

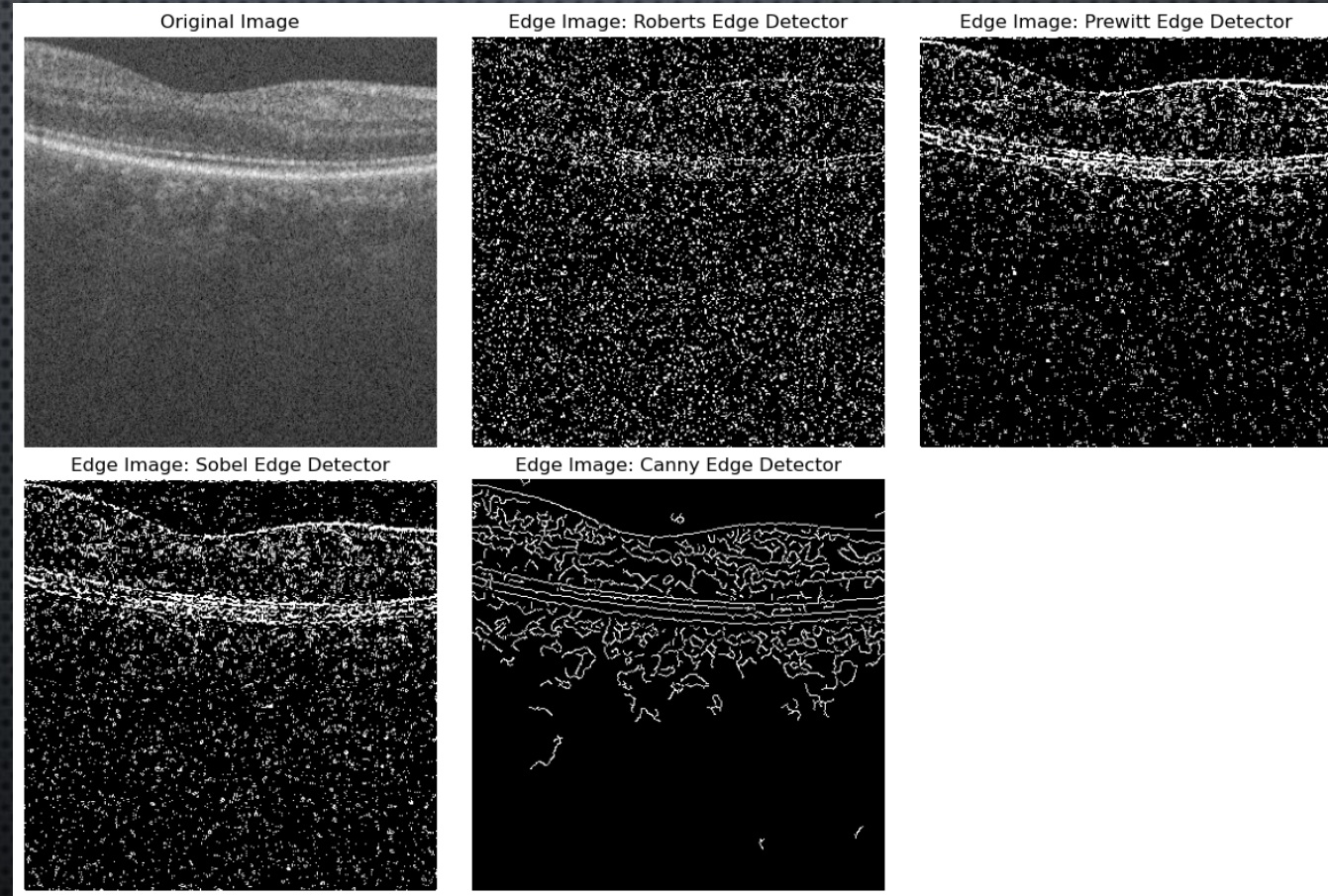
ASSIGNMENT 2: RETINA LAYER SEGMENTATION

F42 GROUP 2 (HONEY, JANE, WAI
YEONG, PHILIP, VERONICA)

12 APRIL 2023

PERFORMANCE ANALYSIS OF EDGE DETECTORS

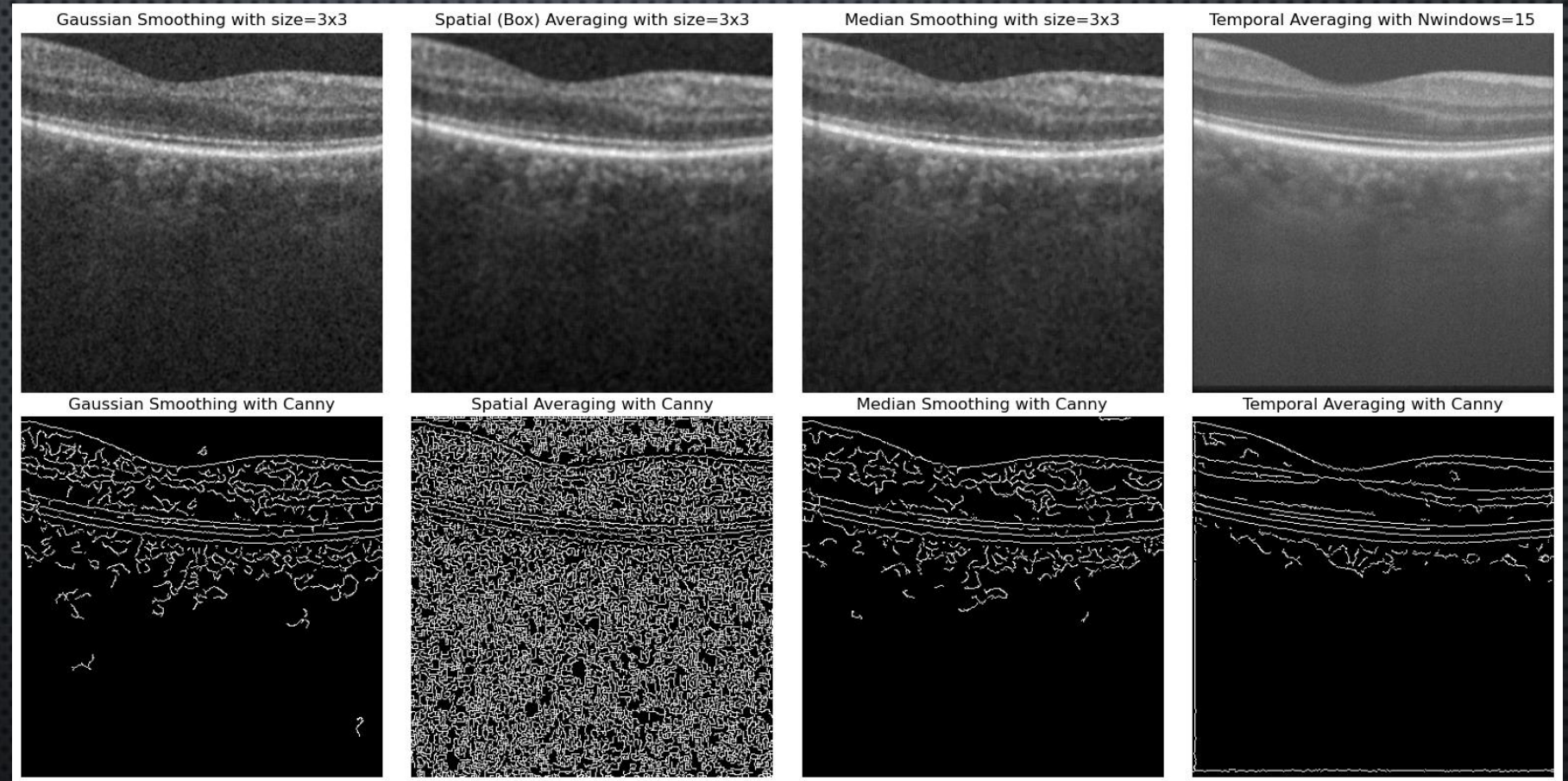
- ROBERTS
- PREWITT
- SOBEL
- CANNY



RNFL SEGMENTATION

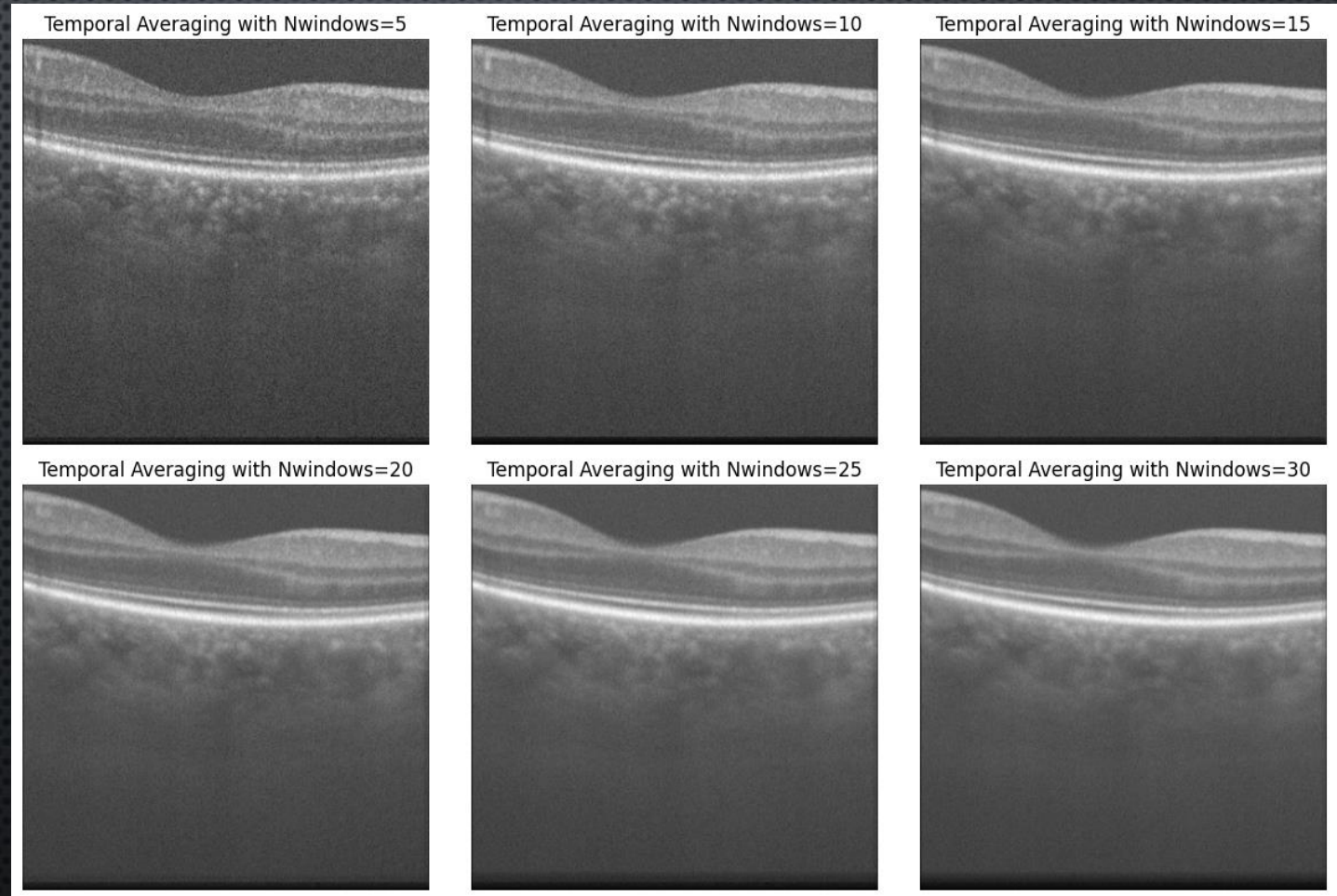
IMAGE SMOOTHING

- SPATIAL
 - ☐ GAUSSIAN
 - ☐ BOX
 - ☐ MEDIAN
- TEMPORAL



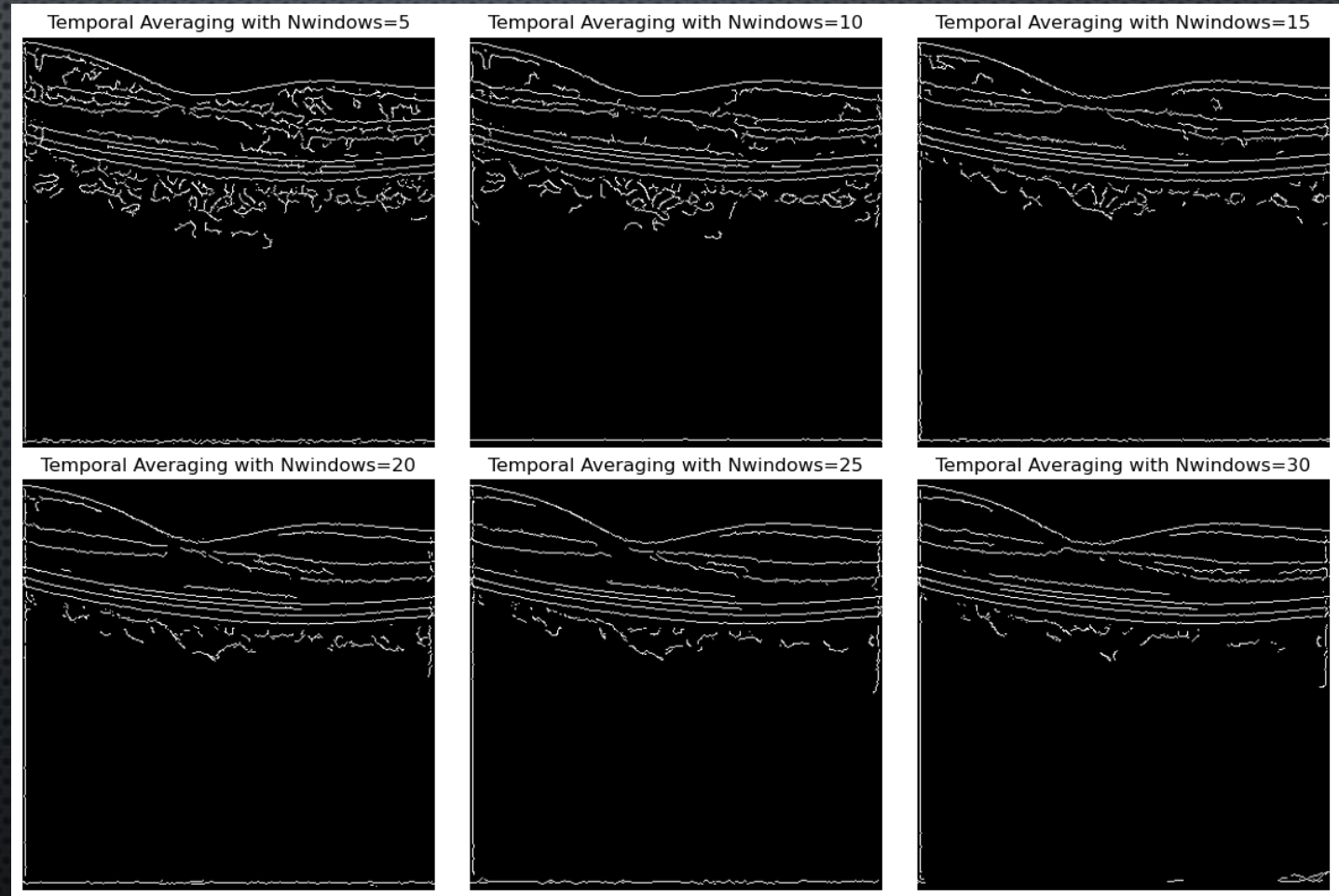
RNFL SEGMENTATION

TEMPORAL AVERAGING: NWINDOWS TUNING



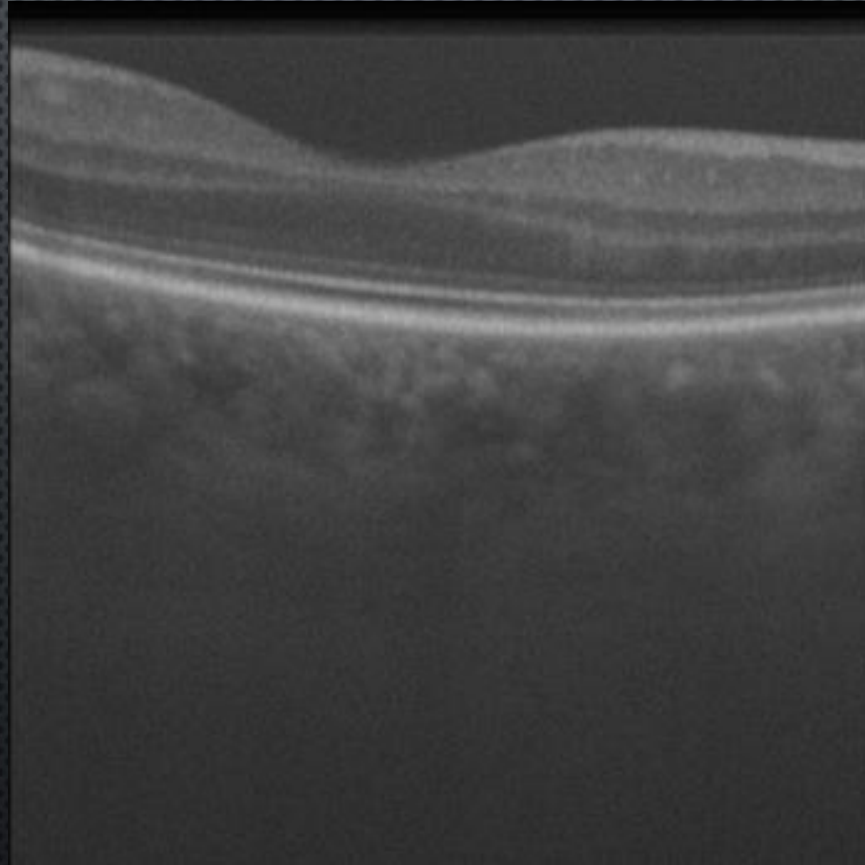
RNFL SEGMENTATION

TEMPORAL AVERAGING: NWINDOWS TUNING



RNFL SEGMENTATION

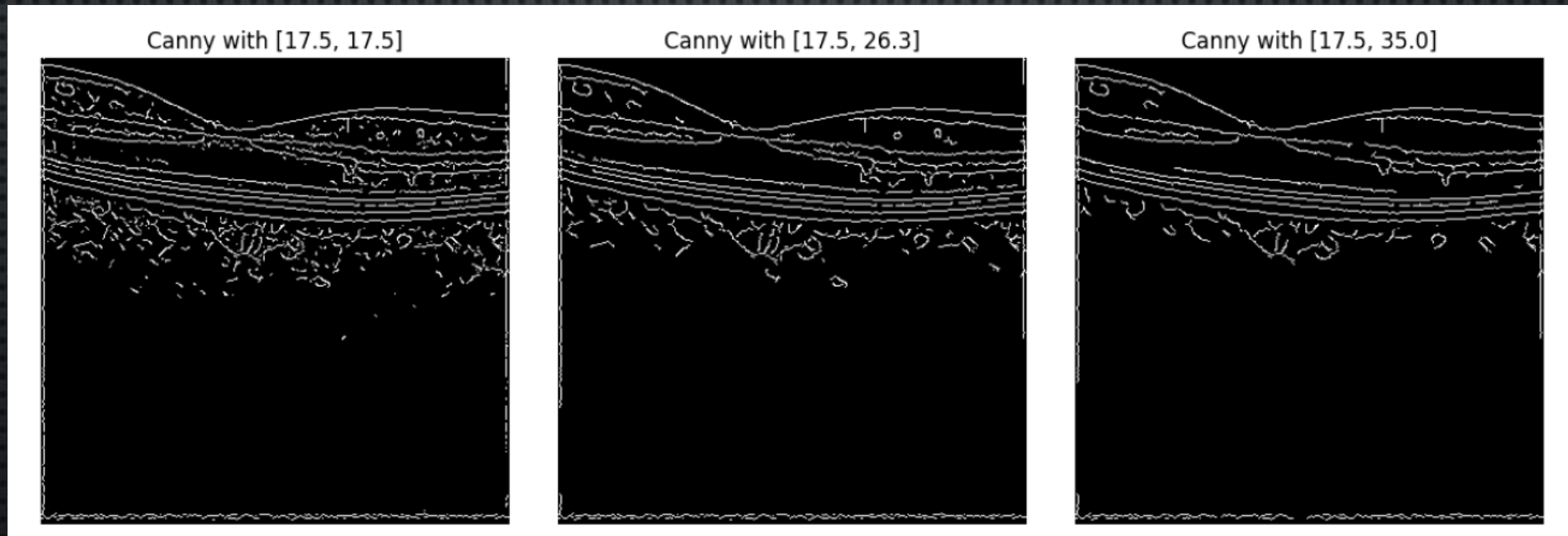
TEMPORAL
AVERAGING



RNFL SEGMENTATION

CANNY EDGE DETECTOR: PARAMETER TUNING

- SIGMA | UPPER AND LOWER THRESHOLDS

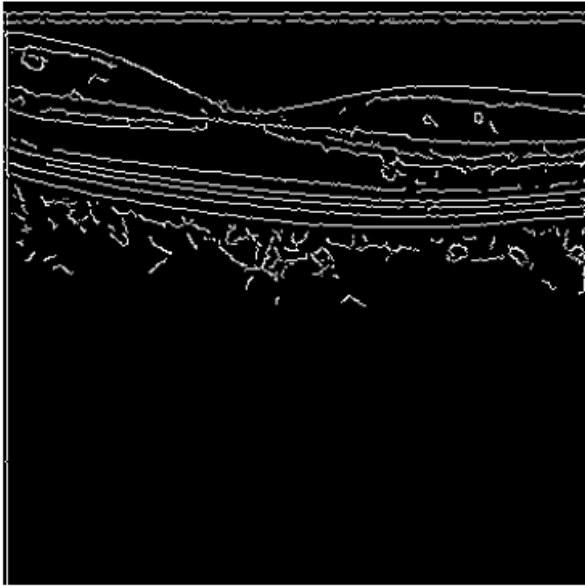


RNFL SEGMENTATION

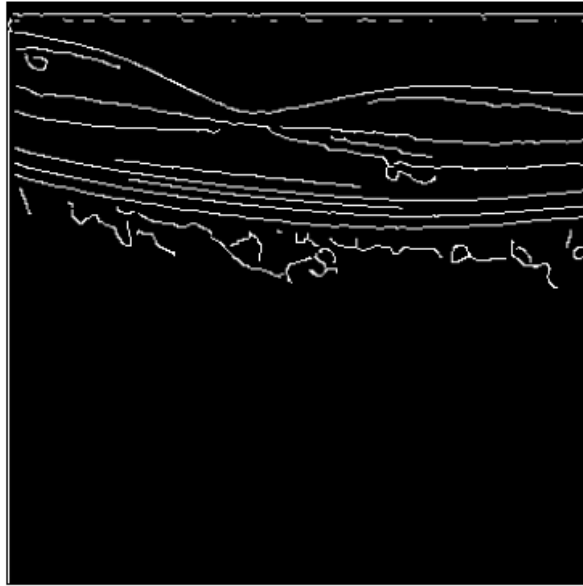
CANNY EDGE DETECTOR: PARAMETER TUNING

- PYTHON VS MATLAB

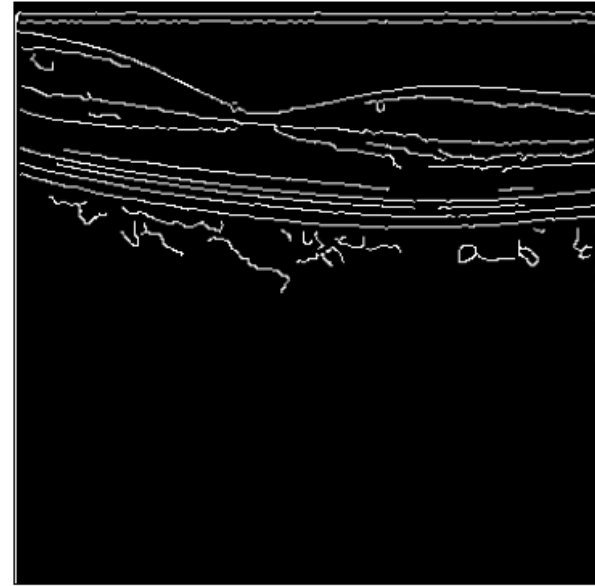
Canny Python with [17.5, 26.3], sigma=1.5



Canny MATLAB with [0.05, 0.15], sigma=2



Canny MATLAB with [0.05, 0.15], sigma=1.5

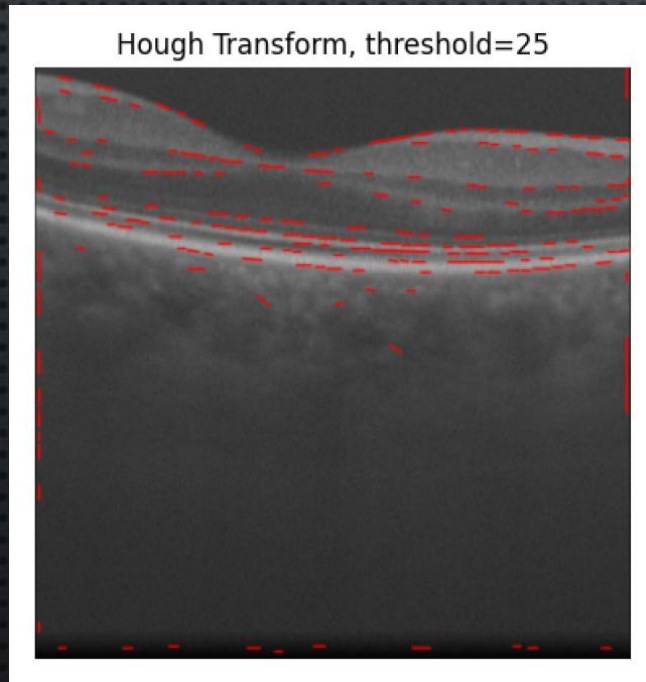


RNFL SEGMENTATION: BEST PARAMETERS

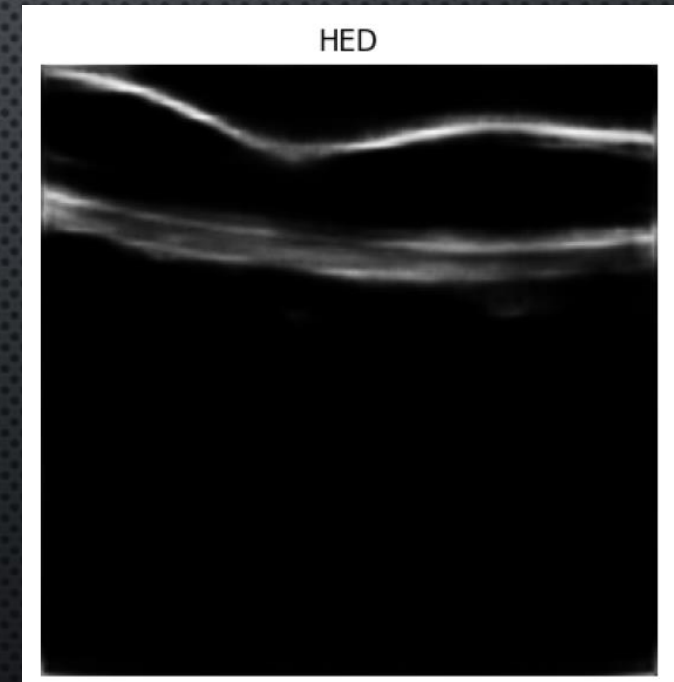
Technique	Step	Parameter	Value
Temporal Averaging		Window Size	20
Canny (Python)	Gaussian Blur	Standard Deviation, σ	1.5
		Kernel Size, $k = 6\sigma + 1$	10
	Hysteresis	Lower Threshold (Percentage)	17.5 (0.10)
		Upper Threshold (Percentage)	26.3 (0.15)
Canny (MATLAB)	Gaussian Blur	Standard Deviation, σ	1.5
		Kernel Size, $k = 8\sigma + 1$	13
	Hysteresis	Lower Threshold (Percentage)	0.05
		Upper Threshold (Percentage)	0.15

SPECIAL TECHNIQUES

HOUGH TRANSFORM



HOLISTICALLY-NESTED EDGE DETECTION (HED)



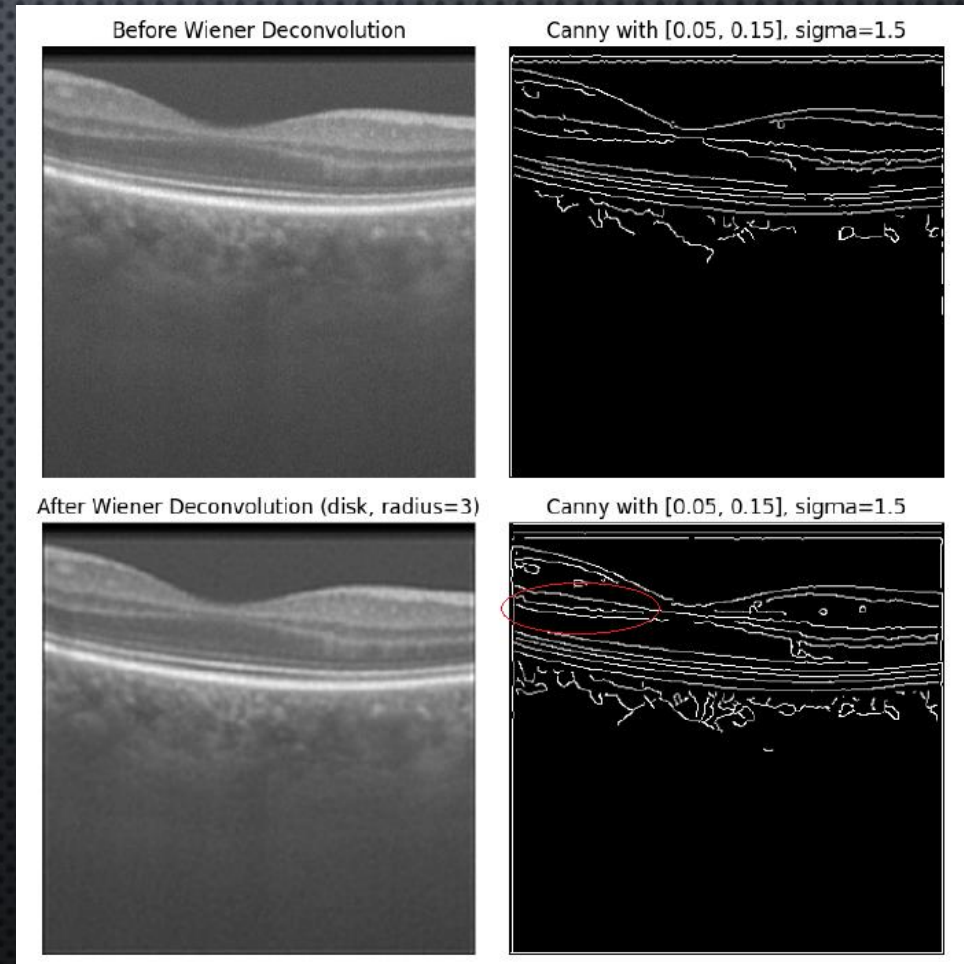
INL/OPL INTERFACE DETECTION

WIENER DECONVOLUTION

POINT SPREAD FUNCTIONS OF:

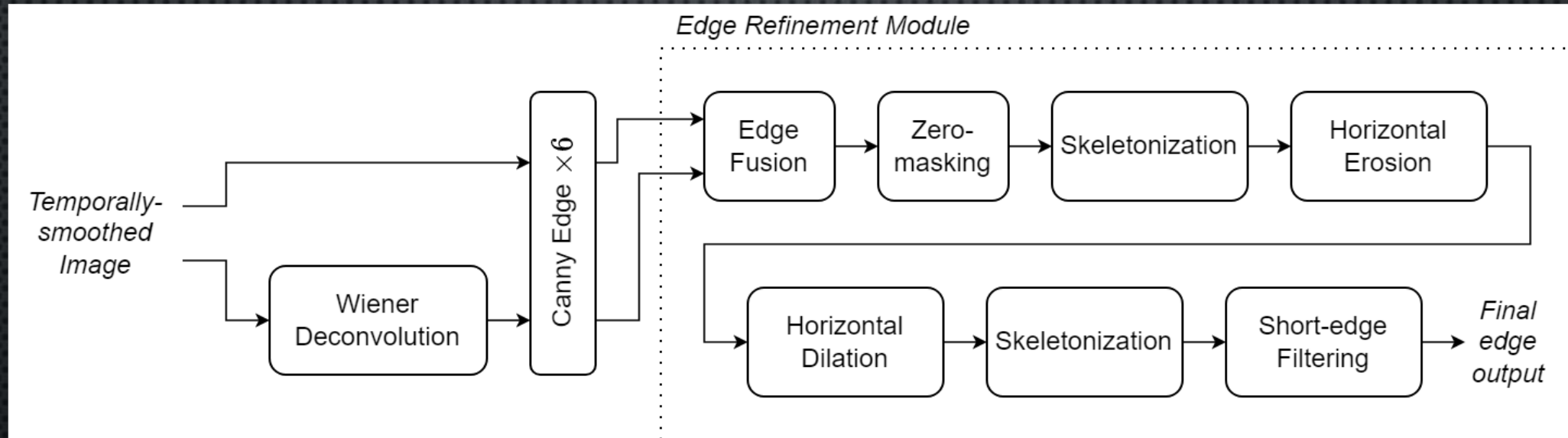
- DISK - RADIUS SIZE 3
- BOX - KERNEL SIZE 5

SAME CANNY PARAMETERS

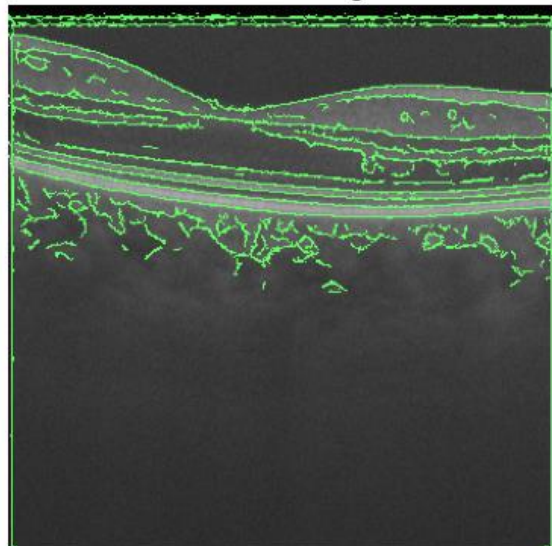


INL/OPL INTERFACE DETECTION

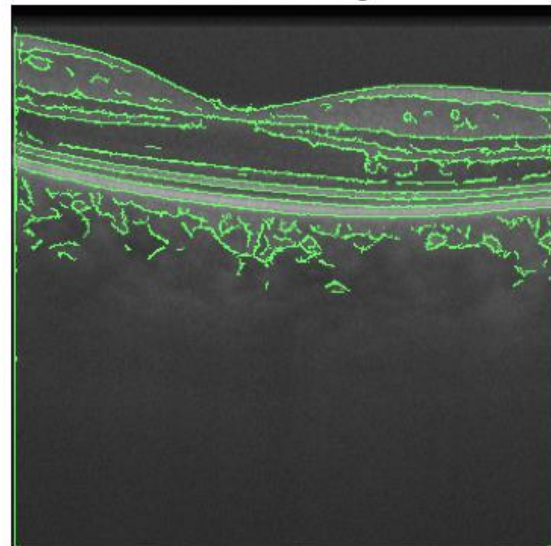
EDGE REFINEMENT MODULE



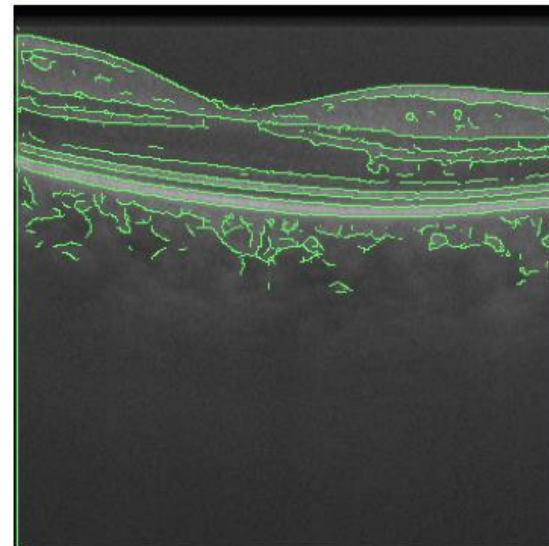
Combined edge



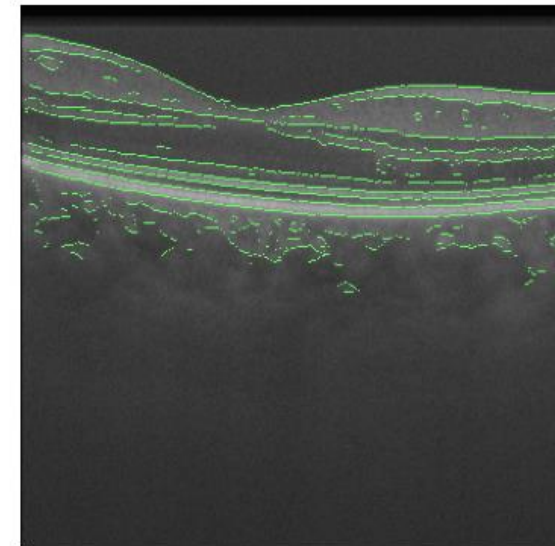
Zero-masking



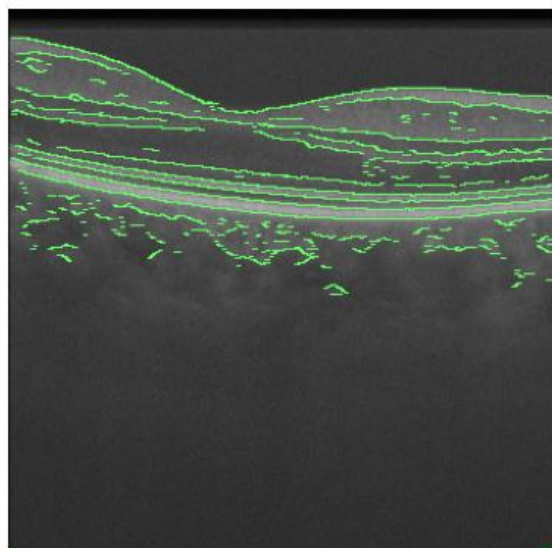
Skeletonization



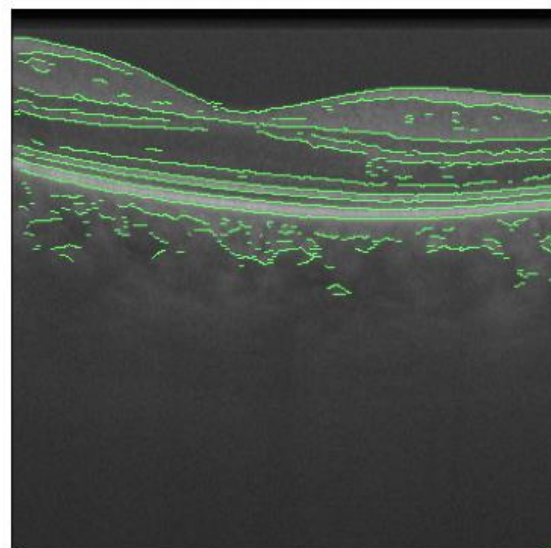
Horizontal Erosion



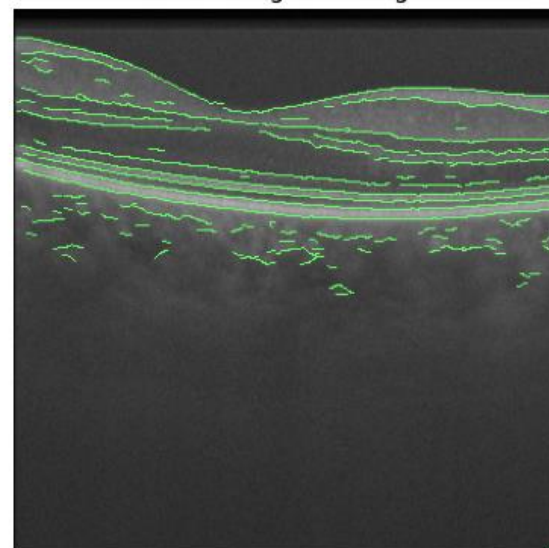
Horizontal Dilation



Skeletonization

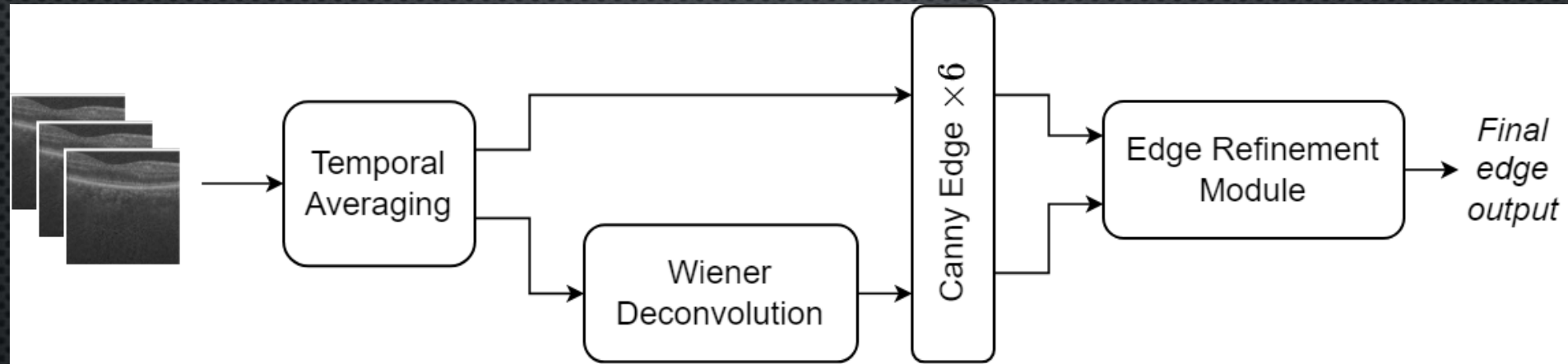


Short Edge Filtering

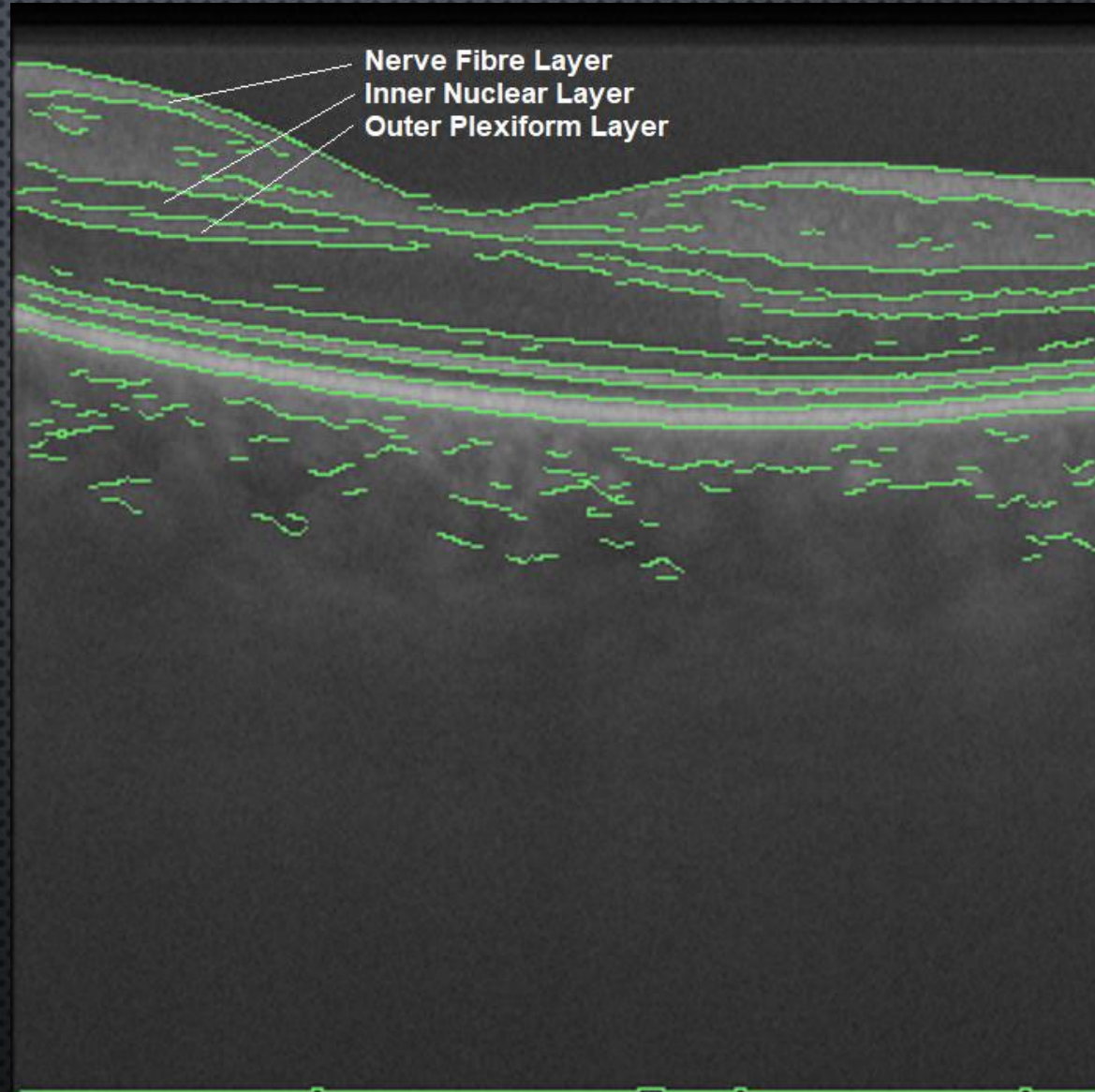


INL/OPL INTERFACE DETECTION

OVERALL SYSTEM PIPELINE



SAMPLE RESULTS



SAMPLE RESULTS

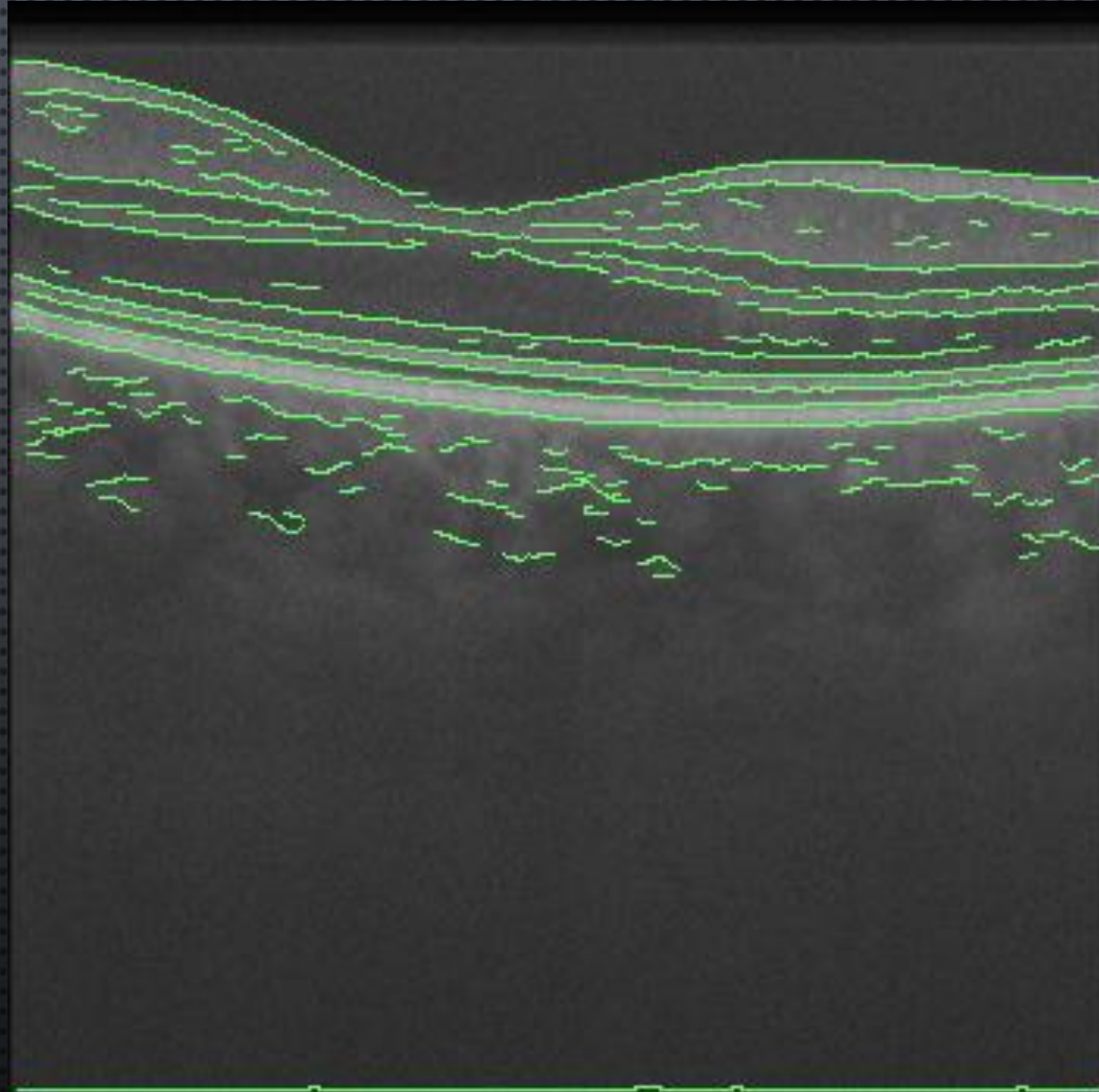


Image #272-291

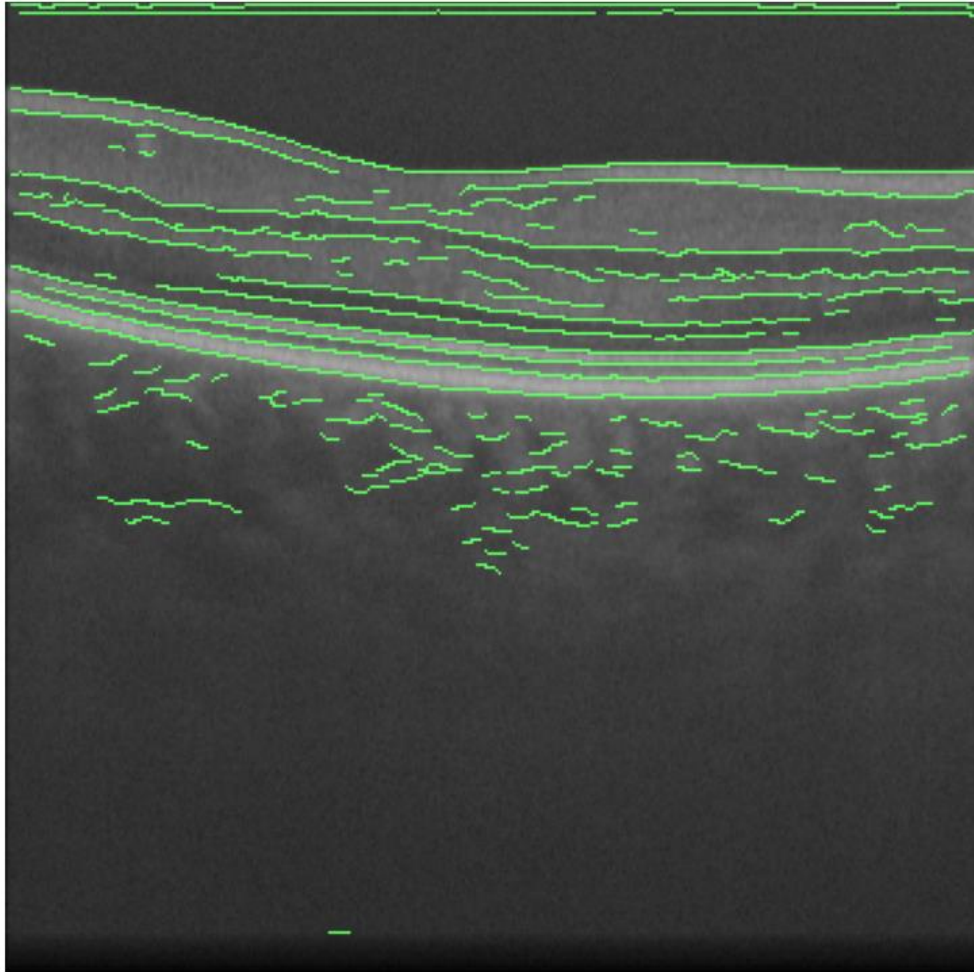
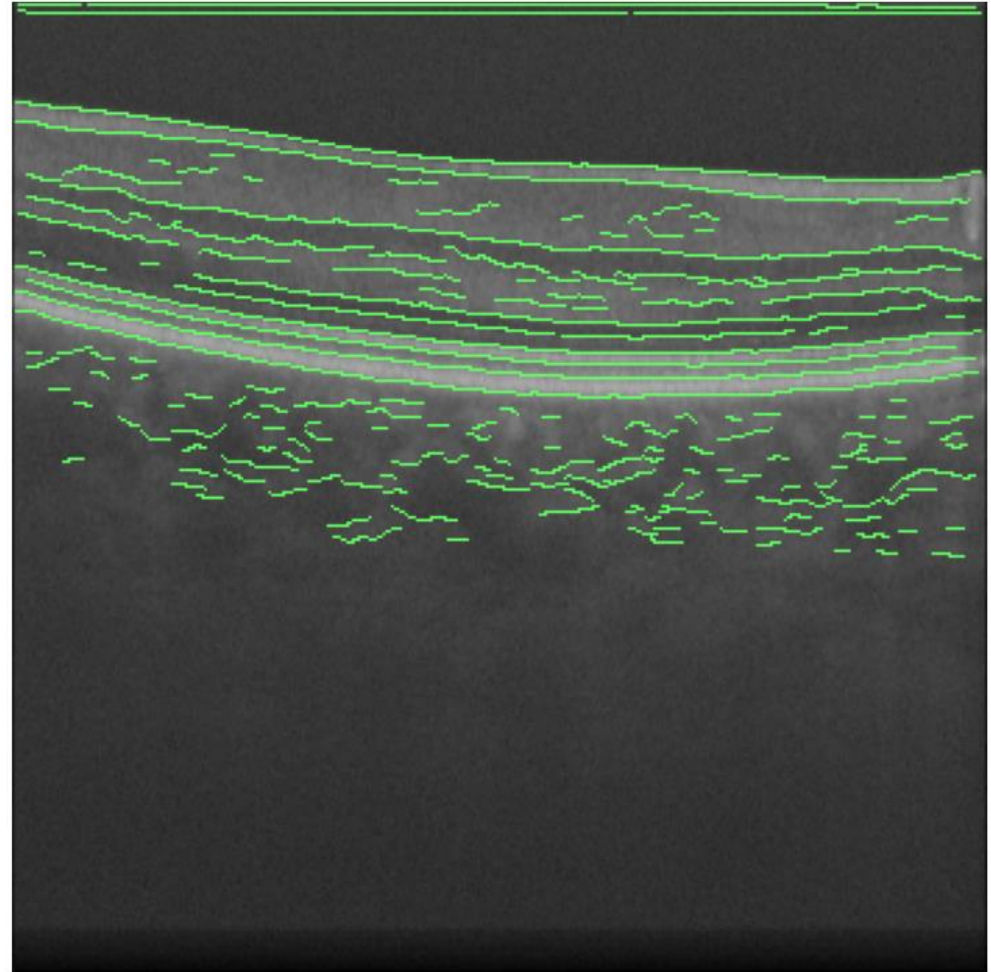







Image #322-341



THANK YOU

CONTRIBUTION

- WORKING COLLABORATIVELY, MEMBERS WERE ABLE TO LEVERAGE EACH OTHER'S STRENGTHS AND CONTRIBUTE VALUABLE INSIGHTS TO EACH OTHER'S SECTIONS, WHICH ULTIMATELY LED TO THE ACHIEVEMENT OF OUR COMMON GOAL. ALONG THE WAY, WE LEARNED A GREAT DEAL FROM EACH OTHER AND DEVELOPED A DEEPER UNDERSTANDING OF THE SUBJECT MATTER.

Name	Matriculation No.	Contribution
Honey Win Naing	U1922724E 	Simple edge detectors, Image smoothing
Jane Kho Shwu Tyng	U1920875K 	Simple edge detectors, Image smoothing, Hough Transform
Lee Wai Yeong	U1923582J 	Canny edge detector and smoothing parameter tuning (Python and MATLAB), HED, Temporal averaging
Philip Lee Hann Yung (Group Leader)	U1923382D 	Temporal averaging, Visualizations, Canny (MATLAB), Wiener Deconvolution, Edge refinement module (all components)
Veronica Tan Yun Qi	U1921775E 	Simple edge detectors, Image smoothing