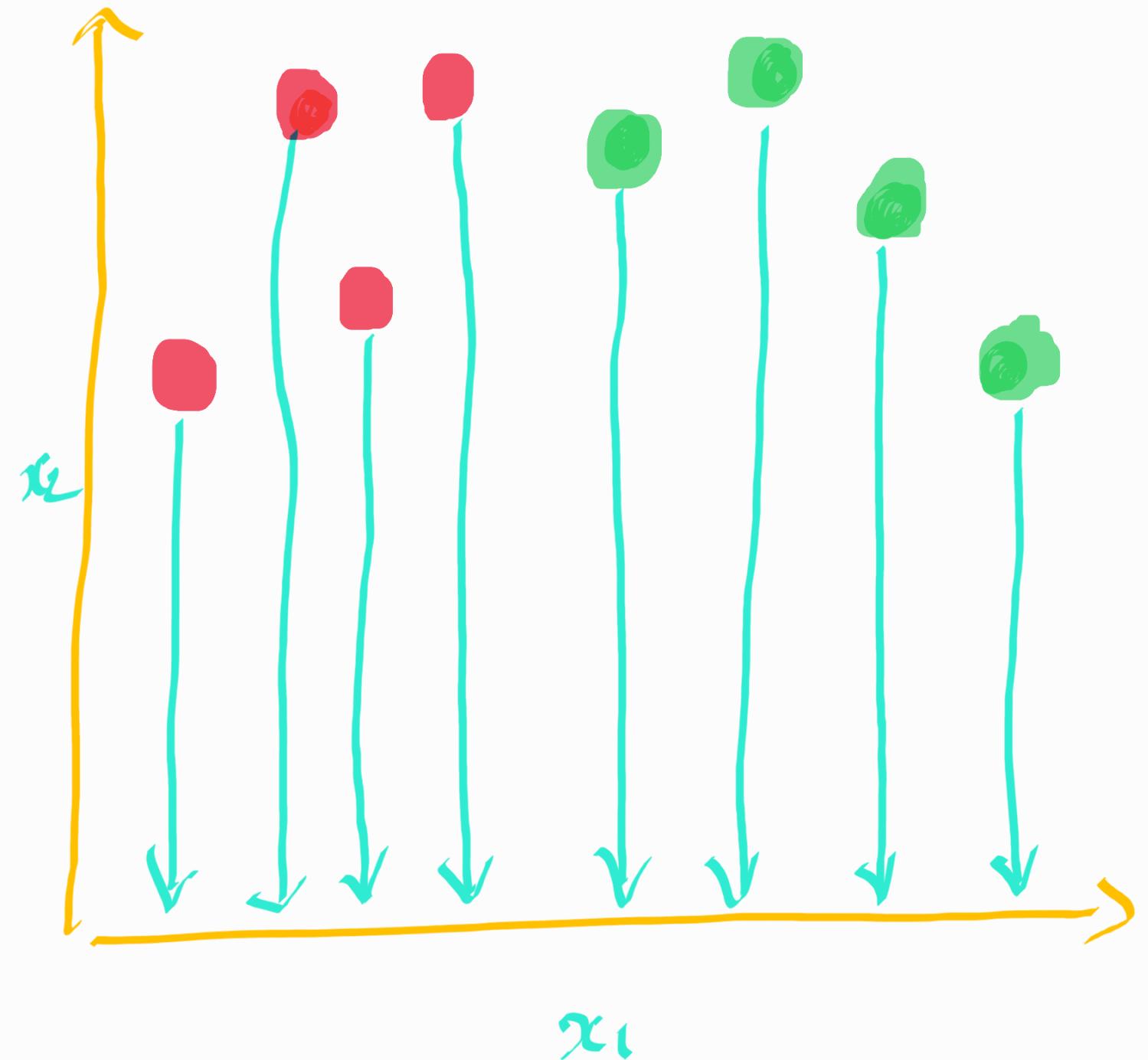
lower dimension al Subspace -

Such that between - group

Variance is maximized and

within group variance minimized -

- If we want to reduce the dimension to 1.
  - project every thing to x axis.



- This approach removes the important features. Thus LDA is used.

### Steps in LDA

- 1) finding within class and between class scatter matrices
- 2) finding eigen vectors and corresponding eigen values for scatter matrices
- 3) Sort the eigen values

in descending order and selecting top k

- 4) Create a new matrix containing eigen vectors that map to the k eigen values.
- 5) New features (LDA components) by taking dot product of the data and matrix C<sub>newly</sub> (Created matrix).

- Nelson Joseph