

## Comparative Analysis of Principal Component Analysis over Uniform Manifold Approximation and Projection Algorithm in Predicting the Indian National Satellite System (INSAT) - Enhanced Celestial Clouds.

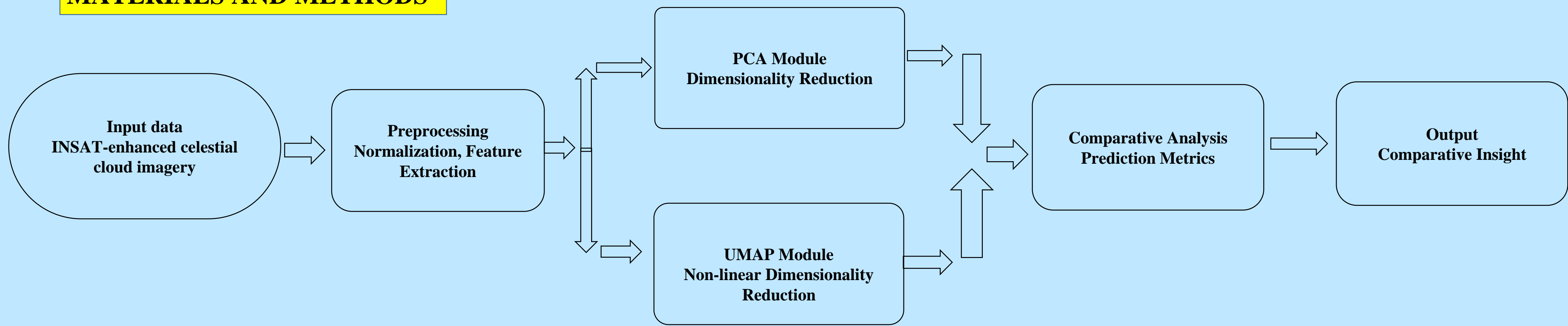
### INTRODUCTION

- To compare Principal Component Analysis (PCA) with Uniform Manifold Approximation and Projection (UMAP) in predicting INSAT-enhanced celestial clouds, aiming for enhanced prediction accuracy and understanding algorithmic efficacy.
- Overview of dimension reduction techniques, such as PCA and UMAP, and their roles in data preprocessing for cloud prediction models.
- Significance of comparative analysis between PCA and UMAP algorithms in determining the more effective approach for INSAT cloud prediction.
- Brief explanation of the evaluation metrics used to assess the performance of PCA and UMAP in this study.
- The study utilizes INSAT-enhanced celestial cloud imagery as the primary dataset, facilitating comparative analysis between PCA and UMAP in reduction of cloud images and behaviors captured by INSAT satellites.



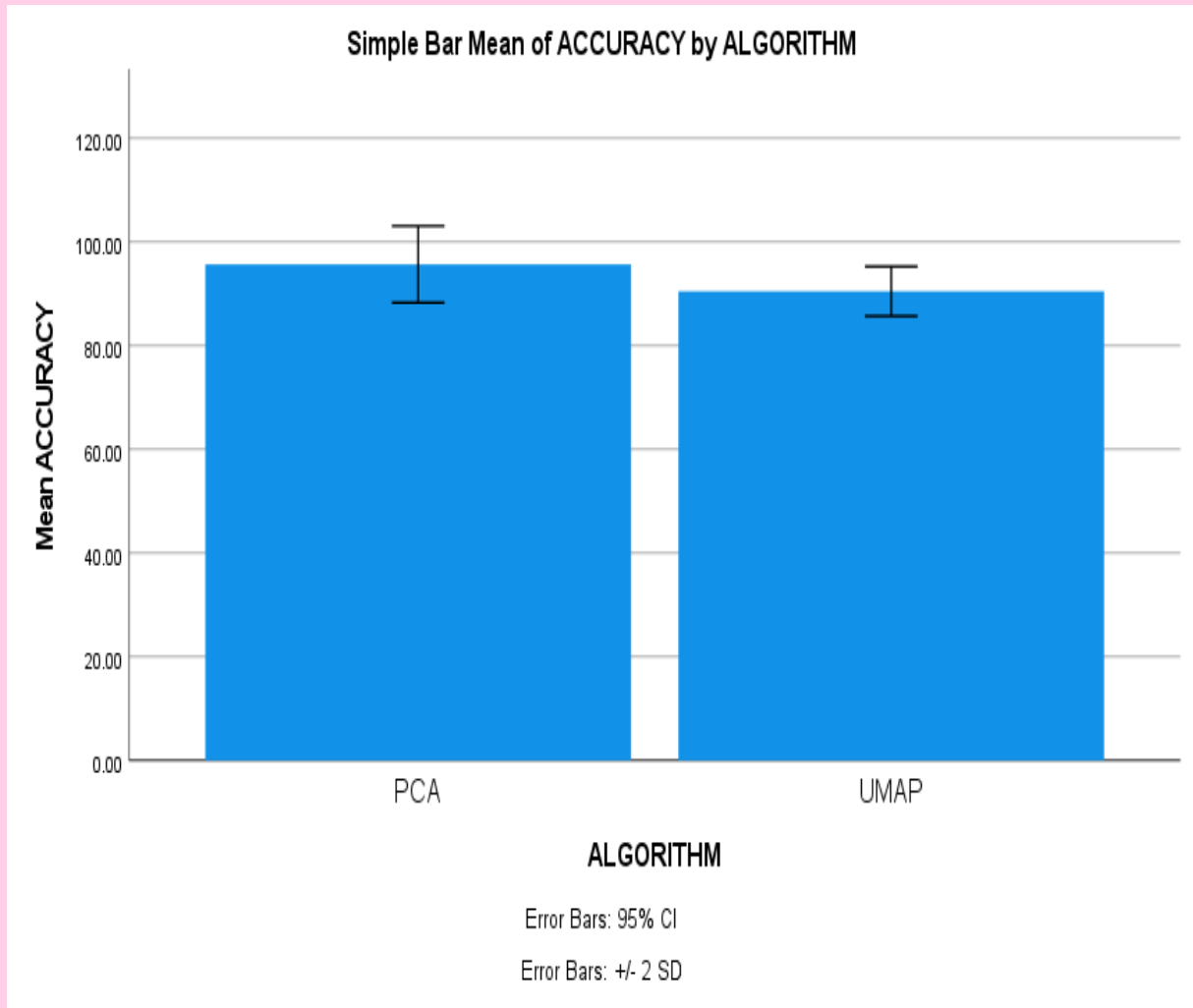
Cloud image captured by INSAT

### MATERIALS AND METHODS

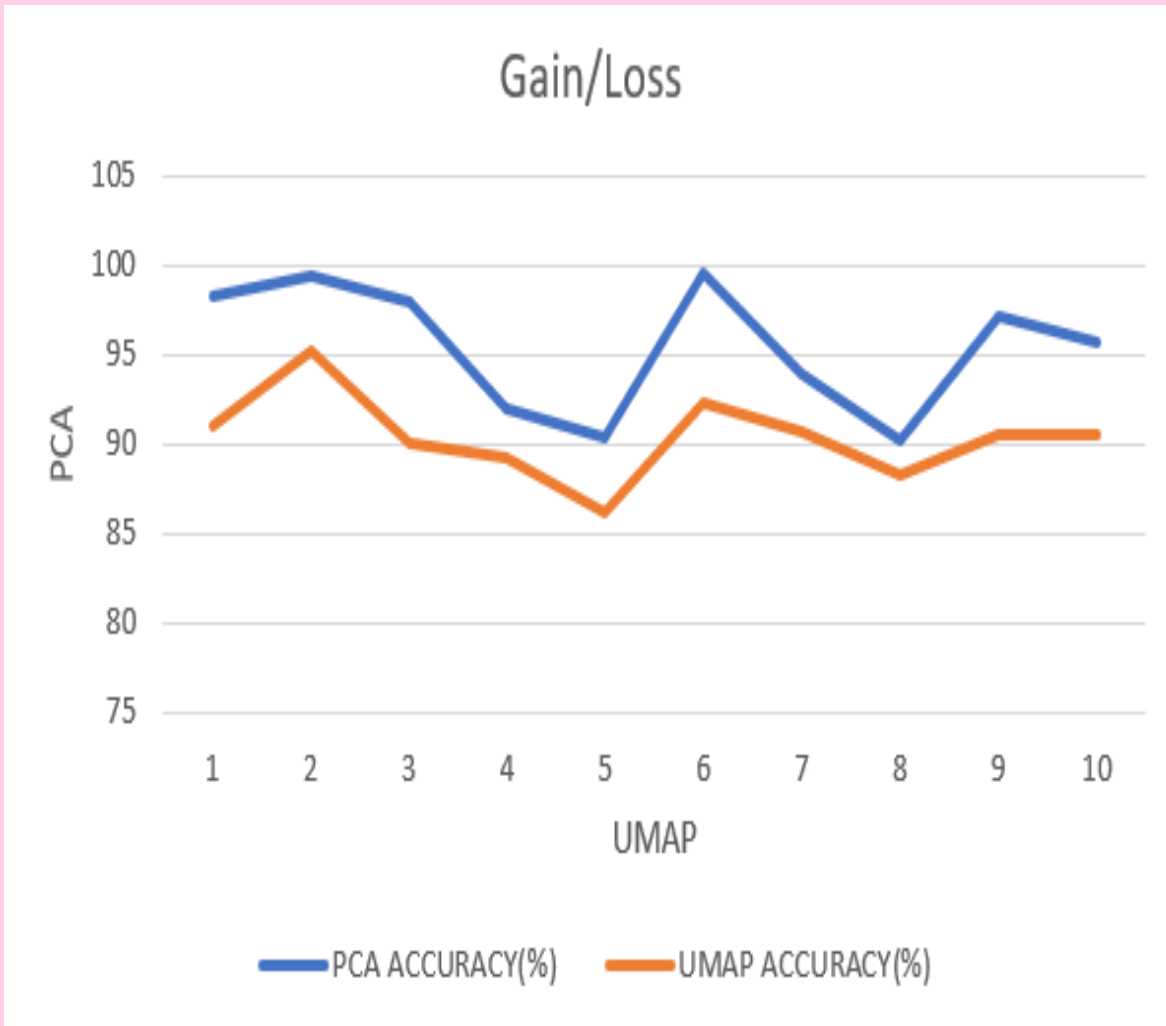


### RESULTS

- Principal component analysis (PCA) and the Uniform Manifold Approximation and Projection approach (UMAP) are examined in this work. The results show that PCA, the suggested approach, provides greater than accuracy (95.68%) than UMAP (90.48%).
- The principal component analysis Algorithm and the uniform manifold approximation and projection algorithm have the values of the Mean accuracy, Standard Deviation, and Standard Error .



PCA and UMAP



Gain and Loss of PCA and UMAP

### DISCUSSION AND CONCLUSION

- According to the investigation findings, the Principal Component Analysis outshone the Consistent of Uniform Manifold Approximation and Projection algorithm with elevated precision of 95.68%.
- Based on the independent sample t-test, with the total sample size of 450, the significance value  $p=0.016$  ( $p<0.05$ ) exhibits that there is noteworthy disparity in the algorithms.
- The accuracy of the Principal Component Analysis (PCA) Algorithm is 95.68% significantly superior to the other algorithm.
- Through this exploration, it is deduced that Principal Component Analysis (PCA) algorithm has elevated precision comparing with Uniform Manifold Approximation and Projection algorithm for compelling examination on dimension decrease.
- PCA and UMAP have the potential to be made much more useful in image dimensionality reduction applications through additional research and development.

### BIBLIOGRAPHY

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