Supplementary Materials

The members of the GoldenPass team were affiliated with Graduate School of Artificial Intelligence in Korea Advanced Institute of Science and Technology (KAIST) and Knowledge of AI Lab in NCSOFT company. The members of the MediTrain team were affiliated with the Medical Science Research Center in Ansan Hospital of Korea University. Lastly, the members of the DRM team were from the School of Electrical Engineering in KAIST.

S1 Table. Algorithm descriptions and hyper-parameters

Team	GoldenPass	MediTrain	DRM
Architecture	FPN+ResNet-50 encoder (model) BCE+Jaccard (loss)	FPN+VGG-16 encoder (model) BCE (loss)	Inception v4, SVM (model) BCEWithLogitsLoss (loss)
Input size (batch size)	256×256×3 (16)	768×1,920×3 (16)	299×299×3 (16)
Slide layer level	Level 4 for AMC Level 3 for SNUBH	Level 4	Level 4
Optimization (learning rate)	Adam (lr=1e-3)	RMSProp (lr=4e-4)	Adam (lr=3e-3)
Decay rate	Step decay when validation loss does not improve	None	Step decrease by 1/3 for every 4 epochs)
Augmentation real-time	Random horizontal and vertical flip Random rotation	Random horizontal and vertical flip Random rotation (±45°)	Random horizontal and vertical flip Random rotation (±90°, 180°)
Pre-processing	ROI extraction to generate patches for training Rescale based on the magnification level of original slide Stain normalization: Vahadane's method Otsu thresholding to discriminate the cell areas	K-fold cross-validation: 5-fold Fine-tuning on VGG-16 with ImageNet pre-trained weights Down-sampling for resizing to specific dimension with Lanczos interpolation	Thresholding tumor (>15%) L2 norm
Post-processing	Resizing the heatmap with different scales and thresholds	Averaging the output predictions from each fold Generation of heatmap from patch classifier	Generation of heatmap from patch classifier Extraction of major axis, minor axis from heat map
Inference for confidence	Max probability value from the heatmap	CNN output confidence	SVM classification from the extracted features
Output threshold	Youden's J Statistic	Youden's J Statistic	Youden's J Statistic

BCE, binary cross entropy; CNN, convolutional neural networks; DRM, DeepRunningMachine; FPN, feature pyramid network; ROI, region of interest; SVM, support vector machine.