Image Processing for Retinal Blood Vessel Segmentation

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Motivation: Diabetic retinopathy is the leading cause of blindness among adults in US, preventable by retinal screening. Retinal blood vessel segmentation is an essential step for the diagnosis of diabetic retinopathy.

Results

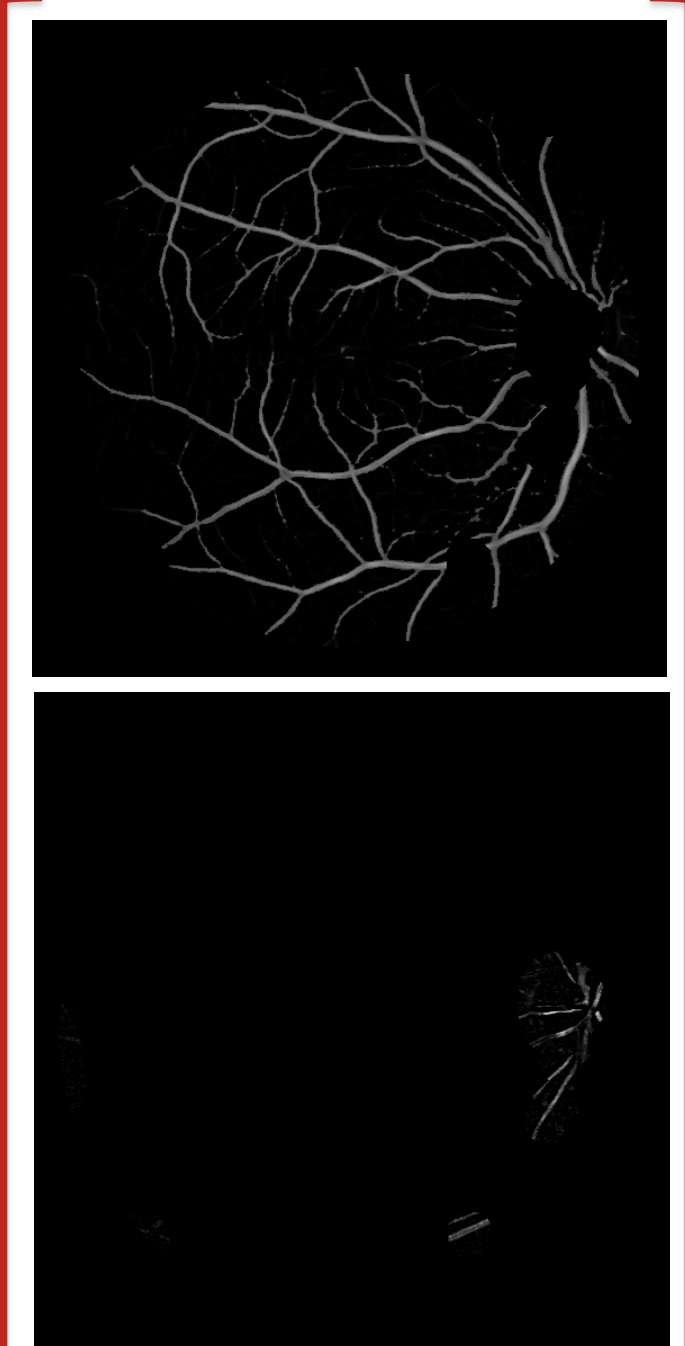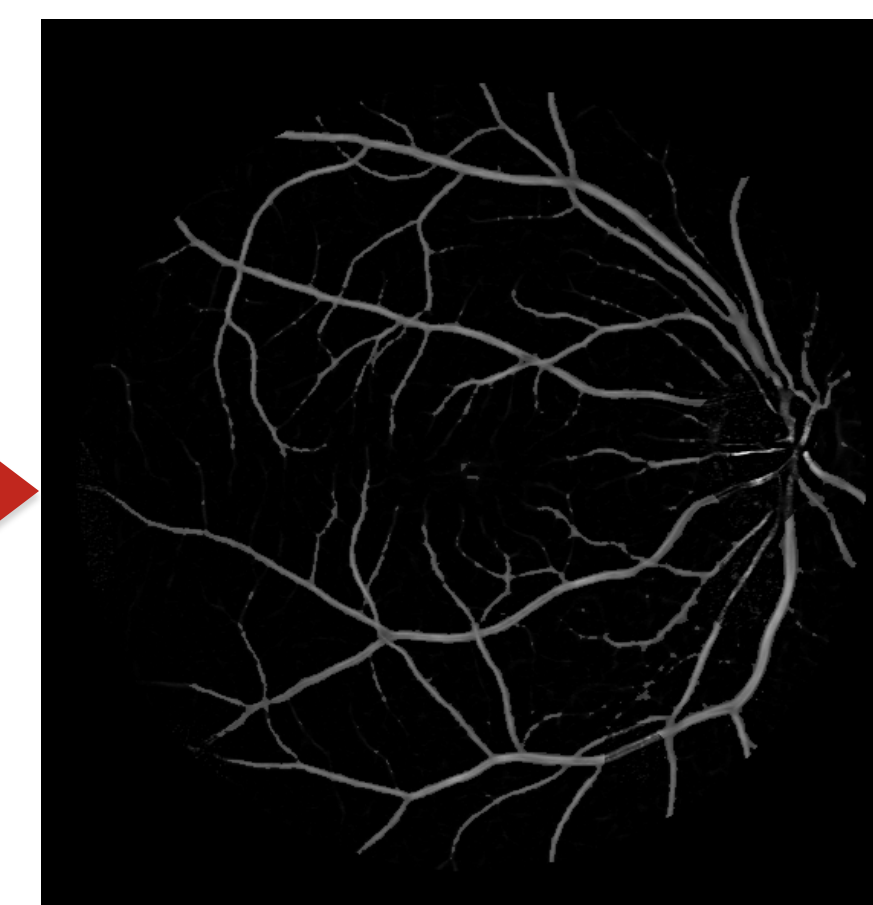
Original Image

- Matched Filtering
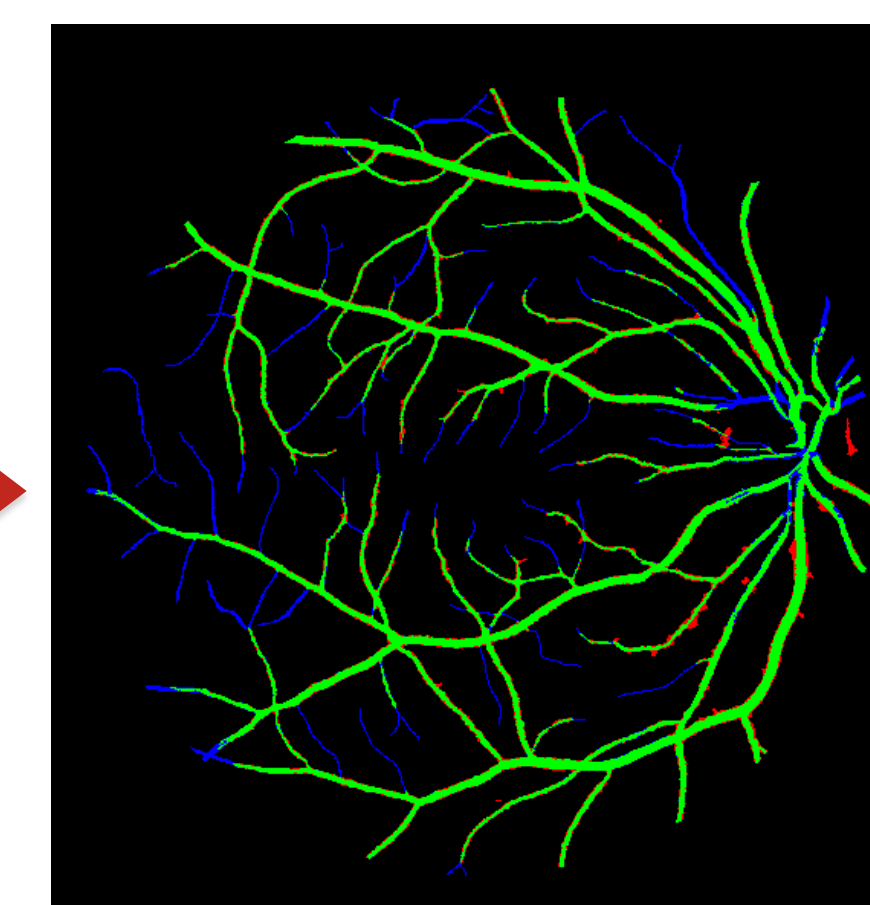- Line Detection
- Neural Network
- Scale Space
- Morphological

Optional Modification

Weighted Avg.

Final Image

MF: Matched Filtering
LD: Line Detection
NN: Neural Network
SS: Scale-space
M: Morphological
H1 : Hybrid Algorithm
H2: Modified Hybrid Algorithm (fewer false negatives around the optical disk)
2nd : hand-labeled vessel segmentation by a second observer
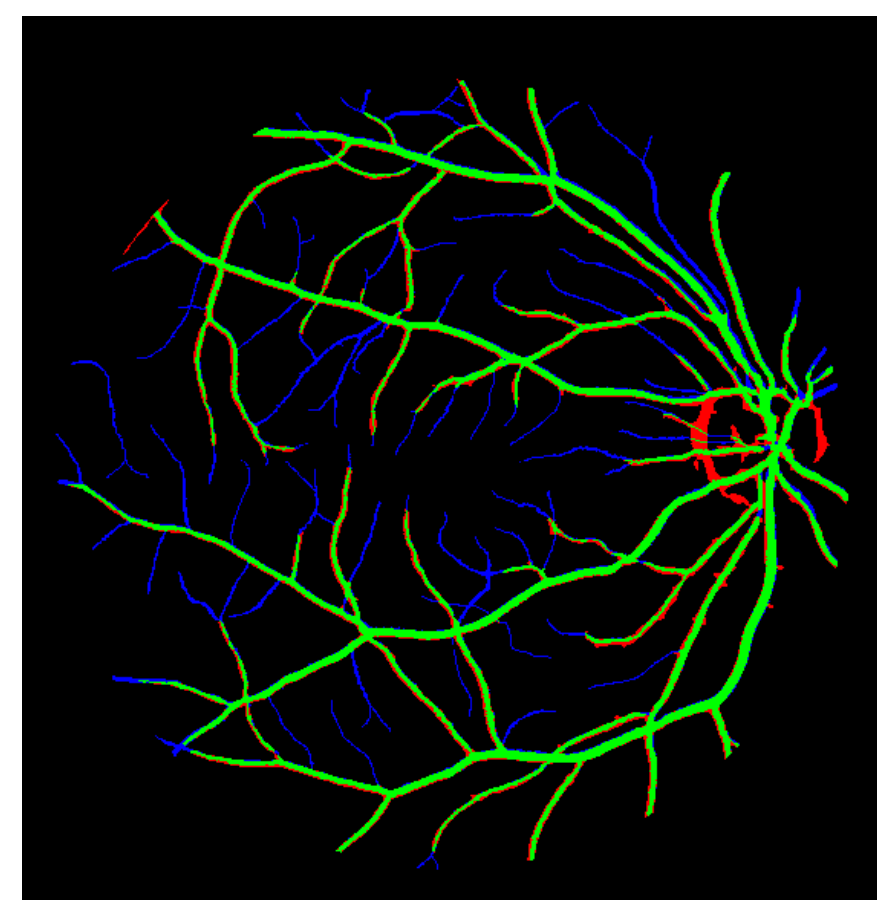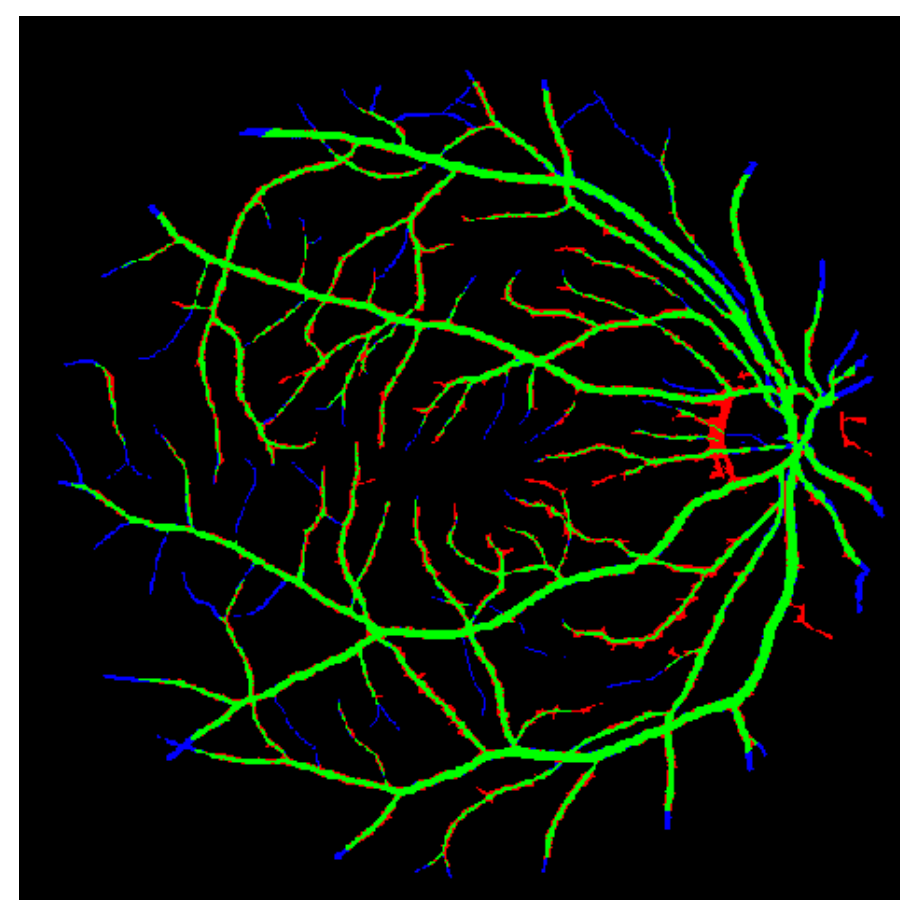
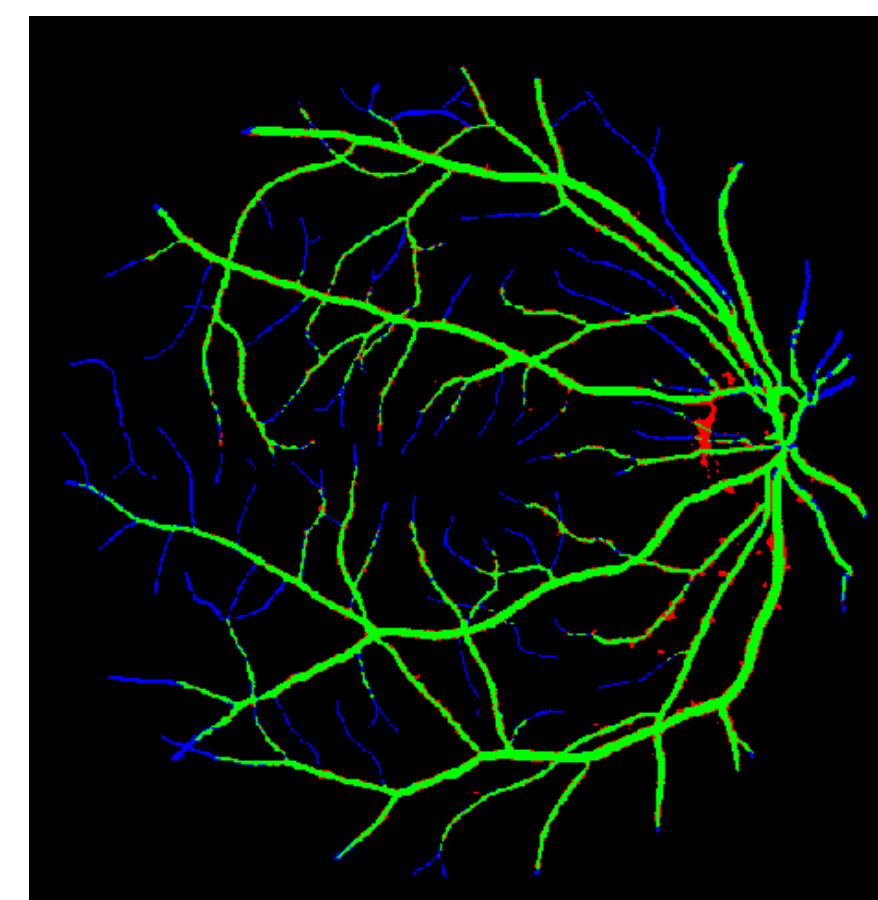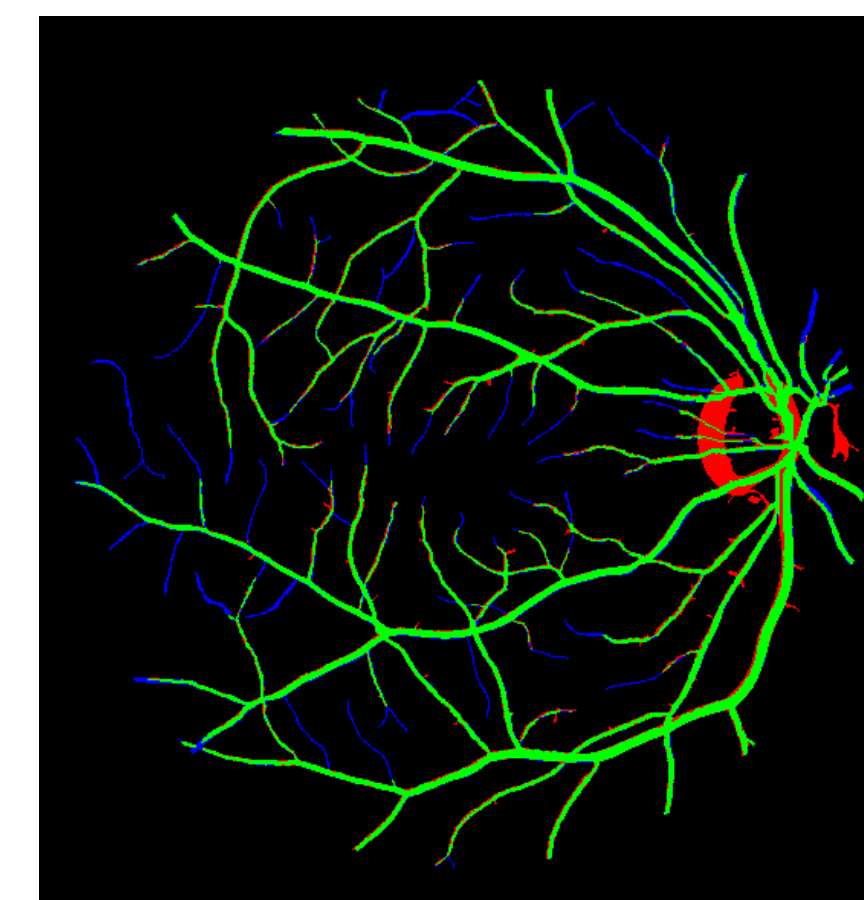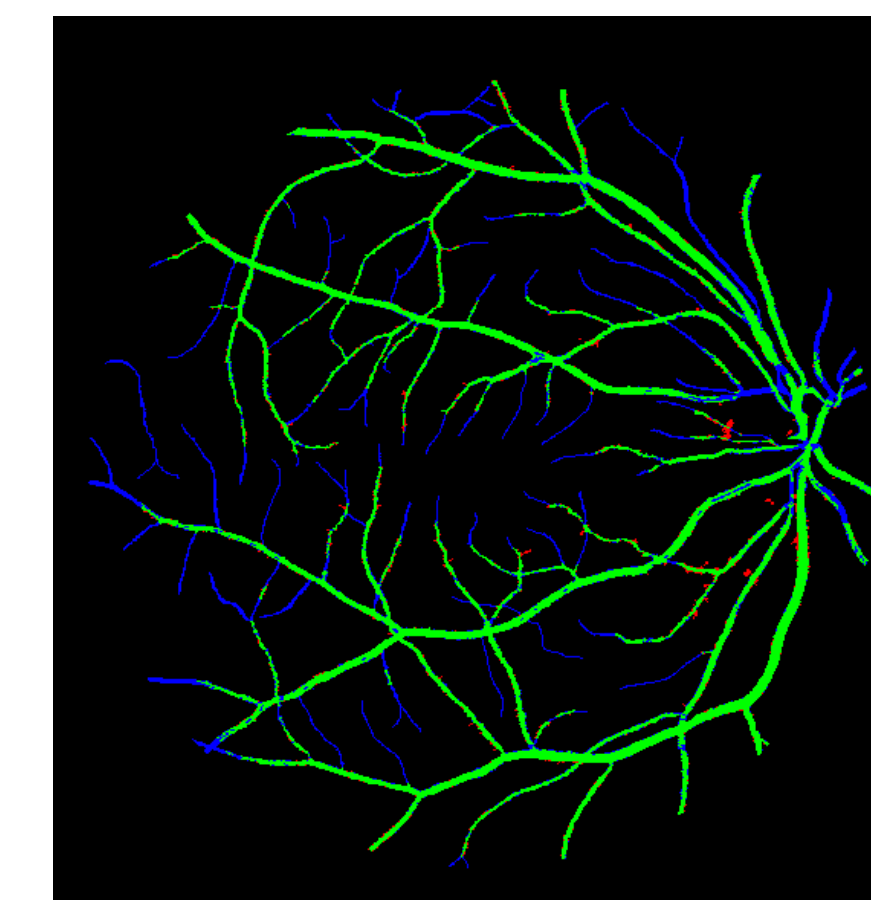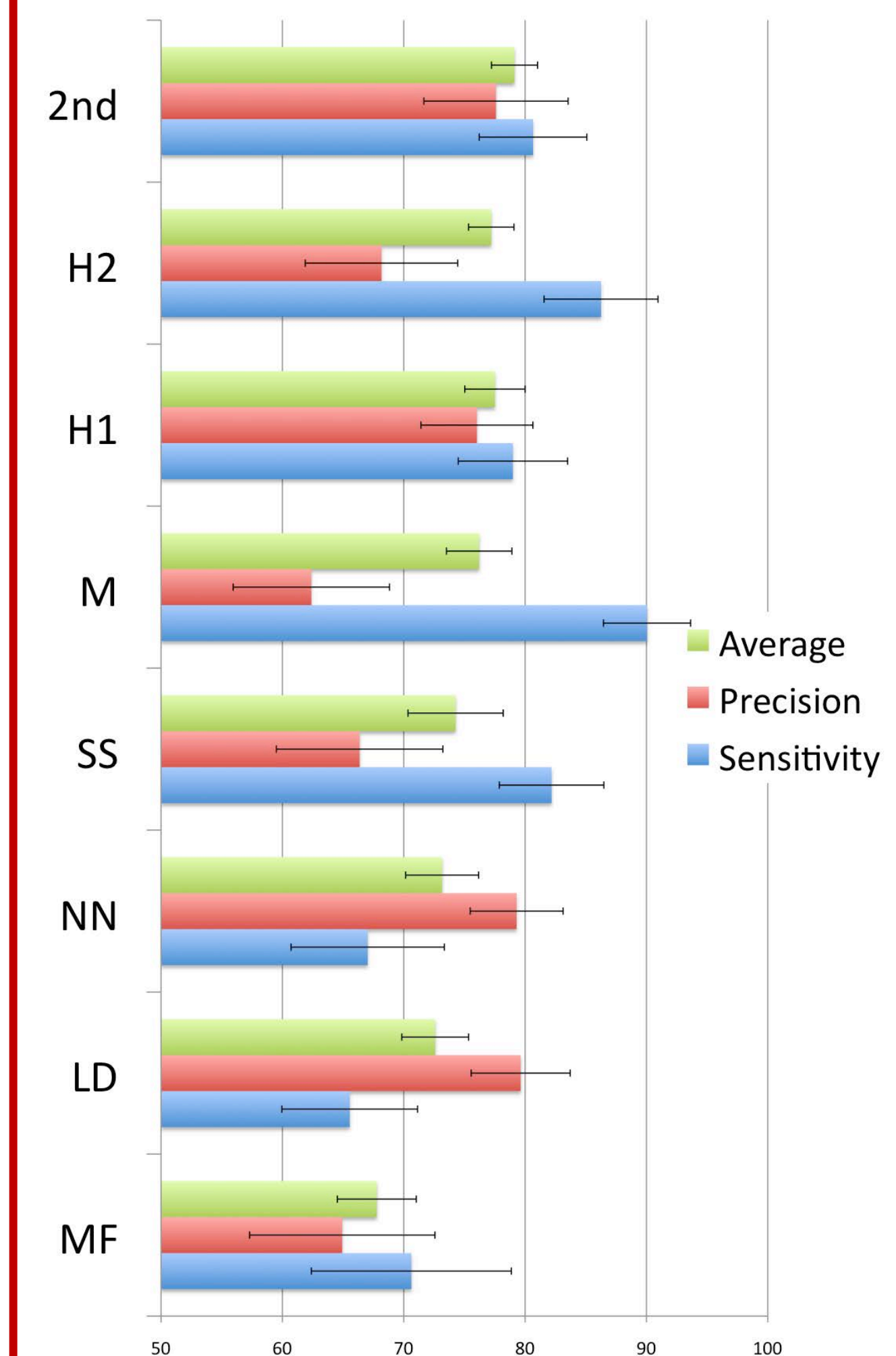| Matched Filtering	Line Detection	Neural Network	Scale-space	Morphological
Gaussian shaped matched filters in 12 directions	Line detection in 18 directions and at 7 scales	Classification with 7 features: gray-levels and invariant moments	Scale-dependent representation for detector based on gradient & hessian	Top-hat operation to keep only the prominent features