SIMATS ENGINEERING

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A Novel Breakthrough in AI-Enabled Ophthalmology using Support vector machine algorithm Compared with K-Nearest Neighbor algorithm in Detecting Glaucoma from Retinal Fundus Images

INTRODUCTION

- This paper presents a new AI technique for ophthalmology by comparing Support Vector Machines (SVM) and K-Nearest Neighbor (KNN) algorithms for detecting glaucoma in retinal pictures.
- This research introduces a groundbreaking application of artificial intelligence (AI) in ophthalmology. It focuses on detecting glaucoma, a major threat to vision.
- The study investigates a novel AI approach and compares two algorithms, Support Vector Machine (SVM) and K-Nearest Neighbor (KNN), to see which performs better at analyzing retinal images, a common tool in eye exams.
- More accurate and efficient glaucoma detection methods, potentially enabled by this research, could lead to earlier diagnoses and interventions, improving patient outcomes.
- A new accomplishment in AI-enabled ophthalmology contrasts Support Vector Machine's complex decision boundaries with K-Nearest Neighbor's proximity-based technique for detecting glaucoma from retinal fundus images.
- The advantage of the Support Vector Machine(SVM) has proven to be faster when compared with the K-Nearest Neighbor Algorithm(KNN)

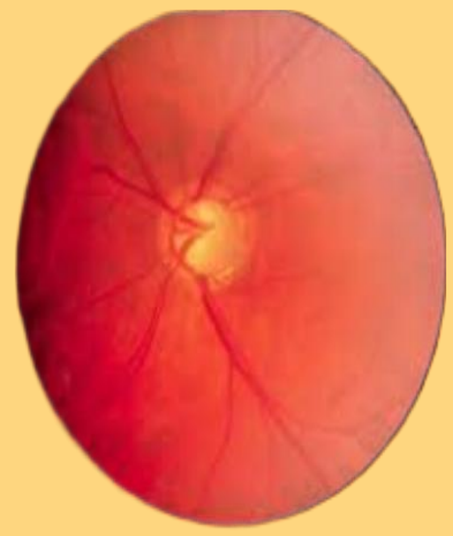

Fig.1:Retinal Image

MATERIALS AND METHODS

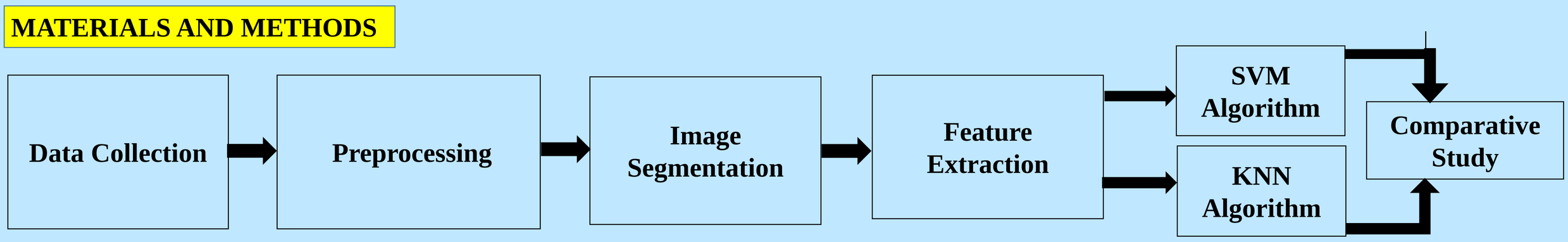

Image Processing Workflow

RESULTS

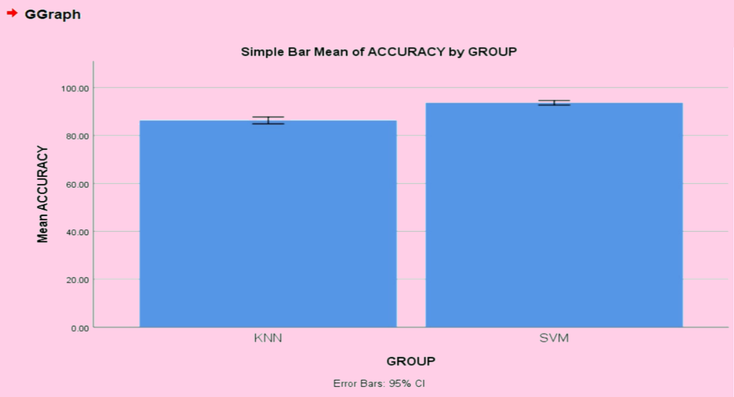

Fig.2 Bar Graph showing the comparison of the mean accuracy of Glaucoma Detection with SVM and KNN .

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

	Group Statistics				
	Groups	N	Mean	Std deviation	Std. Error Mean
Accuracy	SVM	20	93.6500	2.00722	.44883
	KNN	20	86.3000	3.06251	.68480

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 KNN 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	2.496	.122	8.977	38	.000	7.35000	0.81878	5.69247	9.00753
Equal variances not assumed			8.977	32.781	.000	7.35000	0.81878	5.68376	9.01624

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 92.00 % and it is better than K-Nearest Neighbor (KNN) which has up to 90.00%.
- The group statics reveal that SVM has mean accuracy of 92.00 with a standard deviation of 2.00722, whereas KNN has a mean accuracy of 90.00 with a standard deviation of 3.06251.
- Glaucoma Detection using SVM and K-Nearest Neighbor algorithms shows promise for improving accuracy and efficiency. SVM provides speed and simplicity, while K-Nearest Neighbor 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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