

## **Experiment: Principal Component Analysis (PCA) vs Linear Discriminant Analysis (LDA) vs T-distributed Stochastic Neighbor Embedding (t-SNE)**

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### **Title:**

**Implementation of Linear Discriminant Analysis and Principal Component Analysis and T-distributed Stochastic Neighbor Embedding (t-SNE)**

### **Aim:**

**Comparing the results of PCA with LDA and t-SNE for better suitability**

### **Objective:**

Students will learn:

- The implementation of the principal component analysis and Linear Discriminant analysis and T-distributed stochastic neighbor embedding on a dataset.
  - Visualization and interpretation of results.
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## **Problem Statement**

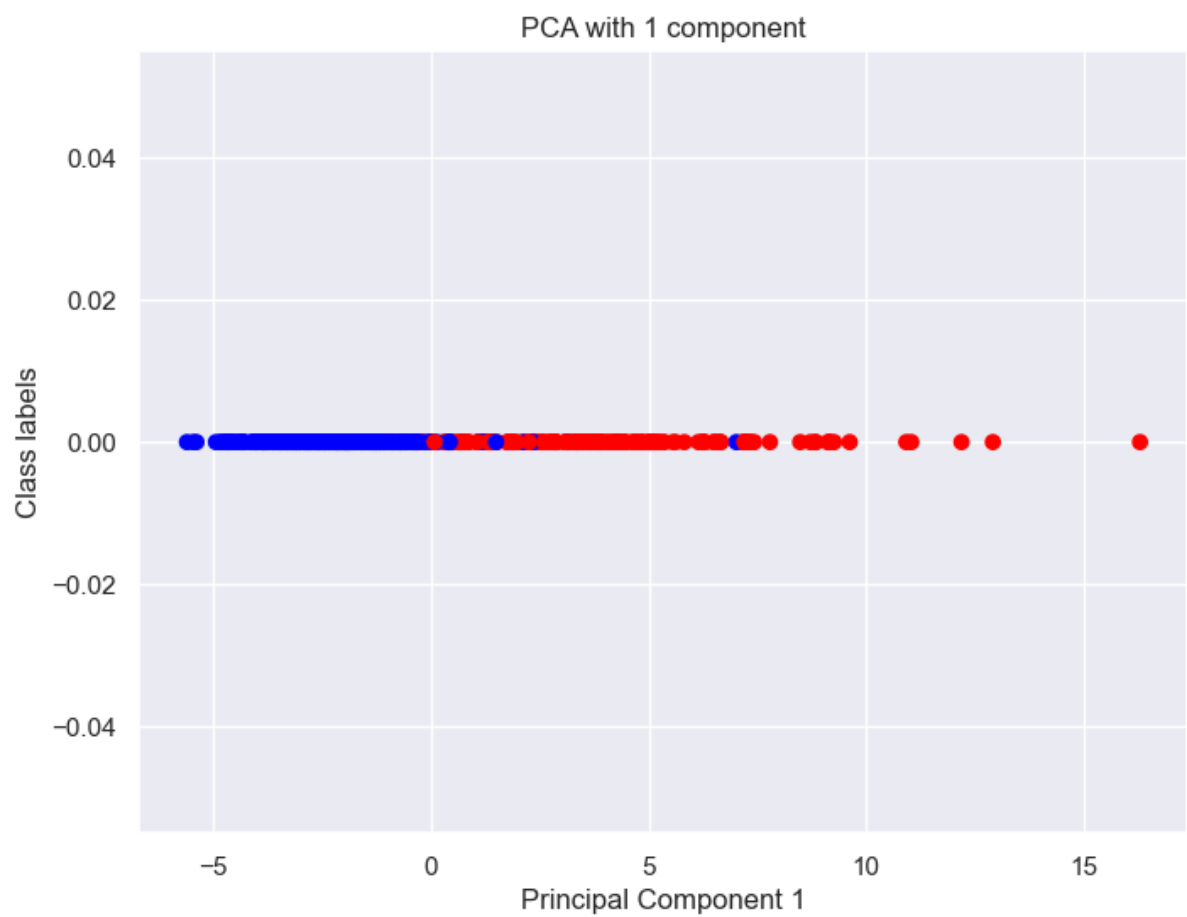
APPLY AND IMPLEMENT T-SNE ALGORITHM ON A SPECIFIC DATASET OF YOUR CHOICE AND COMPARE THE OUTCOMES WITH PCA AND LDA FOR THE SAME

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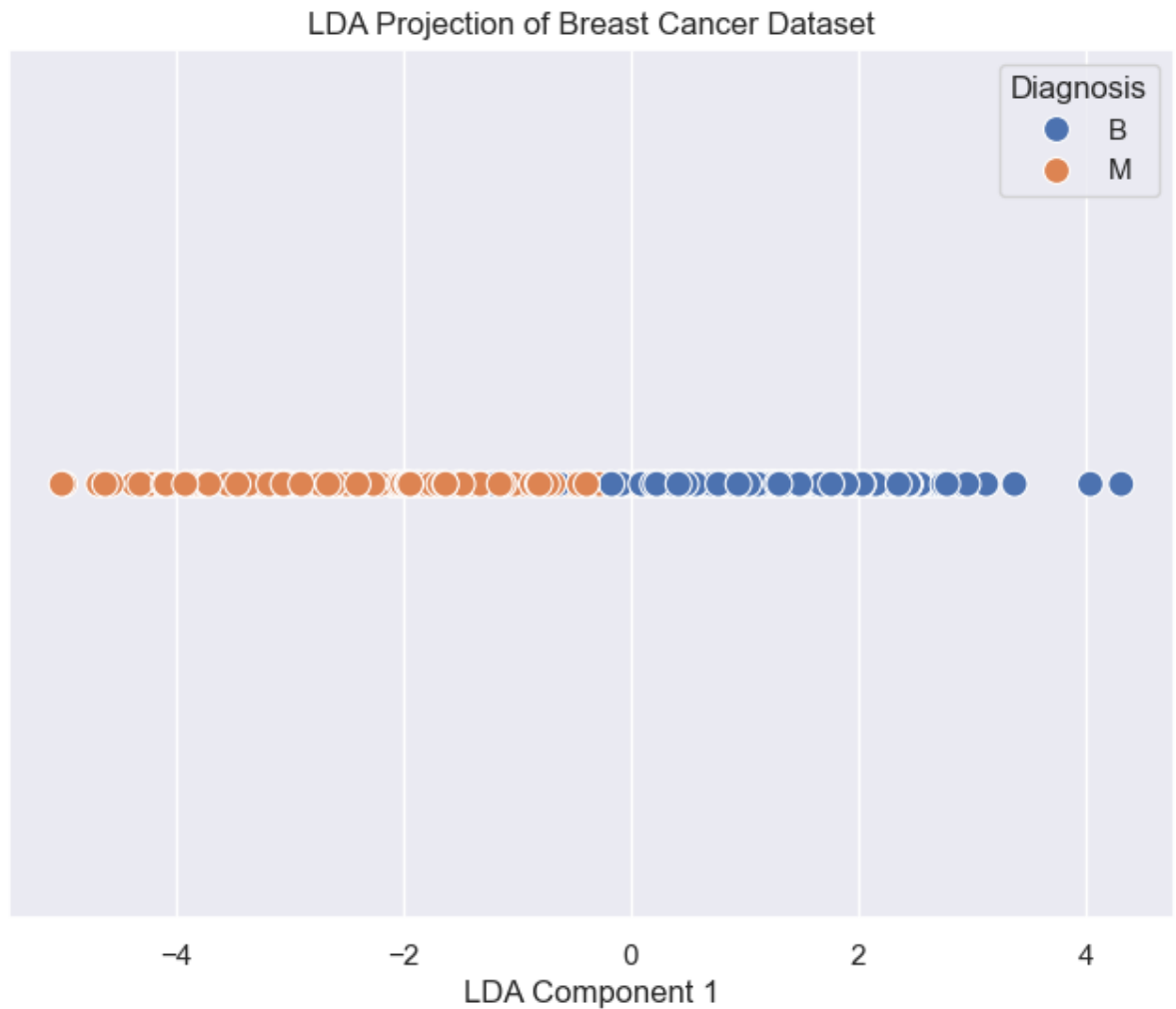
## **Explanation / Stepwise Procedure / Algorithm**

### **1. Figures/Diagrams**

- LDA and PCA and t-SNE plots plotted for the dataset.
- Comparison between LDA and PCA and t-SNE.







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## Challenges Encountered

1. T-SNE needs careful selection of parameters like perplexity and learning rate for good results, or else the outcome may not be accurate.
2. T-SNE can be slow and expensive for large datasets, making it challenging to apply to big data and get quick results.
3. Unlike PCA, which preserves global structure, T-SNE focuses on local structure, making it harder to understand the results, especially for complex high-dimensional data.
4. Comparing T-SNE with LDA can be challenging because LDA is a supervised method that relies on class labels, whereas T-SNE is unsupervised, making it difficult to evaluate their performance on the same dataset.

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## Conclusion

- In conclusion, T-SNE is a powerful tool for dimensionality reduction, but it requires careful parameter selection and can be slow for large datasets.

- Unlike PCA, which preserves global structure, T-SNE focuses on local structure, providing a unique perspective on the data.
- While LDA is a supervised method that excels in certain tasks, T-SNE's unsupervised nature makes it a valuable addition to any data analyst's toolkit.
- Ultimately, the choice between T-SNE, PCA, and LDA depends on the specific needs of the project and the characteristics of the data.