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Innovative AI-Driven Glaucoma Screening with Comparative Study of Support vector machine algorithm and Decision Tree Algorithm in Analysis of Retinal Fundus Images

INTRODUCTION

- The purpose of this project is to create a unique AI system for glaucoma screening by comparing Support Vector Machines (SVM) and Decision Trees in retinal image analysis.
- This research investigates a novel approach to glaucoma screening using artificial intelligence.
- The study focuses on comparing two specific algorithms, Support Vector Machine and Decision Tree, to see which performs better at detecting glaucoma in these images.
- Assist ophthalmologists by offering an objective and potentially speedier technique of assessing retinal pictures for glaucoma diagnosis.
- By providing an objective and automated analysis method, this research could contribute to a more standardized approach to glaucoma detection across healthcare settings.
- Both Support Vector Machine (SVM) and Decision Tree algorithms are typically used for classification tasks. In this case, they would be classifying retinal fundus images as either indicative of glaucoma or not.
- The advantage of the Support Vector Machine(SVM) has proven to be faster when compared with the Decision Tree Algorithm(DT).

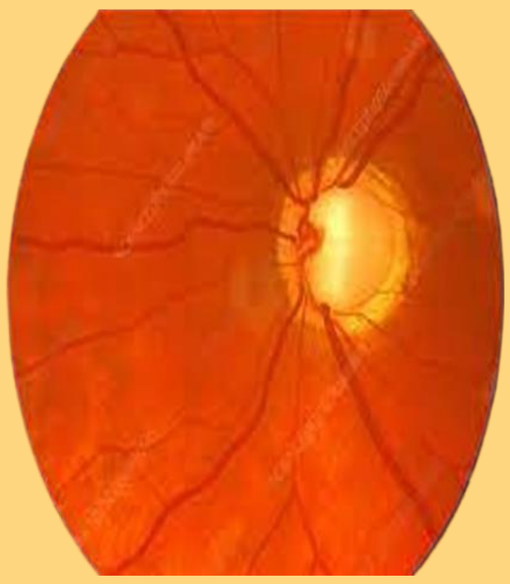

Fig.1.Retinal Image

MATERIALS AND METHODS

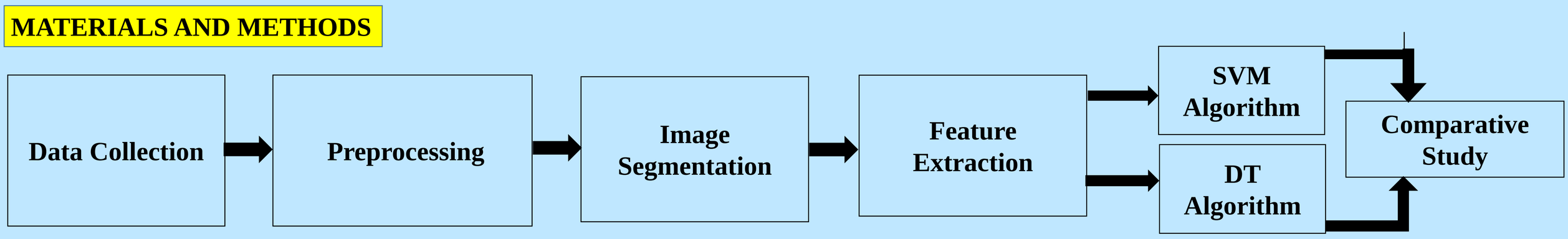

Image Processing Workflow

RESULTS

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

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

	Group Statistics				
	Groups	N	Mean	Std deviation	Std. Error Mean
Accuracy	SVM	20	96.3500	1.66307	.37187
	DT	20	81.1500	2.36810	.52952

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 DT 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	1.571	.218	23.491	38	.000	15.20000	.64706	13.89010	16.50990
Equal variances not assumed			23.491	34.075	.000	15.20000	.64706	13.88513	16.51487

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 96.00 % and it is better than Decision Tree(DT)which has up to 84.00%.
- The group statics reveal that SVM has mean accuracy of 96.00 with a standard deviation of 1.66307, whereas DT has a mean accuracy of 84.00 with a standard deviation of 2.36810.
- Glaucoma Detection using SVM and Decision Tree algorithms shows promise for improving accuracy and efficiency. SVM provides speed and simplicity, while Decision Tree 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.

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