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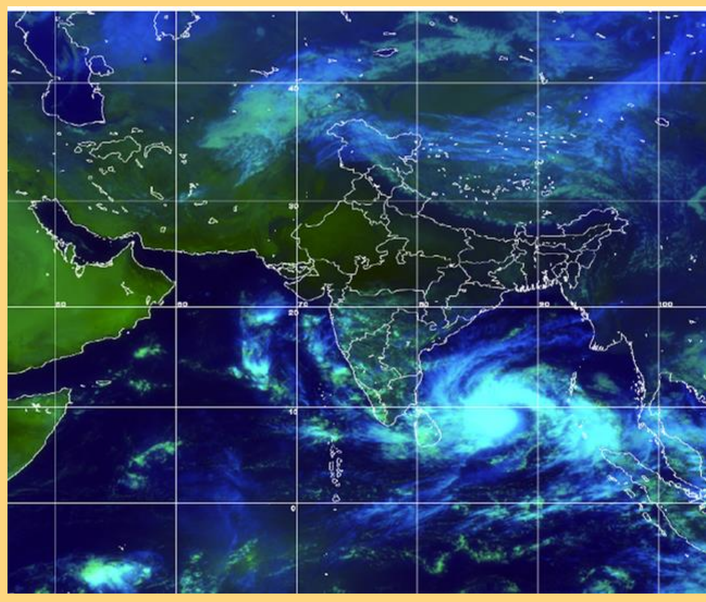
Efficient Prediction of Stargazing the Indian National Satellite System (INSAT) Way Using Principal Component Analysis Algorithm 0ver t-Distributed Stochastic Neighbor Embedding System.

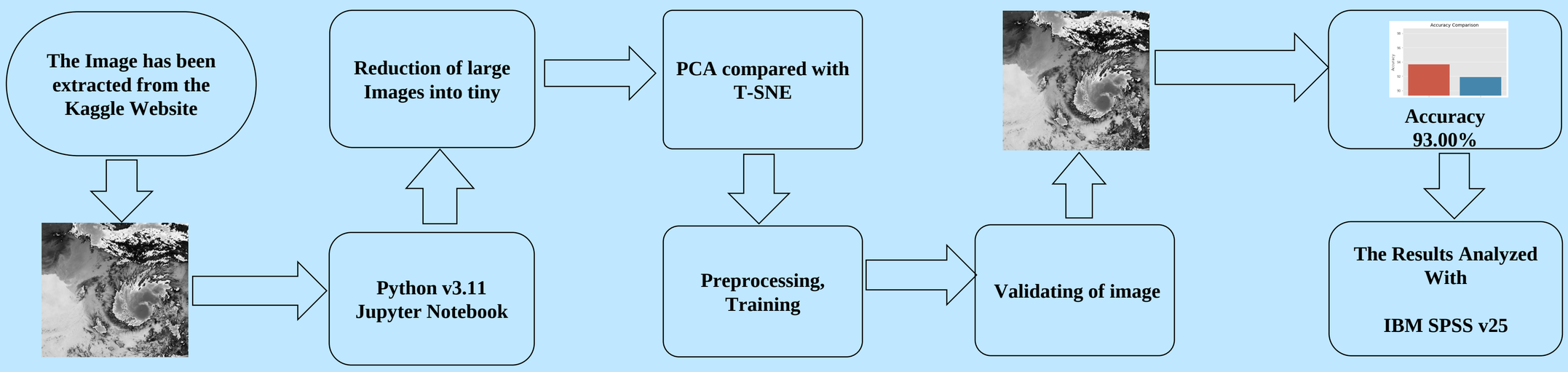
INTRODUCTION

- Enhance stargazing prediction efficiency utilizing Principal Component Analysis (PCA) over t-Distributed Stochastic Neighbor Embedding (t-SNE) within the framework of the Indian National Satellite System (INSAT).
- Through PCA, we identify key components within downsized INSAT images, refining prediction accuracy while minimizing computational overhead.
- Integrating t-SNE allows for detailed spatial visualization despite reduced INSAT image sizes, offering profound insights into celestial phenomena.
- PCA reduces data dimensions while preserving essential stargazing features; t-SNE provides detailed spatial visualization, crucial for interpreting celestial phenomena accurately.
- INSAT satellite imagery, capturing celestial scenes, serves as the primary dataset for training and testing the prediction model.



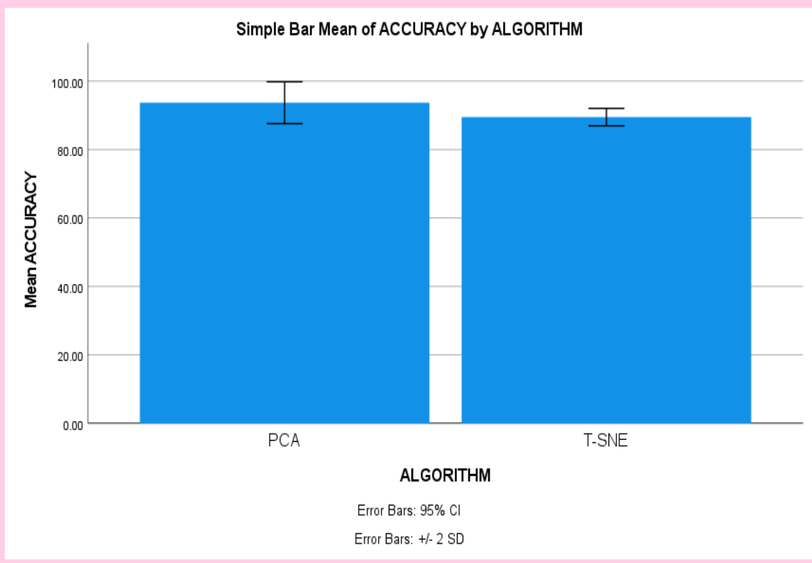
Satellite picture showing cloud cover over India

MATERIALS AND METHODS

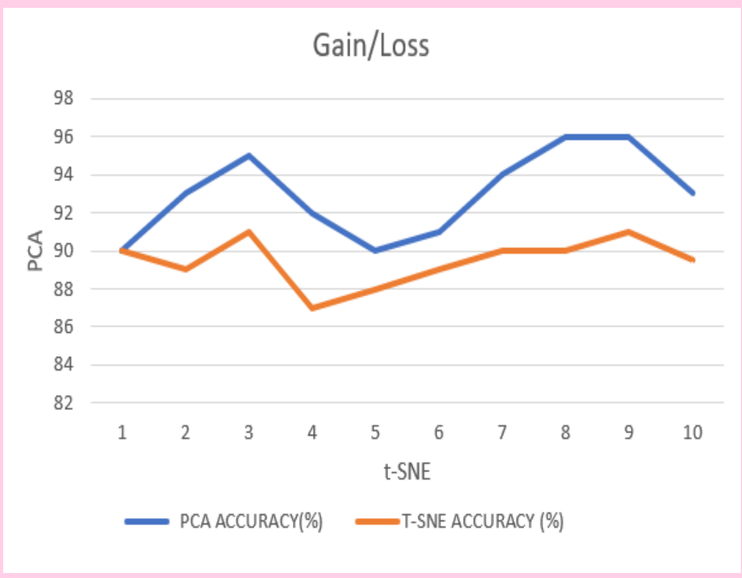


RESULTS

- In the present work, Principal Component Analysis (PCA)) is compared with t-Distributed Stochastic Neighbor Embedding (t-SNE) ,it depicts that the proposed algorithm PCA gives more accuracy of 93.00% then t-SNE of 89.50%.
- The principal component analysis Algorithm and the t-Distributed Stochastic neighbor embedding system algorithm have the values of the Mean accuracy, Standard Deviation, and Standard Error.



PCA and T-SNE



Gain and Loss of PCA and T-SNE

DISCUSSION AND CONCLUSION

- According to the study results Principal Component Analysis algorithm outperformed t-Distributed Stochastic Neighbor Embedding algorithm with high accuracy of 93.00% .Based on the independent sample t-test, with the total sample size of 450, the significance value p=0.016 ($p<0.05$) shows that there is significant difference in the algorithms.
- The accuracy of the Principal Component Analysis (PCA) algorithm is 93.00% significantly better than the other algorithm.
- Through this research, it is inferred that Principal Component Analysis (PCA) algorithm has high accuracy comparing with t-Distributed Stochastic Neighbor Embedding algorithm for effective analysis on dimension reduction.
- Similar findings has been carried with a primary focus on dimensionality reduction, the integration of the Principal Component Analysis (PCA) algorithm with the t-Distributed Stochastic Neighbor Embedding (t-SNE) Algorithm.

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