SIMATS ENGINEERING
Engineer to Excel
TECH STAR SUMMIT 2024

Name: Ms. Yerrapareddy Yamini Reddy
Register Number: 192211153
Guided by Dr. D. Jayalakshmi

# Transformative Approaches in Ophthalmology with Performance Assessment of Support vector machine algorithm against Random Forest Algorithm in Glaucoma Detection from Retinal Images

## INTRODUCTION

- This study investigates transformational AI techniques in ophthalmology by comparing the performance of Support Vector Machines (SVM) and Random Forest algorithms for detecting glaucoma in retinal pictures.
- This research delves into transformative advancements within ophthalmology, specifically focusing on glaucoma detection. It explores innovative methods that go beyond traditional practices.
- The study doesn't just propose these new techniques, but critically assesses their effectiveness. At the heart of this investigation lies the comparison of two machine learning algorithms, Support Vector Machine and Random Forest.
- By evaluating machine learning algorithms for analyzing retinal images, the study could pave the way for more efficient and potentially more accurate tools for ophthalmologists
- Transformative ophthalmology approaches combine Support Vector Machine's tight decision boundaries with Random Forest's ensemble learning to diagnose glaucoma from retinal pictures.
- The advantage of the Support Vector Machine(SVM) has proven to be faster when compared with the Random Forest Algorithm(RF).

Fig.1 Retinal Image

## MATERIALS AND METHODS

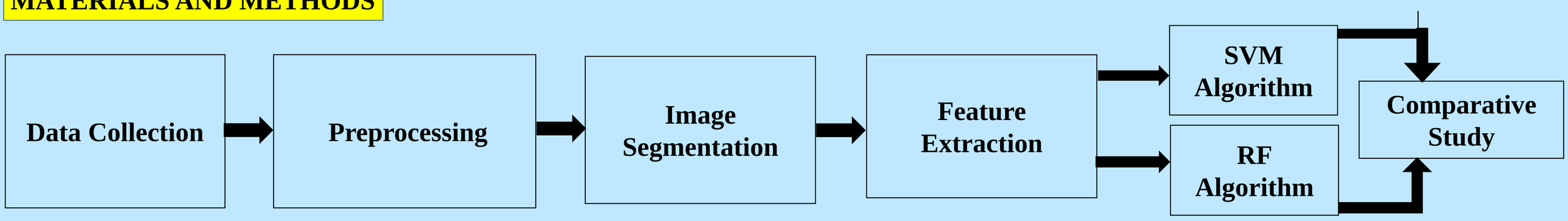


Image Processing Workflow

## RESULTS

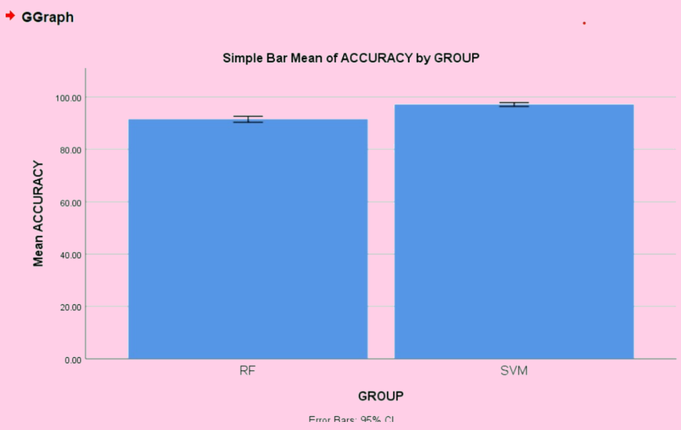


Fig.2 Bar Graph showing the comparison of the mean accuracy of Glaucoma Detection with SVM and RF .

Table 1. Statistical computation of independent samples tested among SVM and RF algorithms

| | Group Statistics | | | | |
|---|---|---|---|---|---|
| | Groups | N | Mean | Std deviation | Std. Error Mean |
| Accuracy | SVM | 20 | 97.1500 | 1.53125 | .3424 |
| | RF | 20 | 91.5000 | 2.43872 | .5453 |

Table 2: The independent sample t-test has a significant value p=0.001(p<0.05) indicating the study between the SVM and the RF is statistically significant.

| | Independent Sample T-Test | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Levene's Test for Equality of Variances | | T-test for Equality of Means | | | | | | |
| Accuracy | F | Sig | t | df | Sig (2-tailed) | Mean Difference | Std. Error Difference | 95% Confidence Interval of the Difference | |
| | | | | | | | | Lower | Upper |
| Equal variances assumed | 1.390 | .246 | 8.775 | 38 | .000 | 5.65000 | .64390 | 4.34650 | 6.95350 |
| Equal variances not assumed | | | 8.775 | 31.966 | .000 | 5.65000 | .64390 | 4.33837 | 6.96163 |

## DISCUSSION AND CONCLUSION

- Based on T-test Statistical analysis, the significance value of p=0.001 (independent sample T - test p<0.05) is obtained and shows that there is a statistical significant difference between the group 1 and group 2.
- Overall , the accuracy of the SVM is 98.00 % and it is better than Random Forest(RF)which has up to 96.00%.
- The group statics reveal that SVM has mean accuracy of 98.00 with a standard deviation of 1.53125, whereas RF has a mean accuracy of 96.00 with a standard deviation of 2.43872.
- Glaucoma Detection using SVM and Random Forest algorithms shows promise for improving accuracy and efficiency. SVM provides speed and simplicity, while Random Forest excels at managing complexity. These developments might lead to earlier Glaucoma Detection.
- Furthermore, the development of models adept at learning future dependencies could offer significant benefits across diverse domains, including artificial intelligence. These models could excel in tasks such as detecting and quantifying desolation dependencies.

## BIBLIOGRAPHY

- Bengie L. Ortiz; Lance McMahon; Peter Ho; Jo Woon Chong. A Novel Prediction Method for Glaucoma Detection Using Retino graphies.DOI: https://doi.org/10.1109/C358072.2023.10436242.
- S. Puangarom; A. Twinvitoo; S. Sangchocanonta; A. Munthuli; P. Phienphanich; R. Itthipanichpong; K. Ratanawongphaib. 3-LbNets: Tri- Labeling Deep Convolutional Neural Network for the Automated Screening of Glaucoma, Glaucoma Suspect, and No Glaucoma in Fundus Images. DOI: https://doi.org/10.1109/EMBC40787.2023.10340102.
- Tehmina Khalil; Samina Khalid; Adeel M. Syed. Review of Machine Learning techniques for glaucoma detection and prediction. DOI:https://doi.org/10.1109/SAI.2014.6918224.
- Akram Belghith; Madhusudhanan Balasubramanian; Christopher Bowd; Robert N Weinreb; Linda M. Zangwill. Glaucoma progression detection using variational expectation maximization algorithm. DOI: https://doi.org/10.1109/ISBI.2013.6556615.