CAMELYON16

ISBI Challenge on Cancer Metastasis Detection in Lymph Node

MIDDLE EAST TECHNICAL UNIVERSITY

Ugur HALICI Prof Dr
Department of Electrical and Electronics Engineering
Neuroscience and Neurotechnology

Mustafa Umit ONER MSc Student
Department of Electrical and Electronics Engineering

Rengul CETIN ATALAY Prof Dr
Health Informatics

Outline of the proposed method

Preprocessing :
Determining lymph node sections on Layer 7 images

Classification :
CNN on sliding windows on Layer 2 images

Post Processing :
Decision fusion for metastasis regions and slides

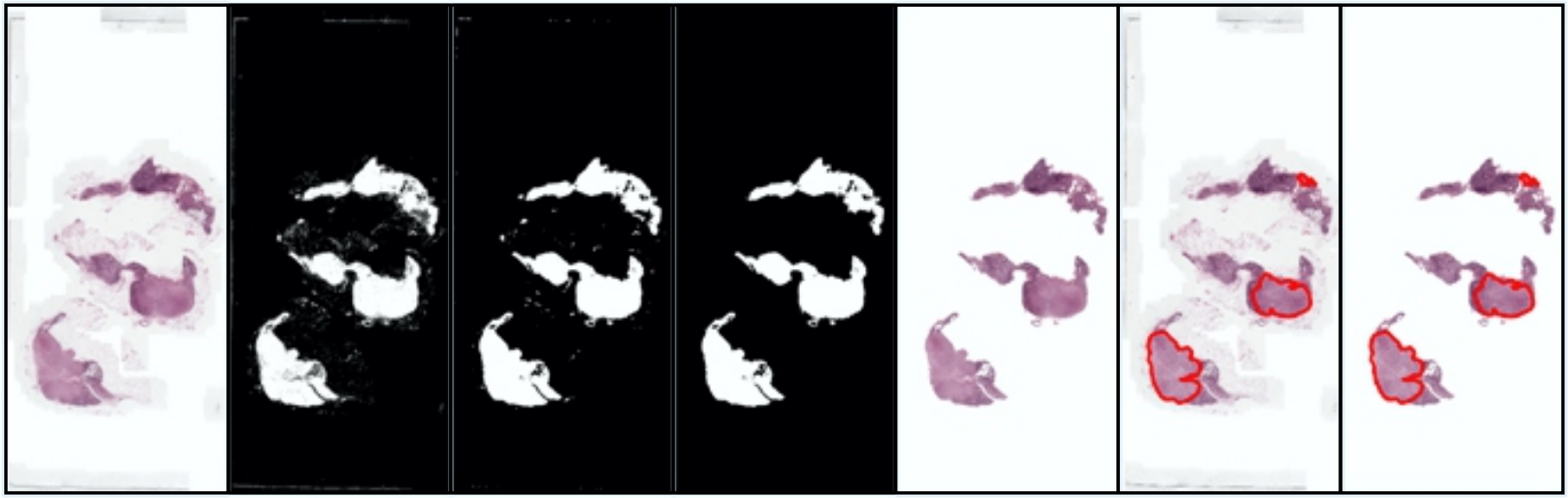
Preprocessing of Whole Slide Images

To eliminate background (Layer 7)

- OTSU thresholding
- Median filtering
- Connected component analysis
- Elimination of small noisy parts
- Converting to binary

Output : Mask of lymph node sections in the WSIs

Effects of preprocessing operations



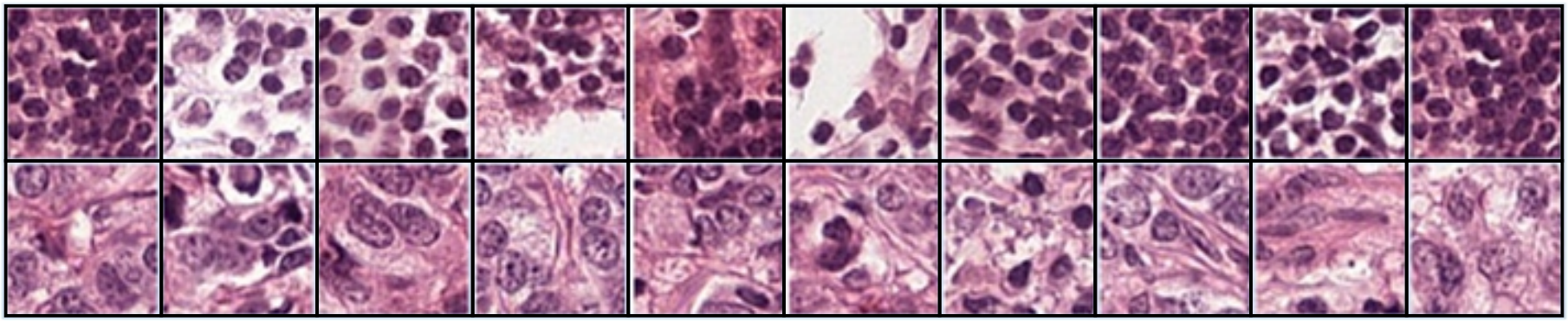
a b c d e f g

a Original image
b Otsu thresholding
c Median filtering
d Small connected component elimination (mask)
e Final output of preprocessing stage (masked image)
f Metastasis region boundaries shown on original image
g Metastasis region boundaries shown on masked image

Dataset for training CNN

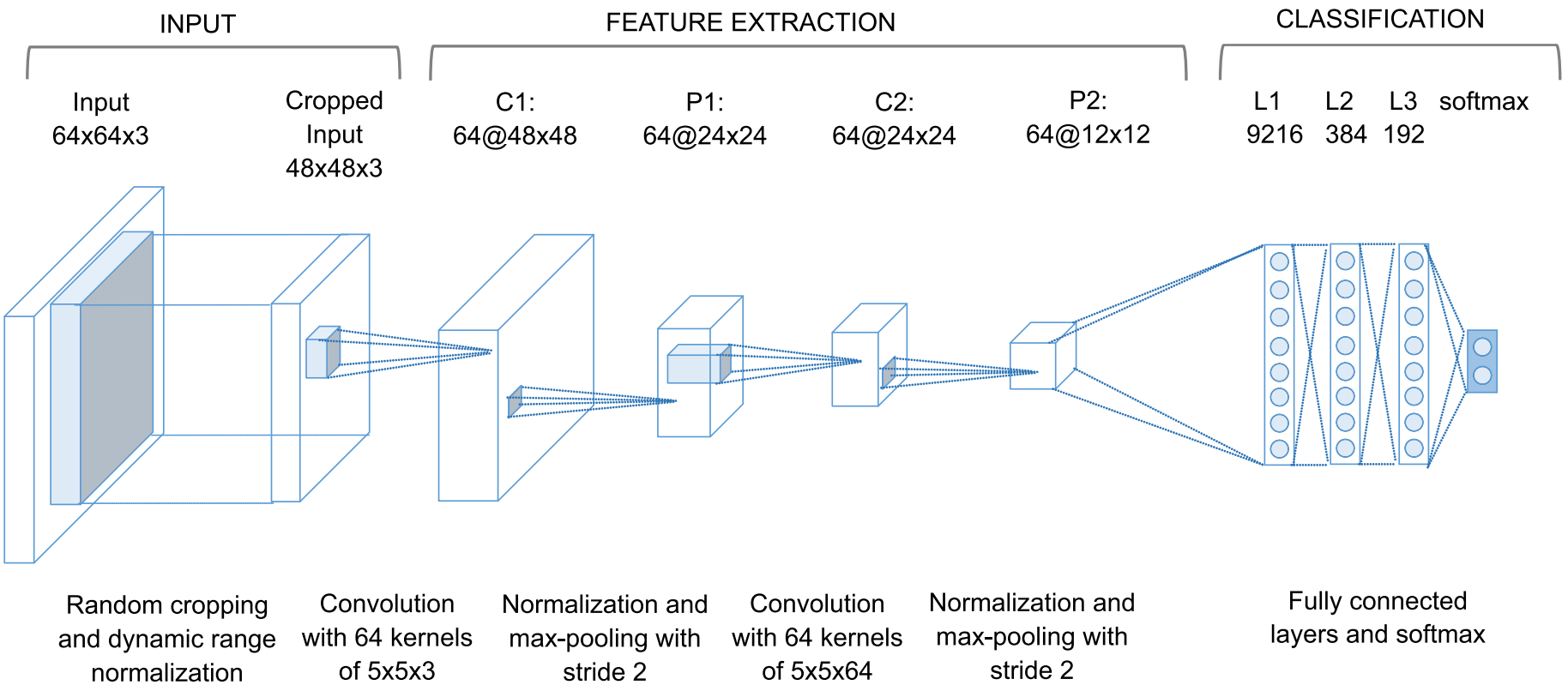
- 480,000 randomly selected 64x64x3 RGB sub-images (Layer 2)
- Half from slides with label NORMAL
- Half from metastasis regions of slides with label TUMOR
- Images with more than 75% background eliminated

Example dataset images



First row : Samples with label NORMAL
Second row : Samples with label TUMOR

Convolutional Neural Network architecture

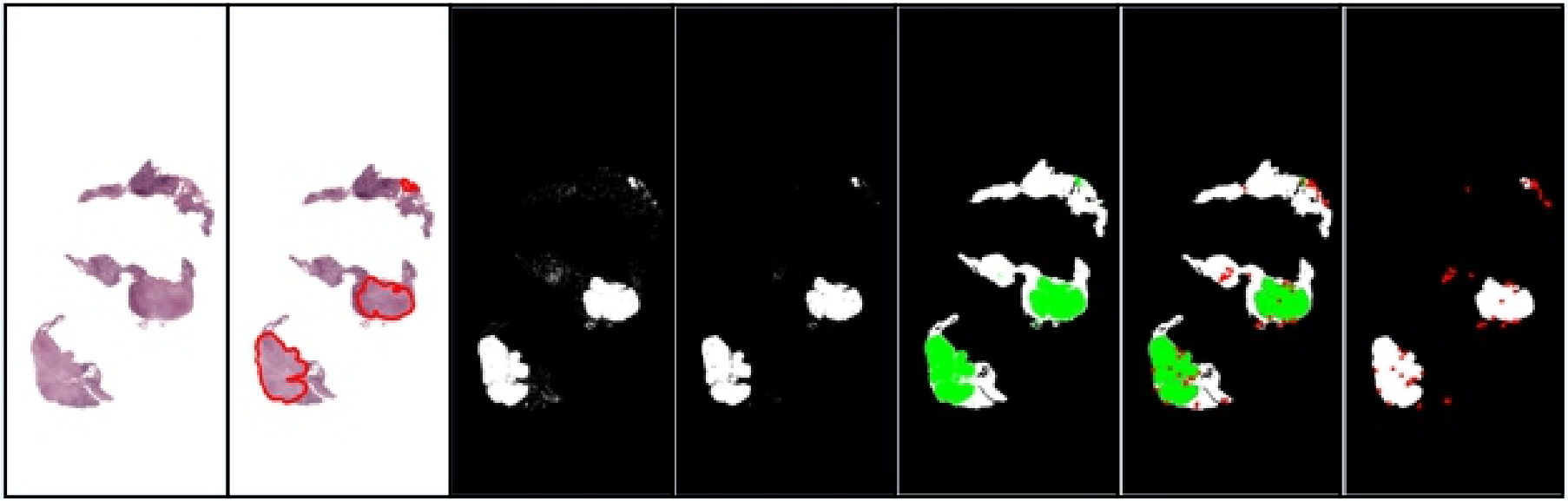


Metastasis detection and localization

Postprocessing consists of :

- Elimination of small regions
- Confidence Filtering (Gaussian like) on CNN output
- Extraction of metastasis region representatives by connected component analysis for Evaluation 2
- Whole slide probabilities for Evaluation I

Effects of post processing operations



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a Final output of preprocessing stage (masked image)
b Metastasis Region Boundaries shown on masked Image
c Binary image showing metastasis regions constructed from CNN output labels,
d Eroded binary image eliminating small regions
e Probability image obtained after Confidence Filtering (green area)
f Metastasis represantative points shown on probability image
g Metastasis representatives shown on evaluation mask image

Results on training set :

Evaluation I
AUC ROC : 0.920087

Evaluation II
Average FROC : 0.5349