

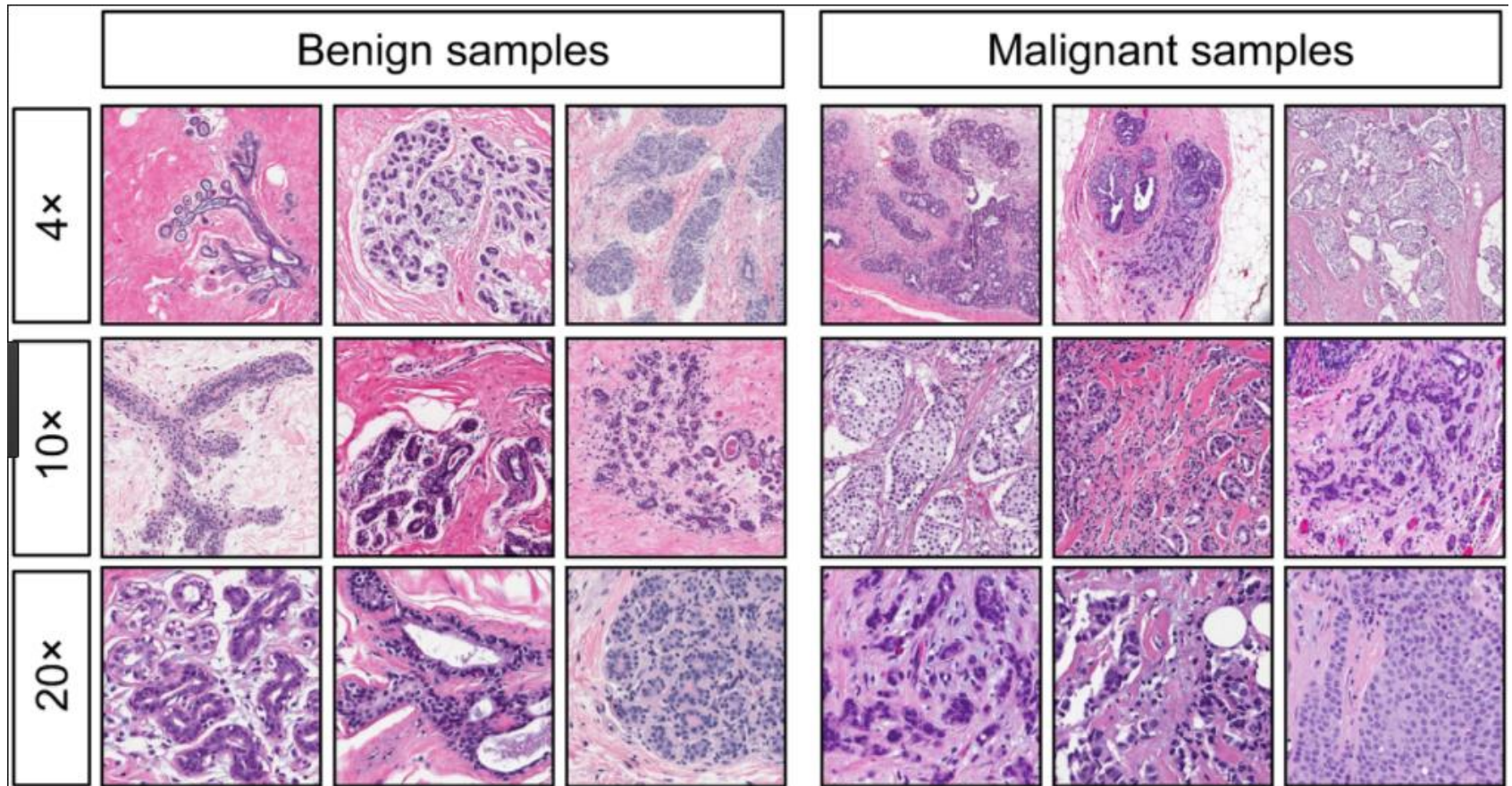
AI HeLP Challenge

Automatic pathology reading
using artificial intelligence:
Breast Cancer Classification

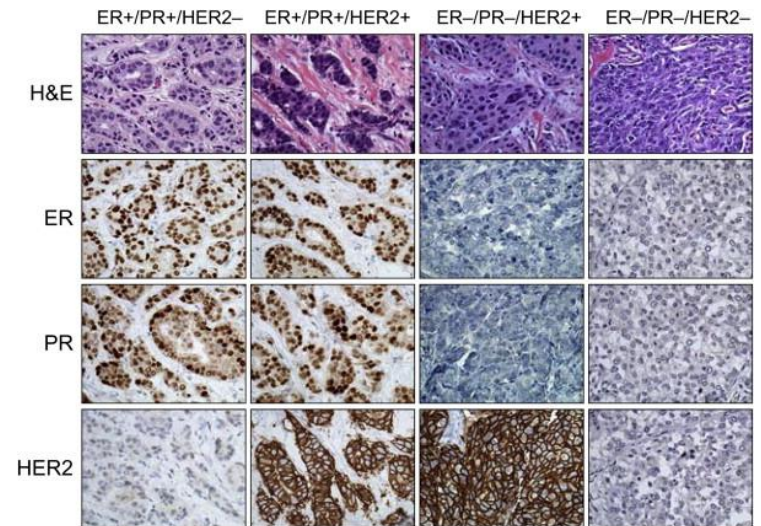
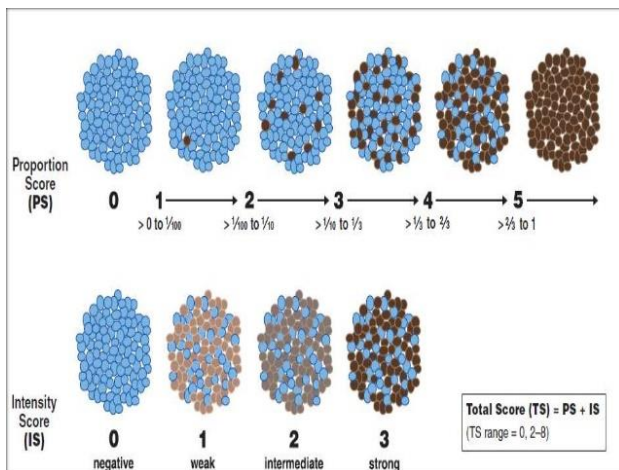
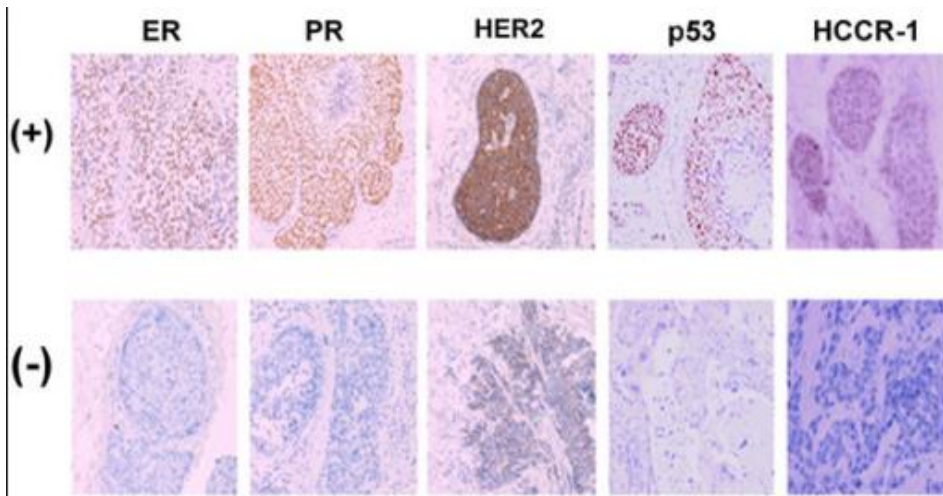
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Automated reading of breast specimens

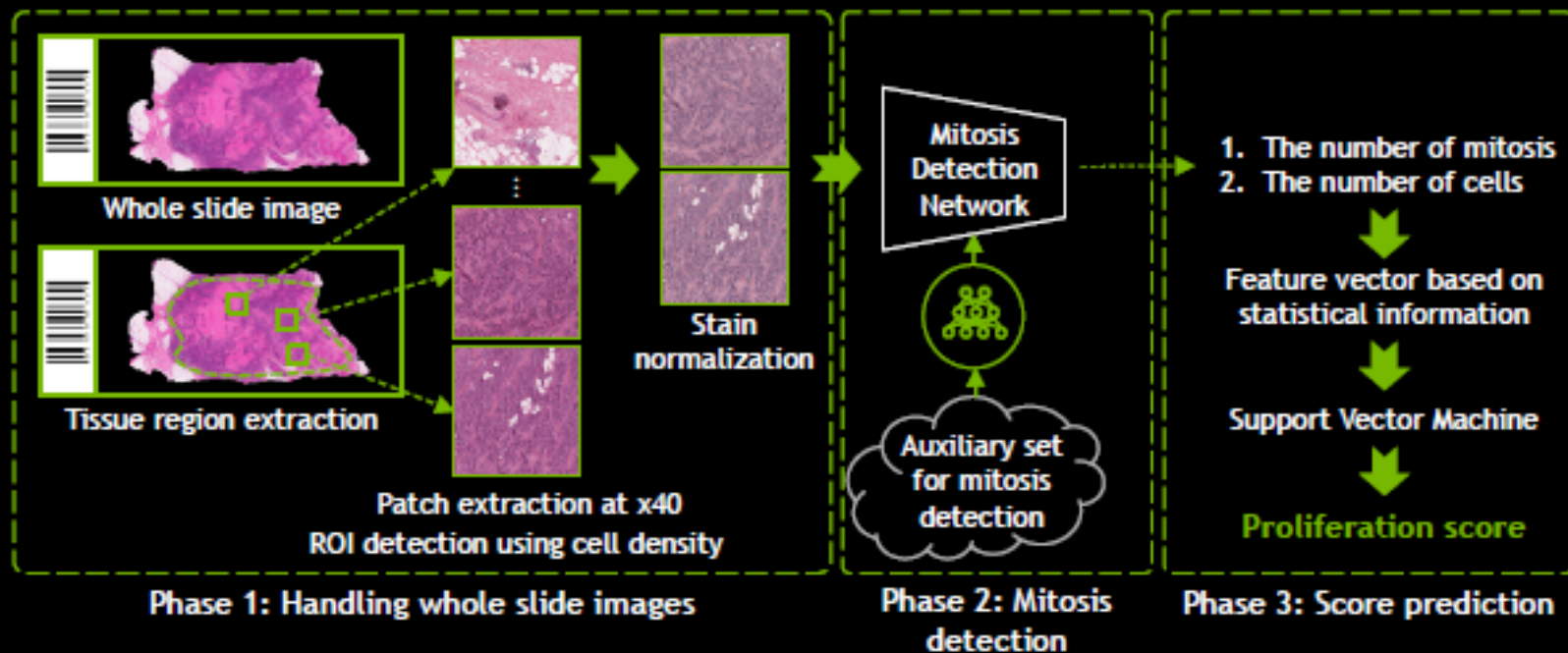


Automatic scoring



TUMOR PROLIFERATION SCORE PREDICTION

System overview



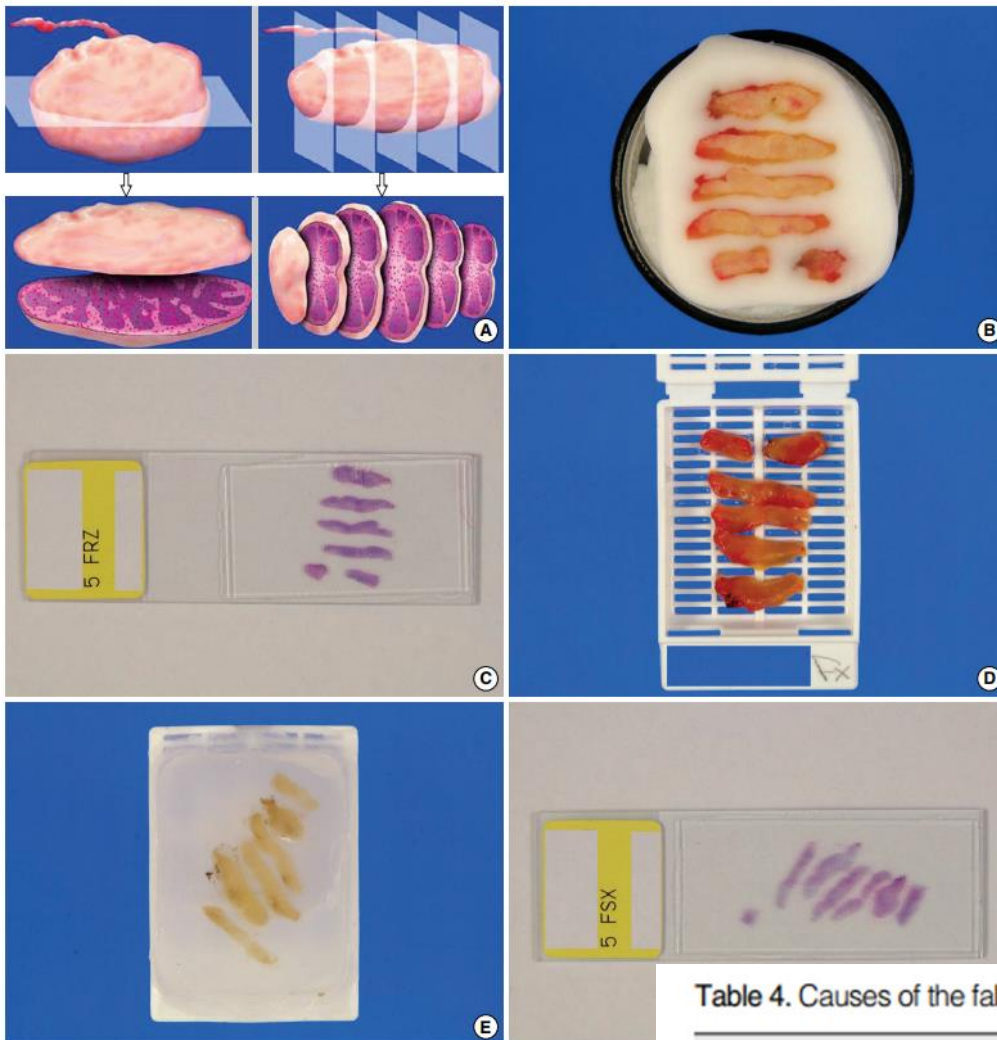


Table 4. Causes of the false negative results

Causes	N	Micro- metastasis	Macro- metastasis
Interpretation error	10	7	3
Presence of tumor in different levels (FS negative, but PS positive)	19	17	2
Poor quality of FS (folding or invisible capsule)	5	5	0
Total	34	29	5

False negativity: 19~42%

연구 방향

- 수술장 연계 응급 병리 판독
 - 감시림프절 암전이 여부
 - 암 절제면 잔여 여부
- 수술 중 시행되는 동결절편 병리검사는 적절한 수술 범위를 결정하는 데 매우 중요함.
- 동결절편 병리검사 시간이 길어질 경우 수술 및 마취 시간이 길어져 환자에게 해를 끼칠 수 있음.
- 판독이 잘못될 경우 암을 완전히 제거하지 못하거나, 불필요한 절제로 인한 합병증이 생길 우려가 있음.
- 빠른 시간 내에 정확한 판독이 필수적임.
- 딥 러닝을 이용한 이미지 분석이 이에 도움될 수 있음.

- 딥 러닝을 동결 절편 진단에 적용할 경우
진단의 정확성 연구 필요
- 림프절이 아닌 암 절제면 진단에서도
딥 러닝 진단의 정확성 연구 필요
- 실제 판독에 적용할 경우
진단 소요 시간에 대한 연구 필요

문헌 검색

- 유방암, 대장 용종, 전립선암 등에서 딥 러닝을 사용한 병리 진단에 대한 연구가 시행된 바 있음
- 그러나 딥 러닝을 동결절편 병리 진단에 이용한 연구는 현재까지 없었음

Diagnostic Assessment of Deep Learning Algorithms for Detection of Lymph Node Metastases in Women With Breast Cancer

Babak Ehteshami Bejnordi, MS; Mitko Veta, PhD; Paul Johannes van Diest, MD, PhD; Bram van Ginneken, PhD; Nico Karssemeijer, PhD; Geert Litjens, PhD; Jeroen A. W. M. van der Laak, PhD; and the CAMELYON16 Consortium

Key Points

Question What is the discriminative accuracy of deep learning algorithms compared with the diagnoses of pathologists in detecting lymph node metastases in tissue sections of women with breast cancer?

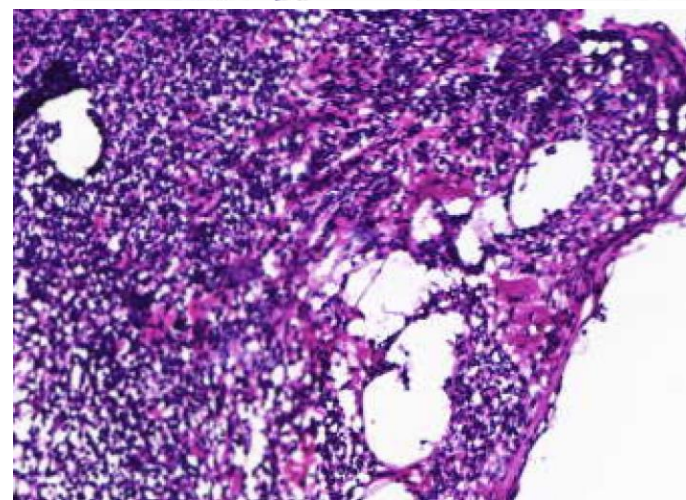
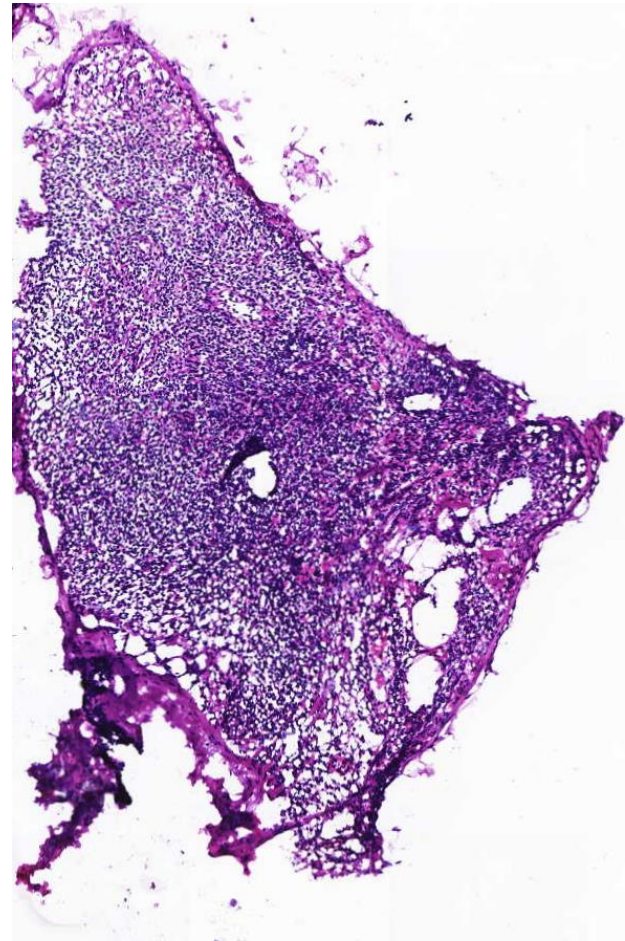
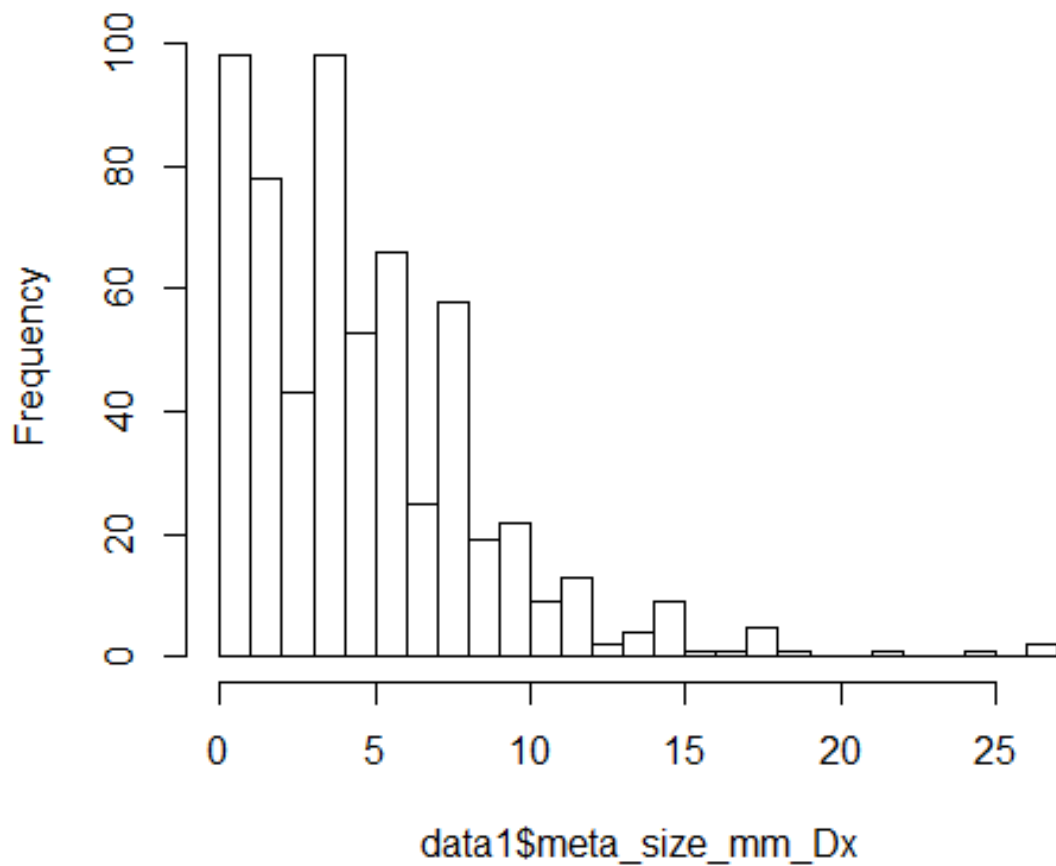
Finding In cross-sectional analyses that evaluated 32 algorithms submitted as part of a challenge competition, 7 deep learning algorithms showed greater discrimination than a panel of 11 pathologists in a simulated time-constrained diagnostic setting, with an area under the curve of 0.994 (best algorithm) vs 0.884 (best pathologist).

Meaning These findings suggest the potential utility of deep learning algorithms for pathological diagnosis, but require assessment in a clinical setting.

Deep learning – Sentinel LN

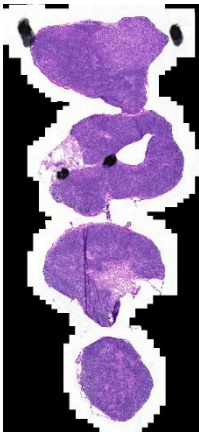
- Case selection (2016.5~2017.8)
 - Patients: 539
 - Slide: 1191
 - Meta (+): 700~750
 - Neo (+): 314
 - ILC or mixed IDC&ILC: 64
 - Micropapillary: 29
 - Metaplastic: 4
 - Mucinous: 16
 - Tubular or tubulolobular: 3

Histogram of data1\$meta_size_mm_Dx

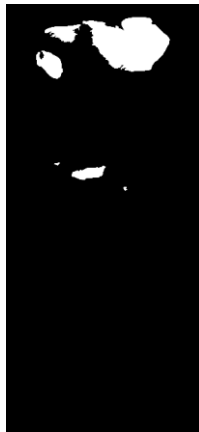


Dataset

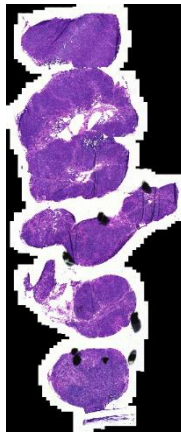
- Abnormal case



Digital image



Cancer mask



Digital image



Cancer mask



Digital image



Cancer mask

Breast Cancer Detection and Localization in Digital Pathology