# CAMELYON16

ISBI Challenge on Cancer Metastasis Detection in Lymph Node


## MIDDLE EAST TECHNICAL UNIVERSITY

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## 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

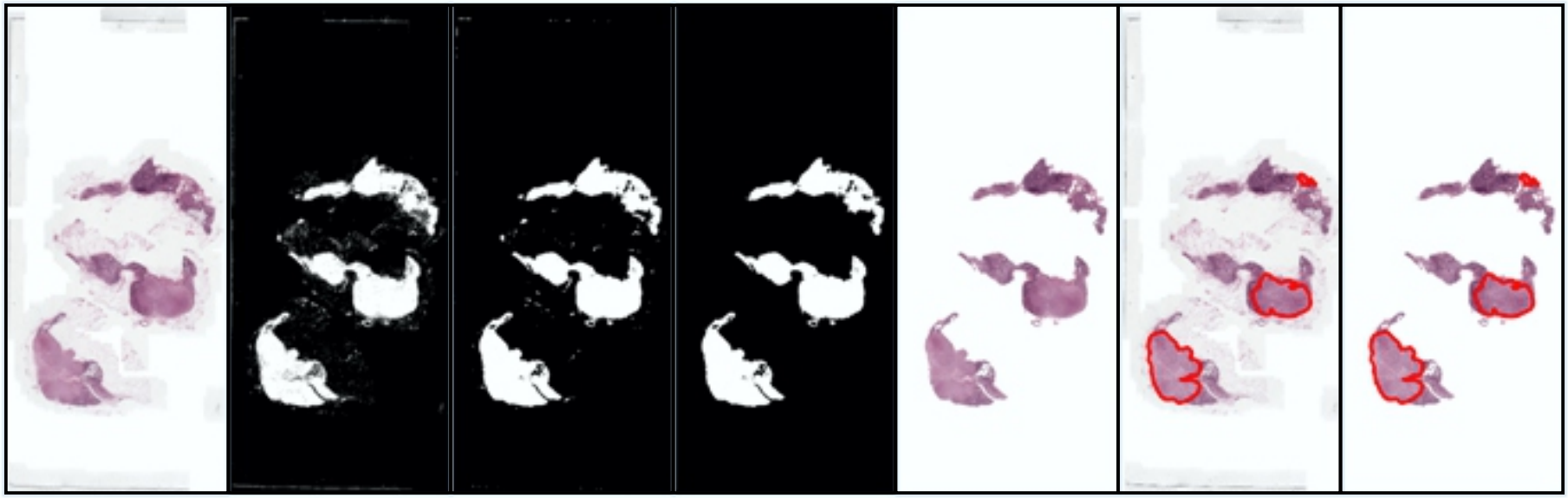
## Preprocessing of Whole Slide Images

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



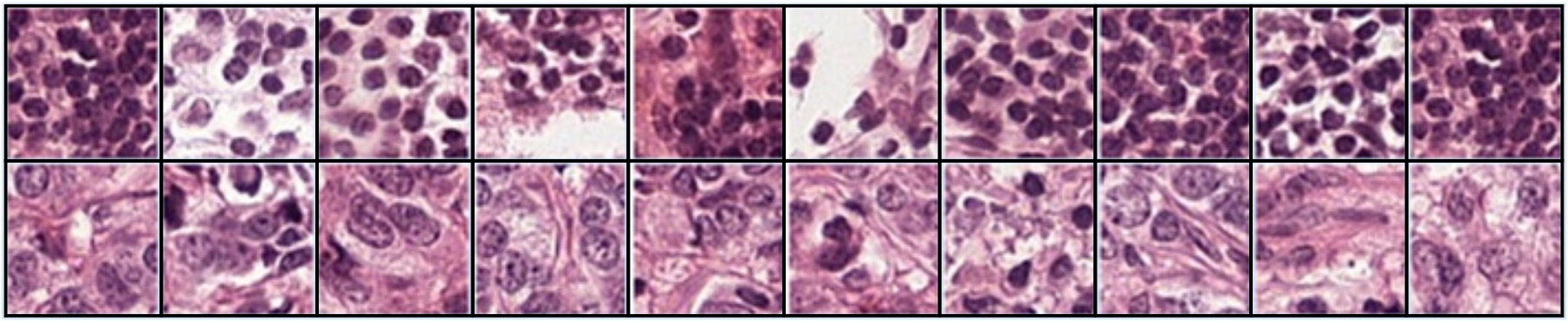
a b c d e f g

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

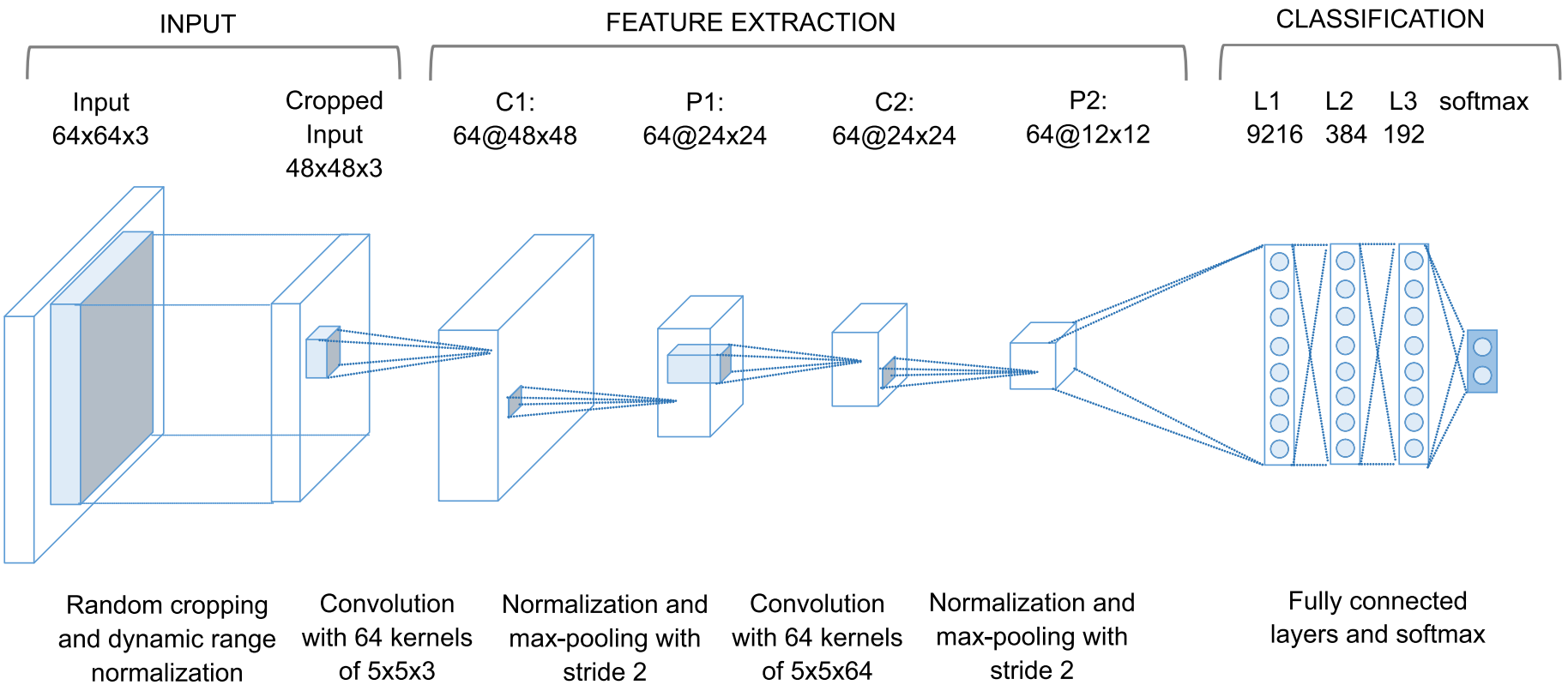
- 480,000 randomly selected 64x64x3 RGB sub-images (Layer 2)
- Half from slides with label NORMAL
- Half from metastasis regions of slides with label TUMOR
- Images with more than 75% background eliminated

# Example dataset images



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

# Convolutional Neural Network architecture

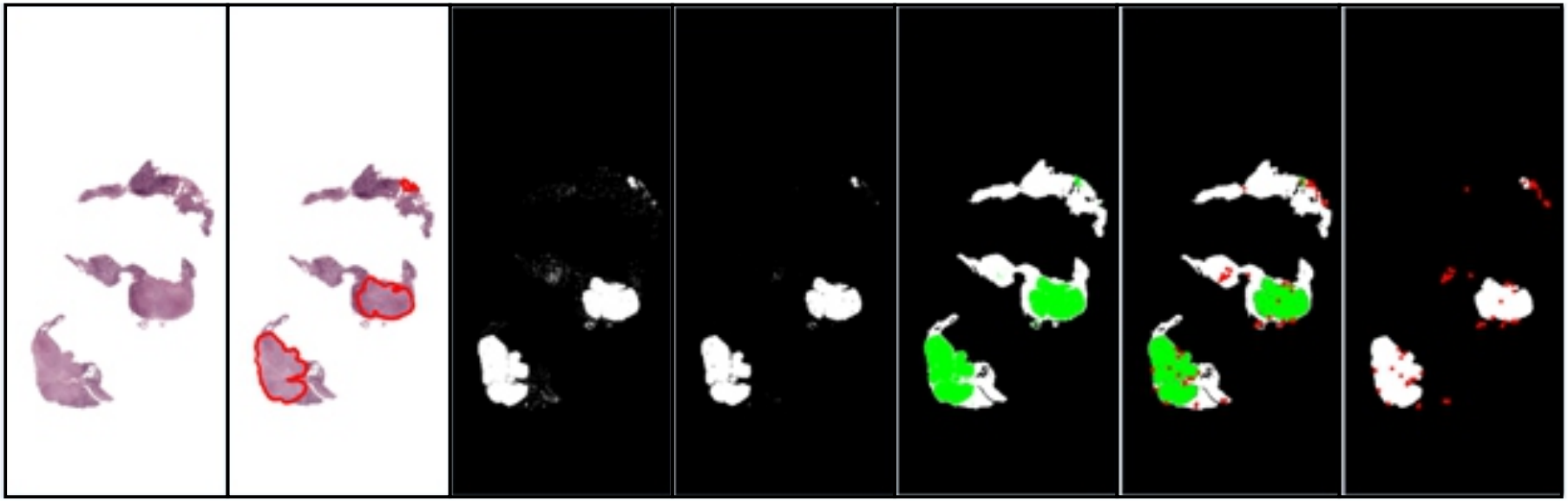


## Metastasis detection and localization

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



a b c d e f g

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