

# TUMOR BUDDING IN BRIGHTFIELD IMMUNOSTAINED COLON SECTIONS

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## What is Tumor Budding?

A bud is defined as a cell cluster of 1-4 tumor cells

TB is an independent inverse prognostic factor for

- lymph node metastasis in pT1 colorectal cancer
- survival in stage II colorectal cancer

Recommended in Germany by guidelines since Q1 2019.

## Manual Hotspot Method

As defined during Int. Tumor Budding Consensus Conference (ITBCC) in 2016:

To be carried out in **H&E-stained** colon sections

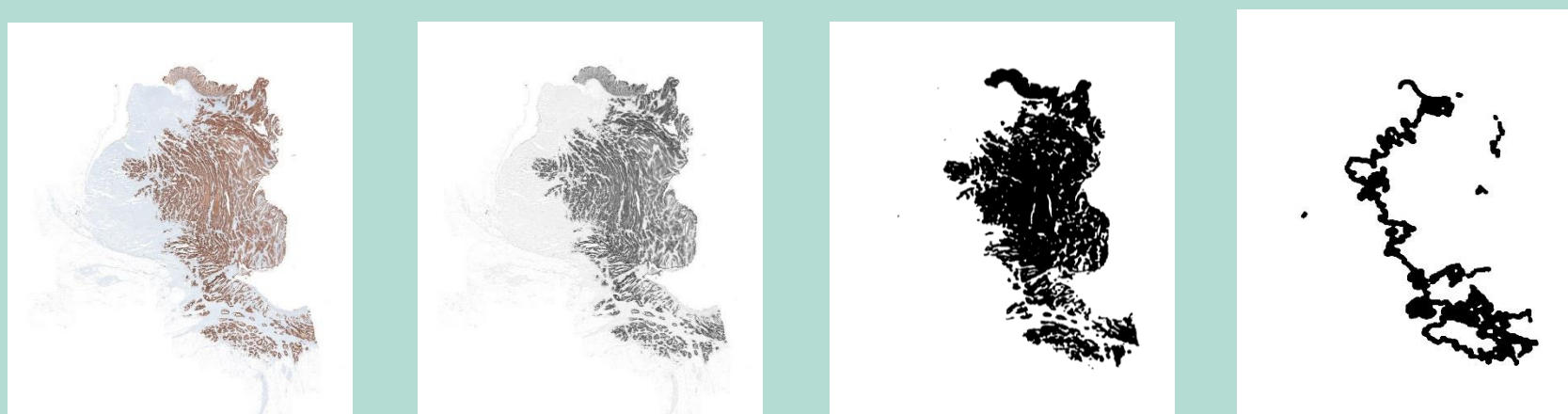
1. Along entire tumor invasive margin, find hotspot of diameter 1mm (20x field of view, 0,785 mm<sup>2</sup>) that contains the most buds
2. Risk stratification with three-tier system:

			pT1 CRC	Stage II CRC
0-4 buds	Low budding	Bd 1		
5-9 buds	Intermediate budding	Bd 2	Increased risk of lymph node metastasis	
10 or more buds	High budding	Bd 3		Increased risk of recurrence and mortality

## Proposed Automatic Hotspot Method

Carried out in **immunostained** colon sections

1. User paints tumor invasive front manually using brush or polygon tool (automatic detection in progress)
2. Potential peri-tumoral buds are identified using „classical“ image processing based on color, area and distance to main tumor mass



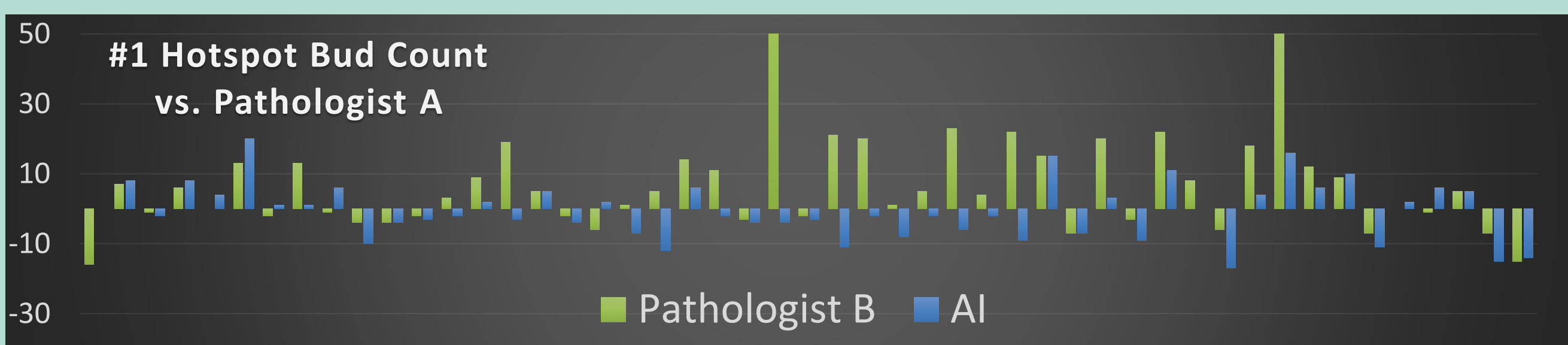
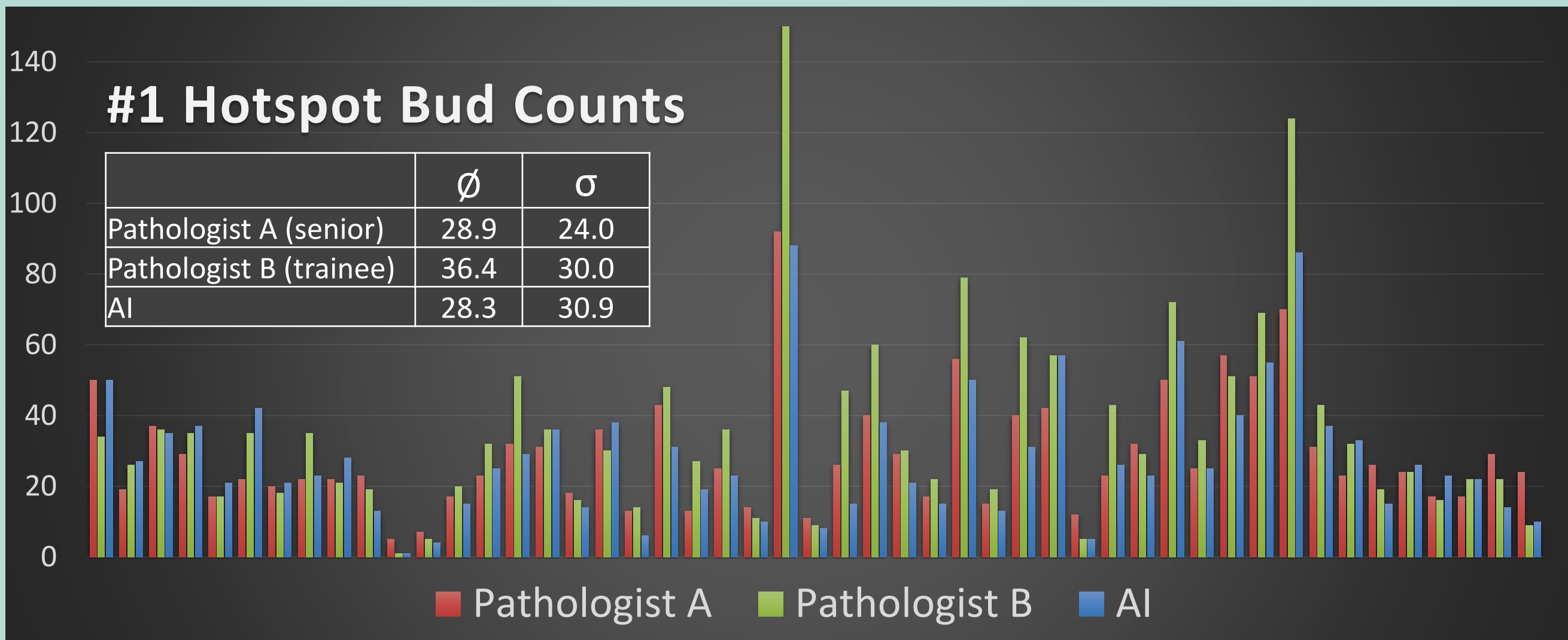
3. Specificity is then increased by filtering out false buds using a Convolutional Neural Network
4. Top N hotspots are automatically located

## Bud Detection Evaluation

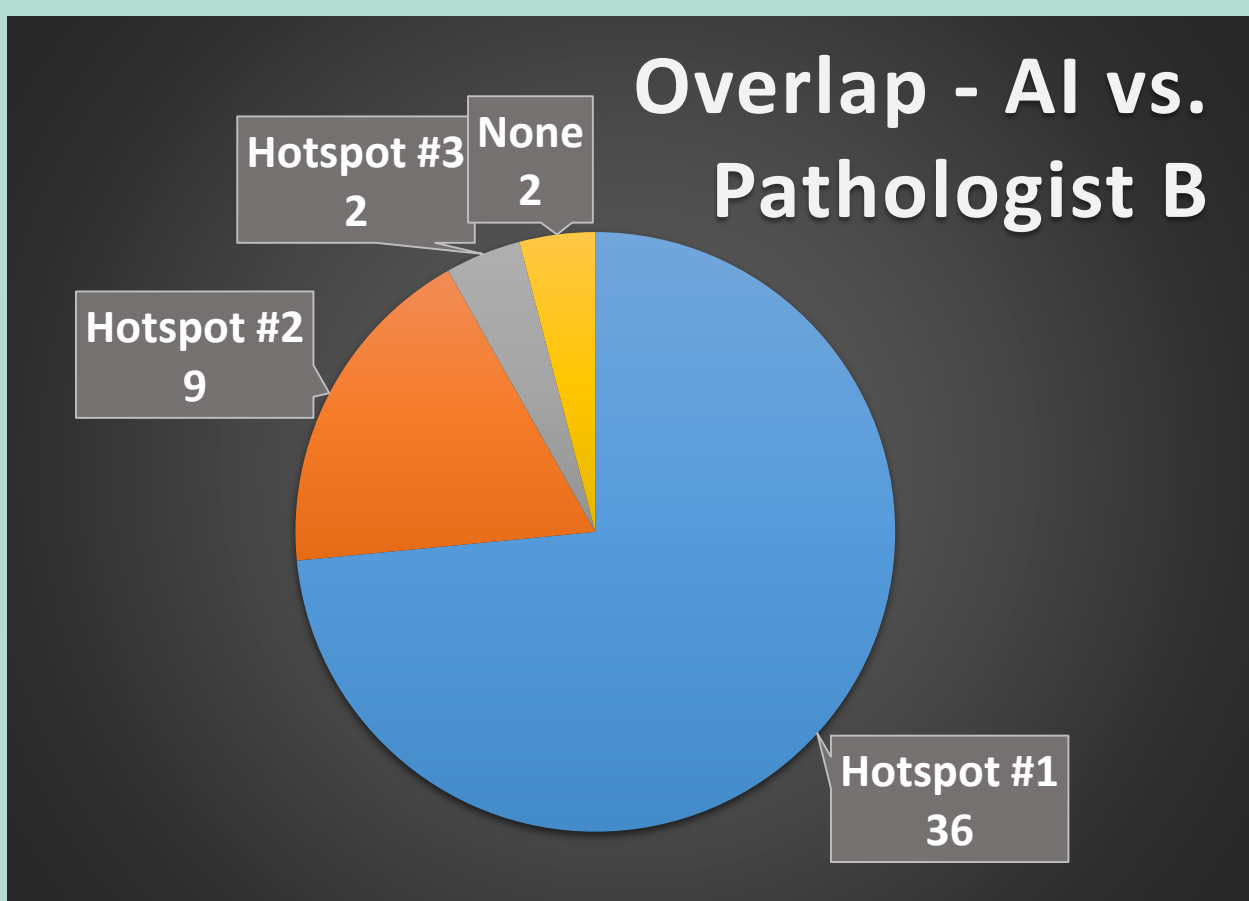
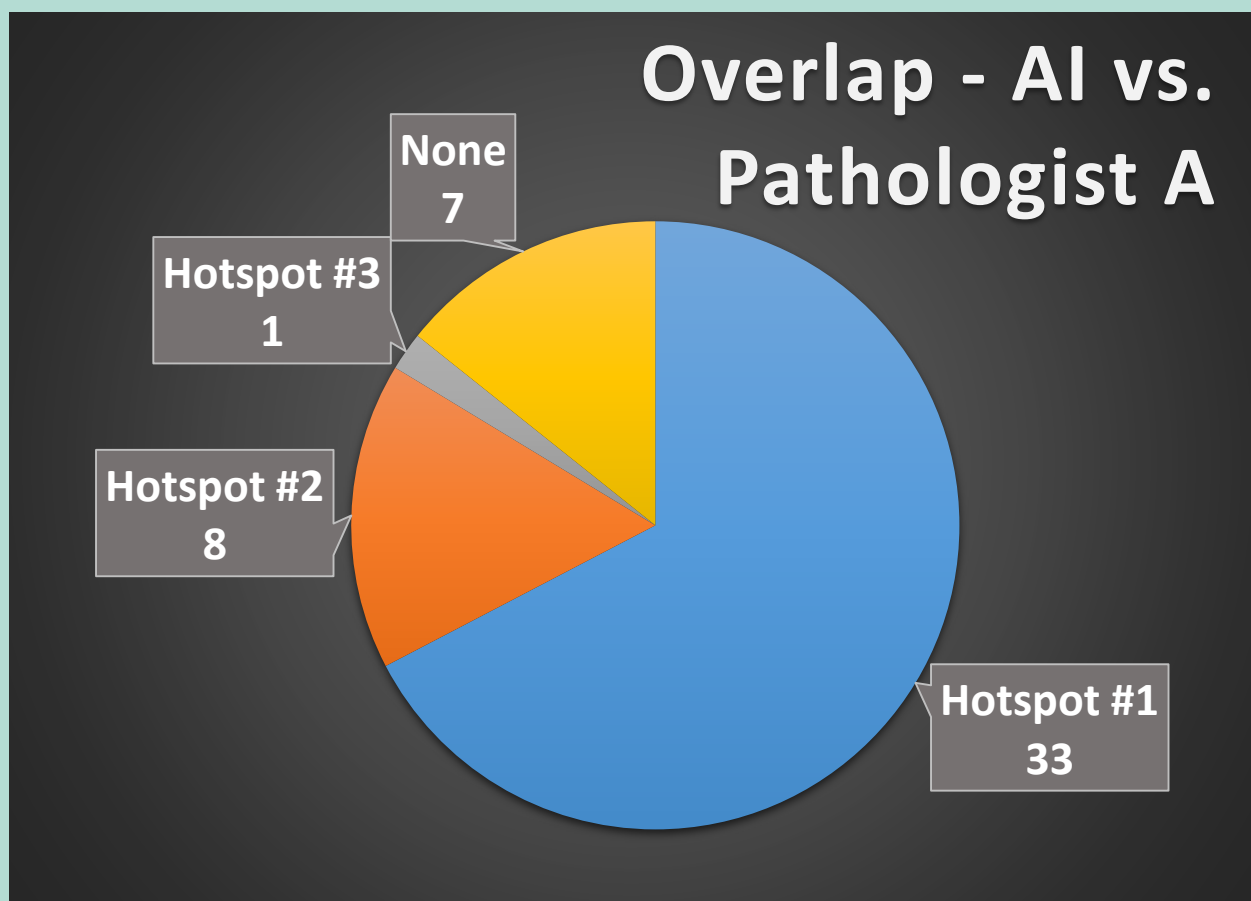
Automatic System termed „AI“ vs. senior pathologist A and trainee pathologist B.

Train N=49 WSIs	Validation N=13 WSIs	Test N=49 WSIs
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- scanned with 3DHISTECH Pannoramic 250 Flash
- 0,19 µm/px (40x objective), brightfield
- Pan cytokeratin (AE1 + AE3)

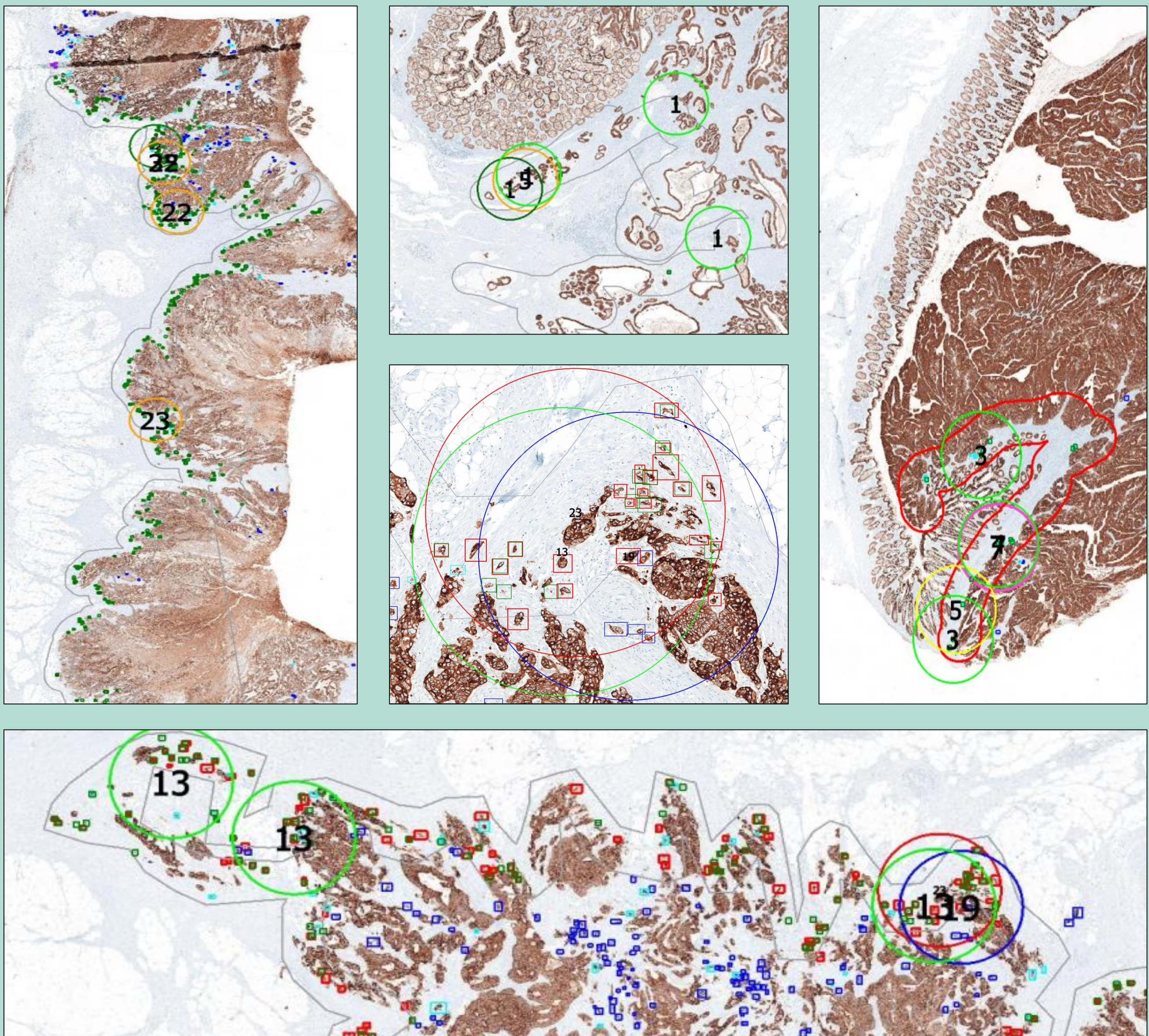


## Hotspot Location Evaluation



Hotspots overlap, if their centers' distance is below 1000 µm

## Gallery



## Outlook

Define IHC cut-offs and explore more accurate stratification algorithm that leverages new automation capabilities