Supplementary Material

Table S1. Network parameters for ResNet50

Layer name	Output size	Kernel size, filters
input	128×128	
conv1	64×64	7×7, 64, stride=2
max pool	32×32	3×3
conv2_block	32×32	$\begin{bmatrix} 1 \times 1, & 64 \\ 3 \times 3, & 64 \\ 1 \times 1, & 256 \end{bmatrix} \times 3$
conv3_block	16×16	$\begin{bmatrix} 1 \times 1, & 128 \\ 3 \times 3, & 128 \\ 1 \times 1, & 512 \end{bmatrix} \times 4$
conv4_block	8×8	$\begin{bmatrix} 1 \times 1, & 256 \\ 3 \times 3, & 256 \\ 1 \times 1, & 1024 \end{bmatrix} \times 6$
conv5_block	4×4	$\begin{bmatrix} 1 \times 1, & 512 \\ 3 \times 3, & 512 \\ 1 \times 1, & 2048 \end{bmatrix} \times 3$
output	1×1	Global Average Pooling, 7-D FCN

Table S2. Classification performance using 4096- and 256-level grayscale images

Grayscale levels	**4096**			**256**		
Evaluation	**Acc.**	**m-F1**	**M-F1**	**Acc.**	**m-F1**	**M-F1**
Fold 1	0.937	0.937	0.877	0.942	0.942	0.890
Fold 2	0.894	0.894	0.763	0.873	0.873	0.761
Fold 3	0.903	0.903	0.831	0.897	0.897	0.789
Fold 4	0.935	0.935	0.832	0.931	0.931	0.817
Fold 5	0.910	0.910	0.792	0.887	0.887	0.779
Avg.	0.916	0.916	0.819	0.906	0.906	0.807

Table S3. Classification performance across preprocessing modes: original, segmented (non-binarized), and segmented (binarized) images.

	Original			Segmented Non-binarized			Segmented Binarized		
	Acc.	**m-F1**	**M-F1**	**Acc.**	**m-F1**	**M-F1**	**Acc.**	**m-F1**	**M-F1**
Fold 1	0.617	0.617	0.220	0.937	0.937	0.877	0.747	0.747	0.682
Fold 2	0.592	0.592	0.338	0.894	0.894	0.763	0.906	0.906	0.784
Fold 3	0.576	0.576	0.227	0.903	0.903	0.831	0.908	0.908	0.822
Fold 4	0.500	0.500	0.229	0.935	0.935	0.832	0.917	0.917	0.788
Fold 5	0.590	0.590	0.229	0.910	0.910	0.792	0.903	0.903	0.807
Avg.	0.575	0.575	0.249	0.916	0.916	0.819	0.876	0.876	0.777

Table S4. m-F1 and M-F1 scores across contrast enhancement methods (format: m-F1/M-F1).

	Segmented (non-binarized)		HE		CLAHE-1		CLAHE-3		CLAHE-40	
	m-F1	**M-F1**	**m-F1**	**M-F1**	**m-F1**	**M-F1**	**m-F1**	**M-F1**	**m-F1**	**M-F1**
Fold 1	0.937	0.877	0.931	0.852	0.936	0.865	0.949	0.905	0.923	0.849
Fold 2	0.894	0.763	0.896	0.788	0.887	0.744	0.869	0.744	0.887	0.769
Fold 3	0.903	0.831	0.883	0.789	0.892	0.748	0.885	0.743	0.871	0.751
Fold 4	0.935	0.832	0.591	0.295	0.920	0.813	0.931	0.812	0.872	0.632
Fold 5	0.910	0.792	0.893	0.800	0.888	0.764	0.890	0.791	0.857	0.748
Avg.	0.916	0.819	0.839	0.705	0.905	0.787	0.905	0.799	0.882	0.750