Retinal OCT Classification Challenge

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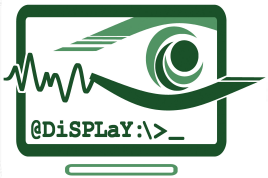
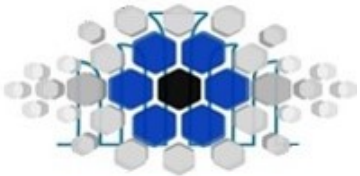
22 November 2017





Outline

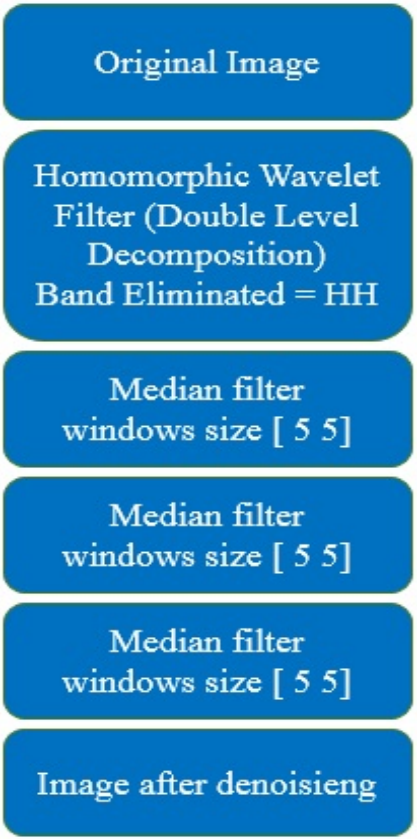
Denoising

We have used various low pass filters for speckle noise reduction which are introduced in Medical Imaging.

Speckle noise reduction methods

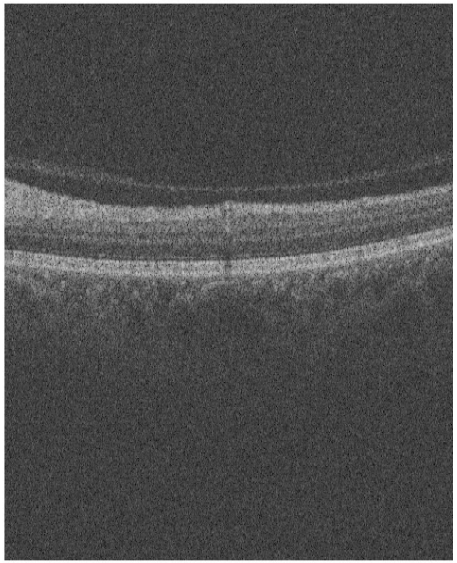
- Median Filter
- Adaptive Weighted Median Filter
- Fourier Ideal Filter
- Butterworth Filter
- Wavelet Filter
- Homomorphic Ideal Filter
- Homomorphic AWMF Filter
- Homomorphic Butterworth Filter
- **Homomorphic Wavelet Filter**

Denoising

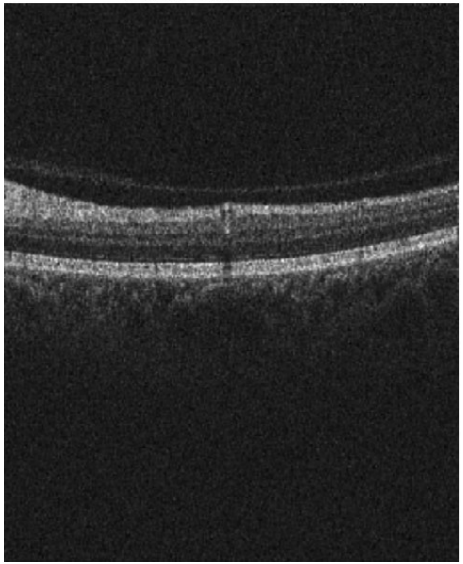

Original Image
Homomorphic Wavelet Filter (Double Level Decomposition) Band Eliminated = HH
Median filter windows size [5 5]
Median filter windows size [5 5]
Median filter windows size [5 5]
Image after denoisieng

Denoising

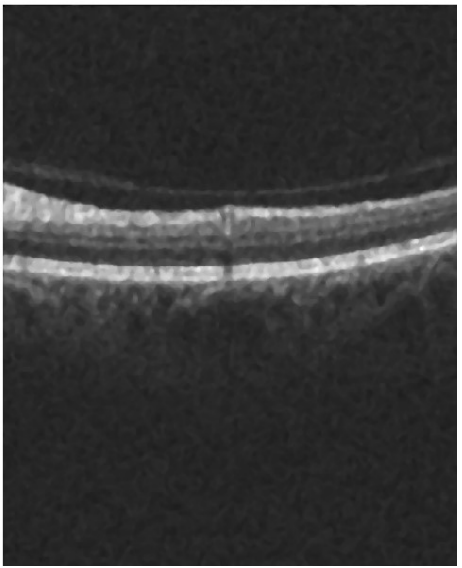
Original Image



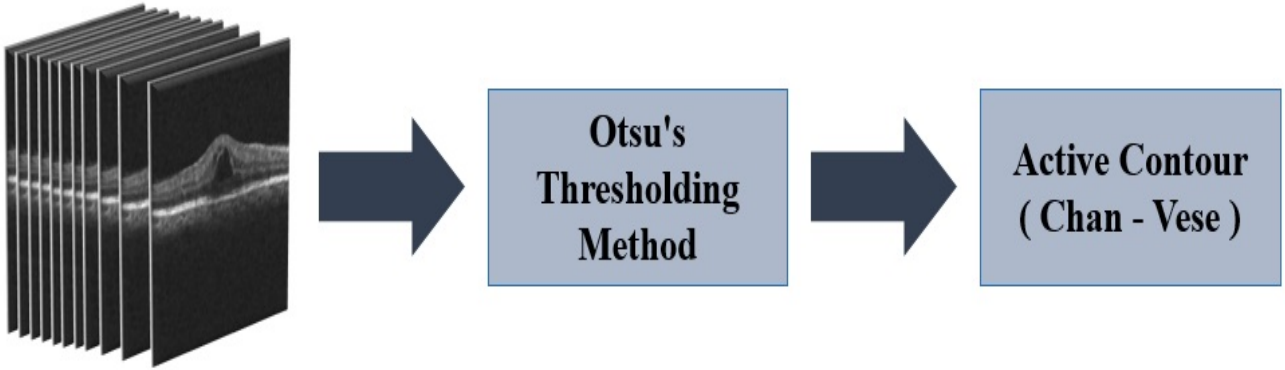
Homomorphic Wavelet Filter Analysis
Band Eliminated = HH



Median Filter

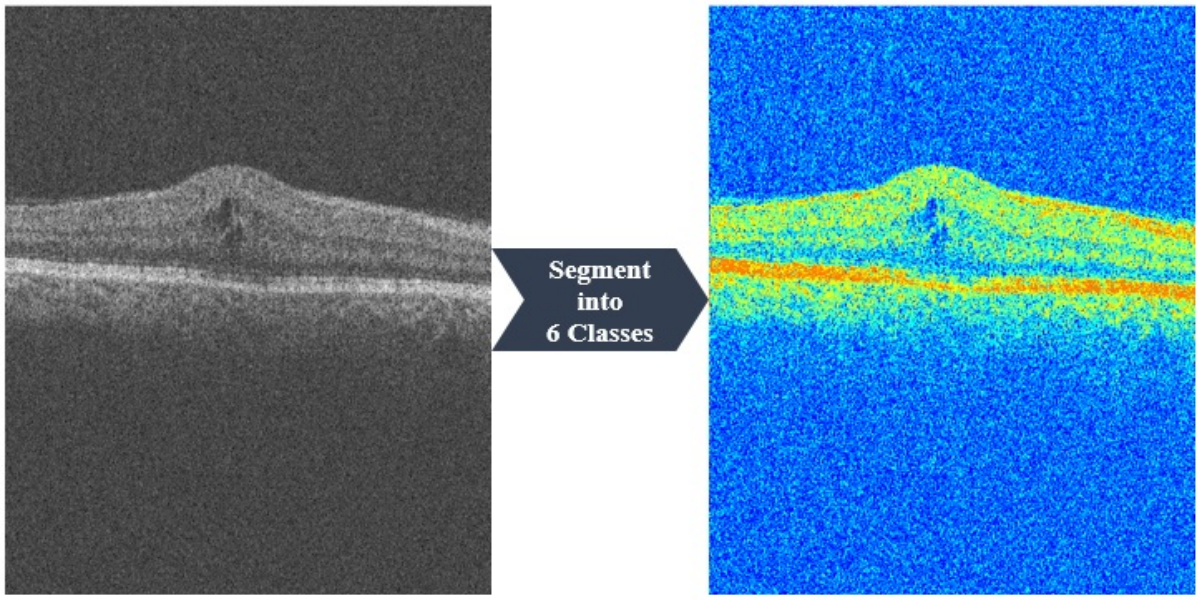


Segmentation



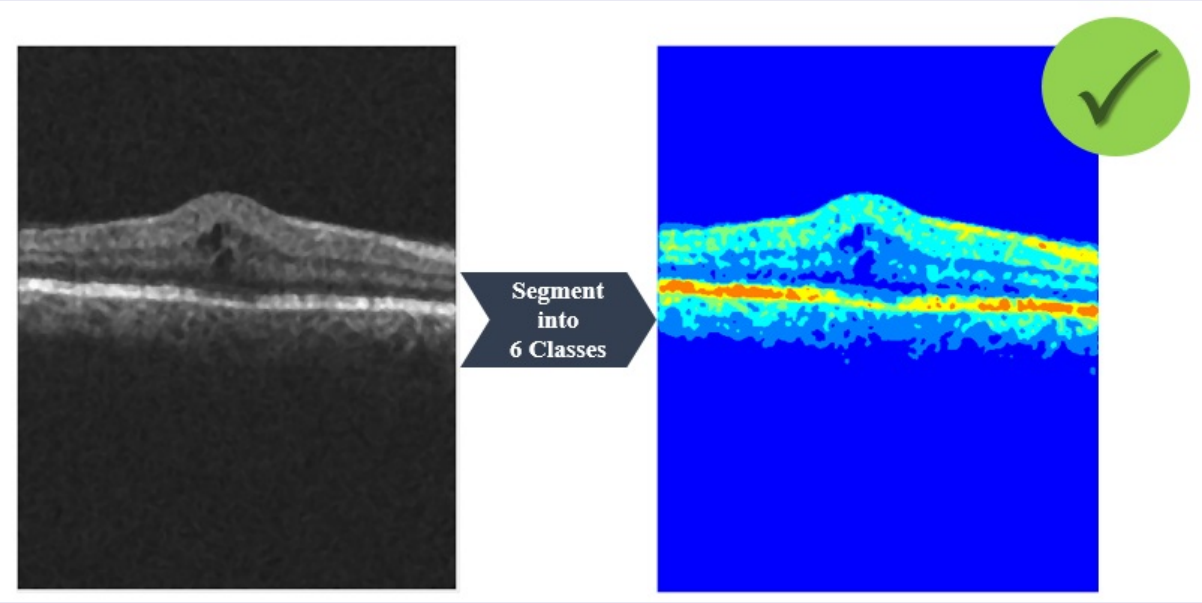
Otsu's Thresholding Method

For **original OCT**, Extract 5 thresholds and also we have 6 classes:



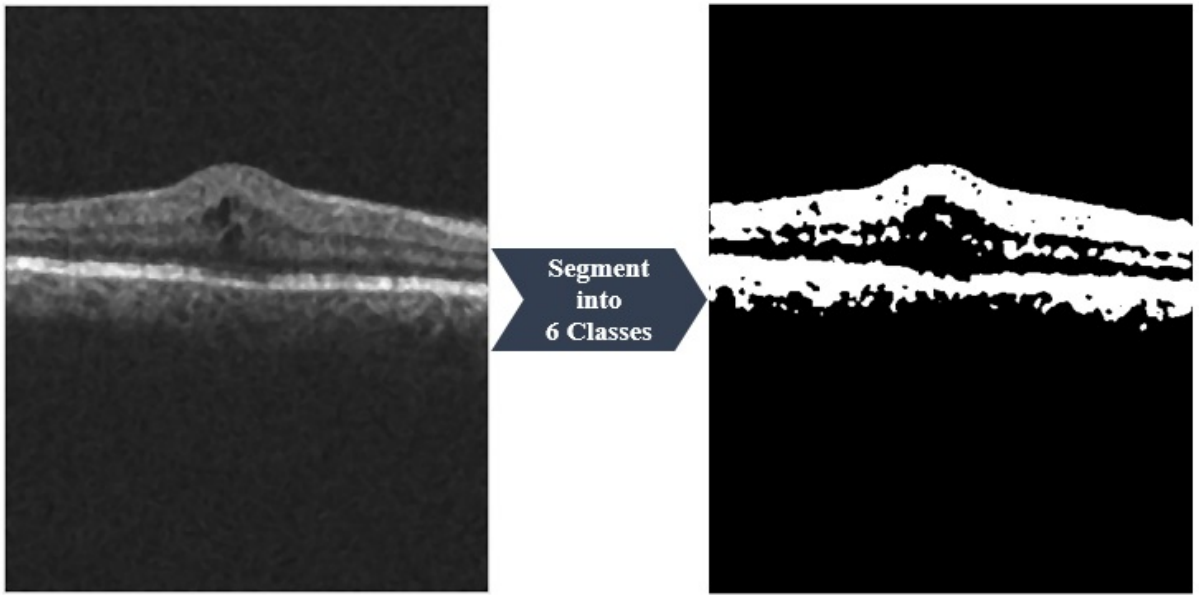
Otsu's Thresholding Method

For **denoised OCT**, Extract 5 thresholds and also we have 6 classes:



Otsu's Thresholding Method

Extract all pixel in denoised OCT with intensity $\geqslant$ threshold(2) to have binary mask with max point in Retina

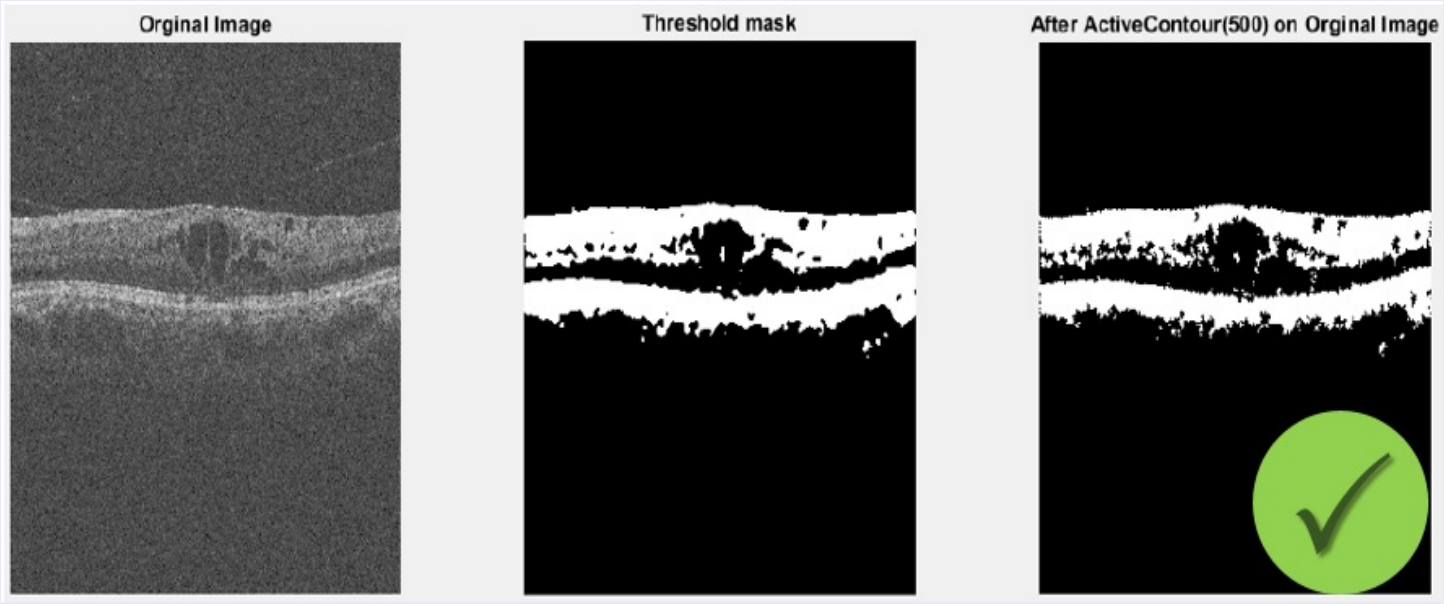


Active Contour

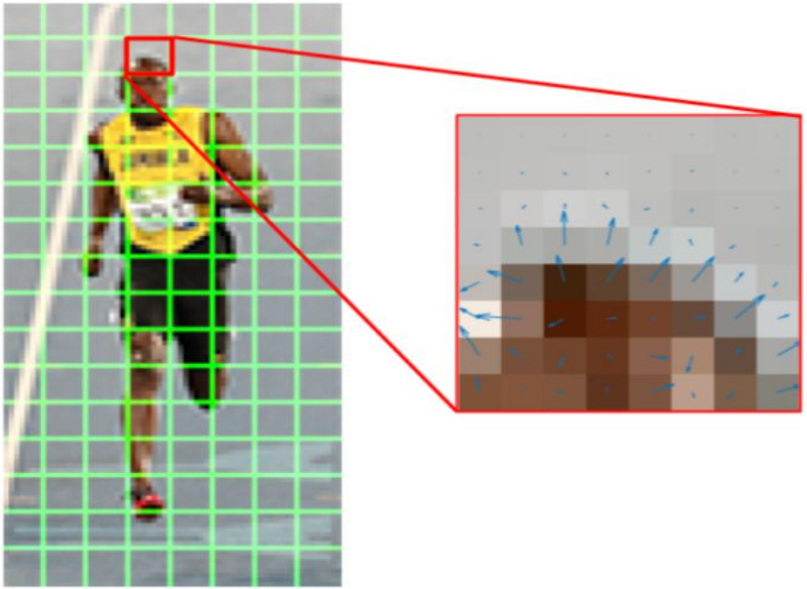
Apply active contour with initial mask on **denoised OCT**:

Active Contour

Apply active contour with initial mask on **original OCT**:



Histogram of Oriented Gradients (HOG)



2	3	4	4	3	4	2	2
5	11	17	13	7	9	3	4
11	21	23	27	22	17	4	6
23	99	165	135	85	32	26	2
91	155	133	136	144	152	57	28
98	196	76	38	26	60	170	51
165	60	60	27	77	85	43	136
71	13	34	23	108	27	48	110

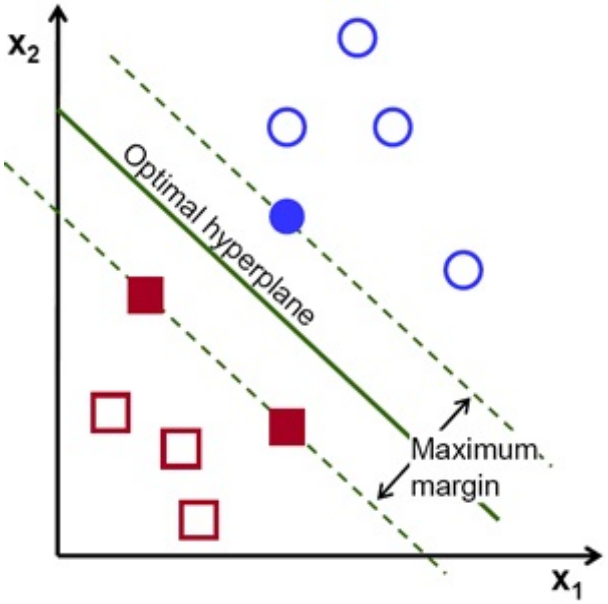
Gradient Magnitude

80	36	5	10	0	64	90	73
37	9	9	179	78	27	169	166
87	136	173	39	102	163	152	176
76	13	1	168	159	22	125	143
120	70	14	150	145	144	145	143
58	86	119	98	100	101	133	113
30	65	157	75	78	165	145	124
11	170	91	4	110	17	133	110

Gradient Direction

Support Vector Machine (SVM)

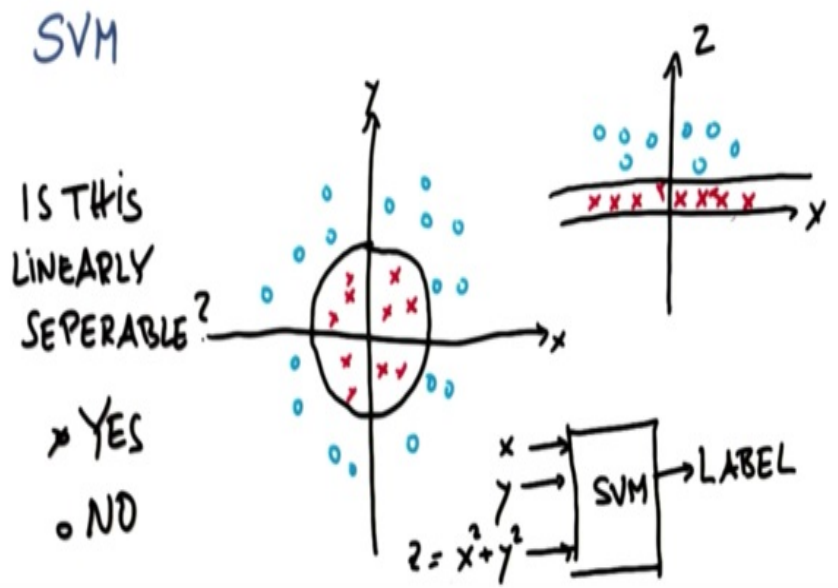
The operation of the SVM algorithm is based on finding the hyperplane that gives the largest minimum distance to the training examples. Twice, this distance receives the important name of **margin** within SVM's theory. Therefore, the optimal separating hyperplane maximizes the margin of the training data.



Nonlinear SVM

Kernel Trick:

- Polynomial Kernel
- Radial Basis Function Kernel



Thanks for attention.

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Questions and Comments?

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