

Development & Validation of an AI-based Tumour Cell Estimation Algorithm for Use in a Lung Adenocarcinoma Molecular Pathology Workflow



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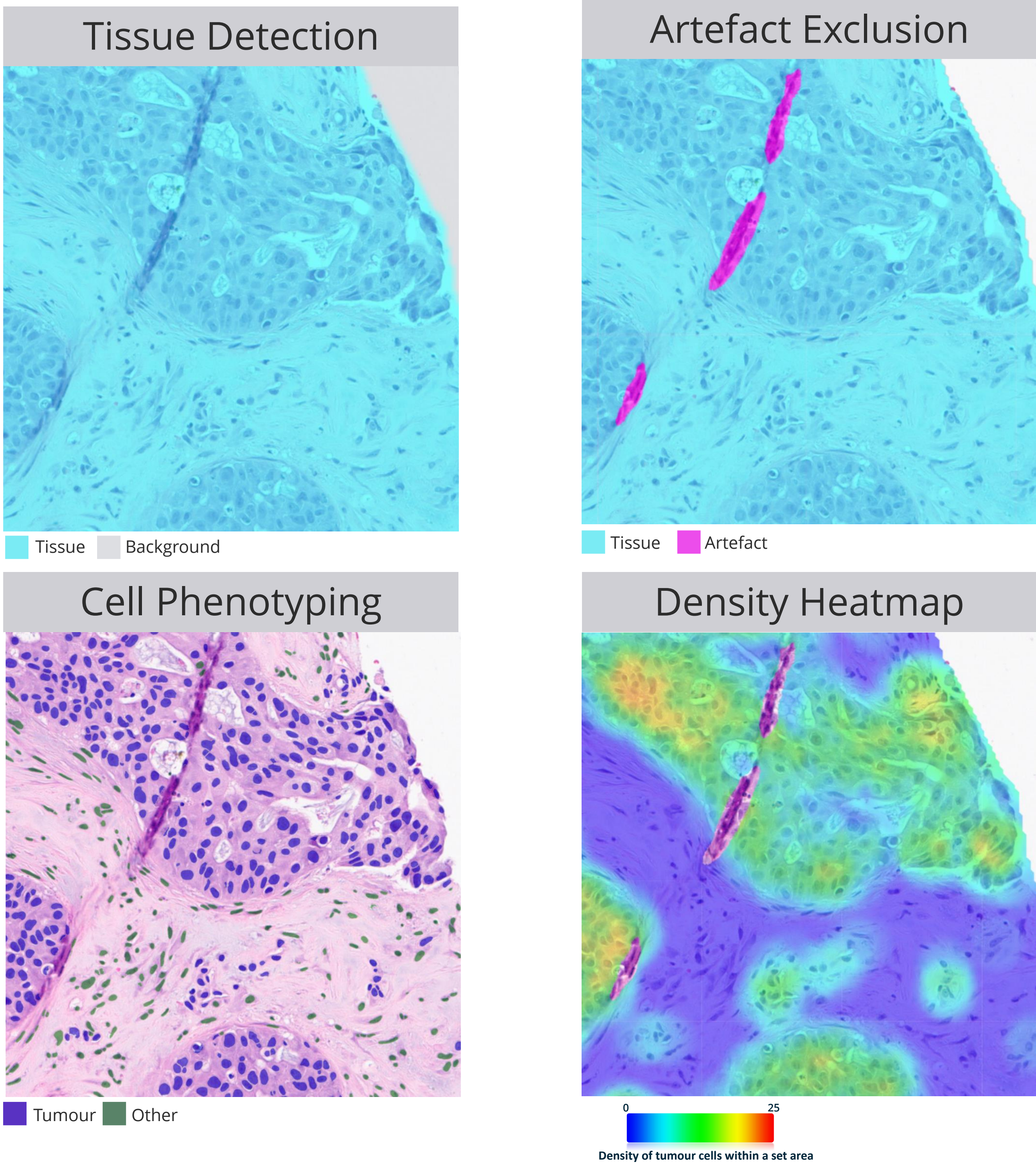
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INTRODUCTION

The development of targeted therapies has led to an increasing volume of molecular testing on FFPE tissue samples. This has increased the workload for pathologists, who review H&E-stained slides, mark a tumour dense region suitable for macrodissection, and estimate the percentage of tumour cells within the area. These estimates suffer from subjectivity and inter-observer variability. Computational assessment of cell counts can standardise tumour fraction measurements, bringing efficiency and quality gains to the molecular pathology workflow. More accurate results and faster turnaround times will reduce workloads and benefit patients.

Here, we present an AI-based algorithm for the clinical scoring of pulmonary oncology samples to support pathologists and increase consistency.

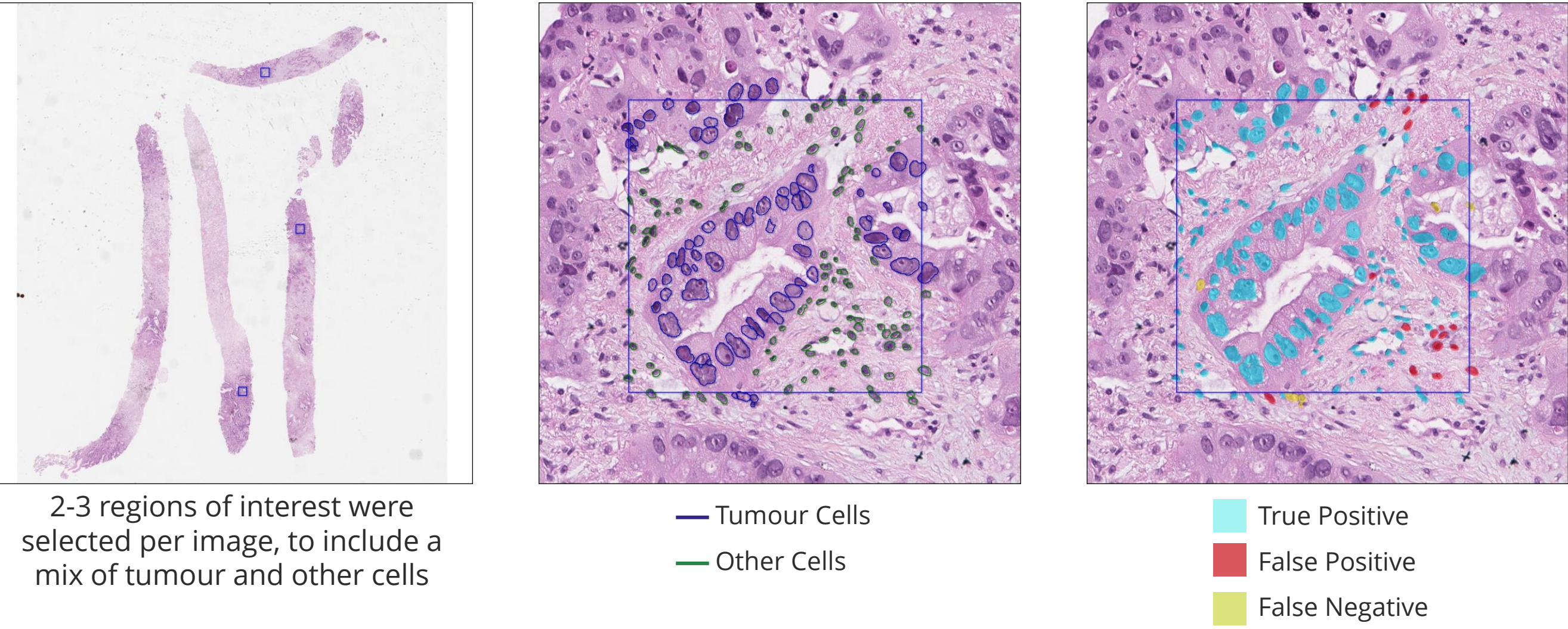
HALO Lung Macrodissect AI: ALGORITHM SETUP



- A Resnet 18-based network (190,822 annotations) was developed to classify cells within the tissue as ‘cancer’ (blue) or ‘other’ (green). A density heatmap highlights regions containing cancer cells.
- Data was sourced from two independent institutions.

ANALYTICAL VALIDATION

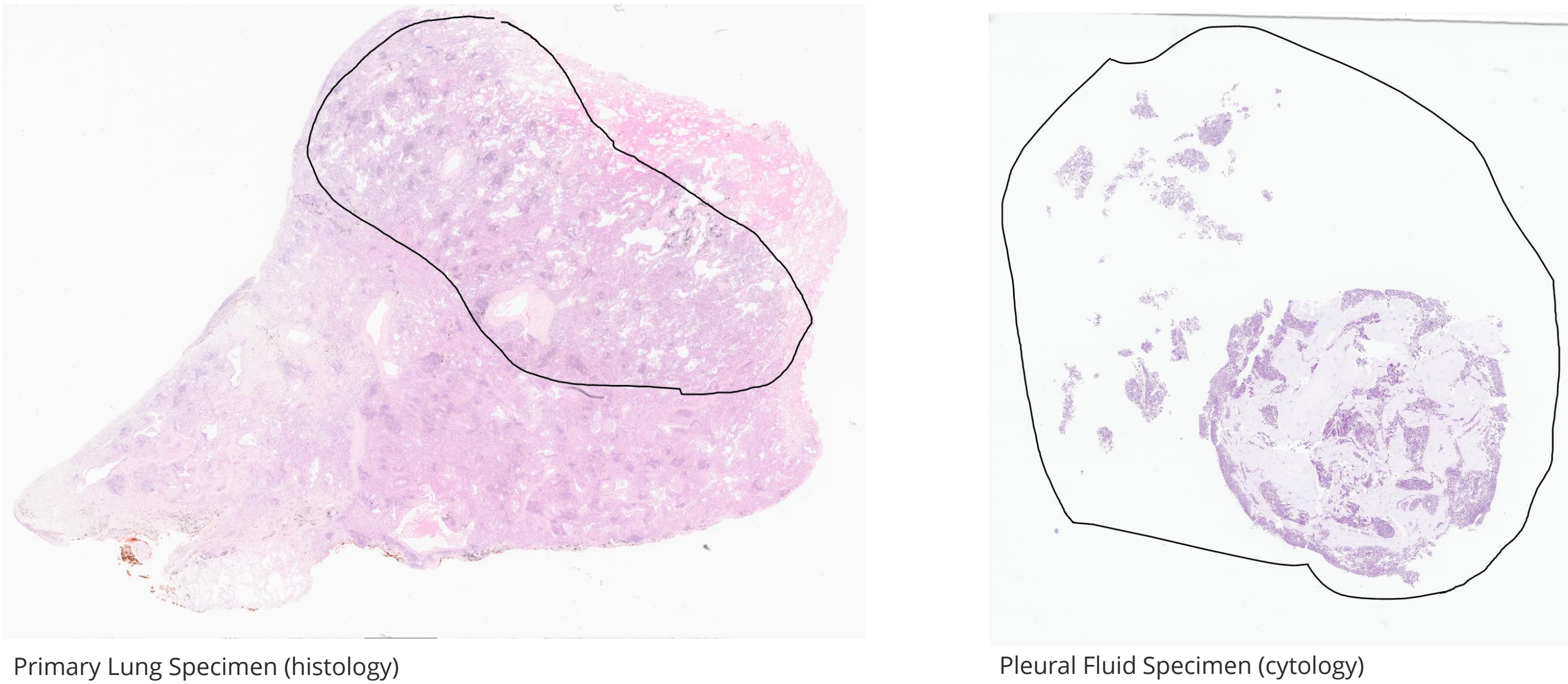
HALO Lung Macrodissect AI was validated on 26 images unseen during algorithm development, using 29,152 pathologist-reviewed annotations for the cell phenotyper.



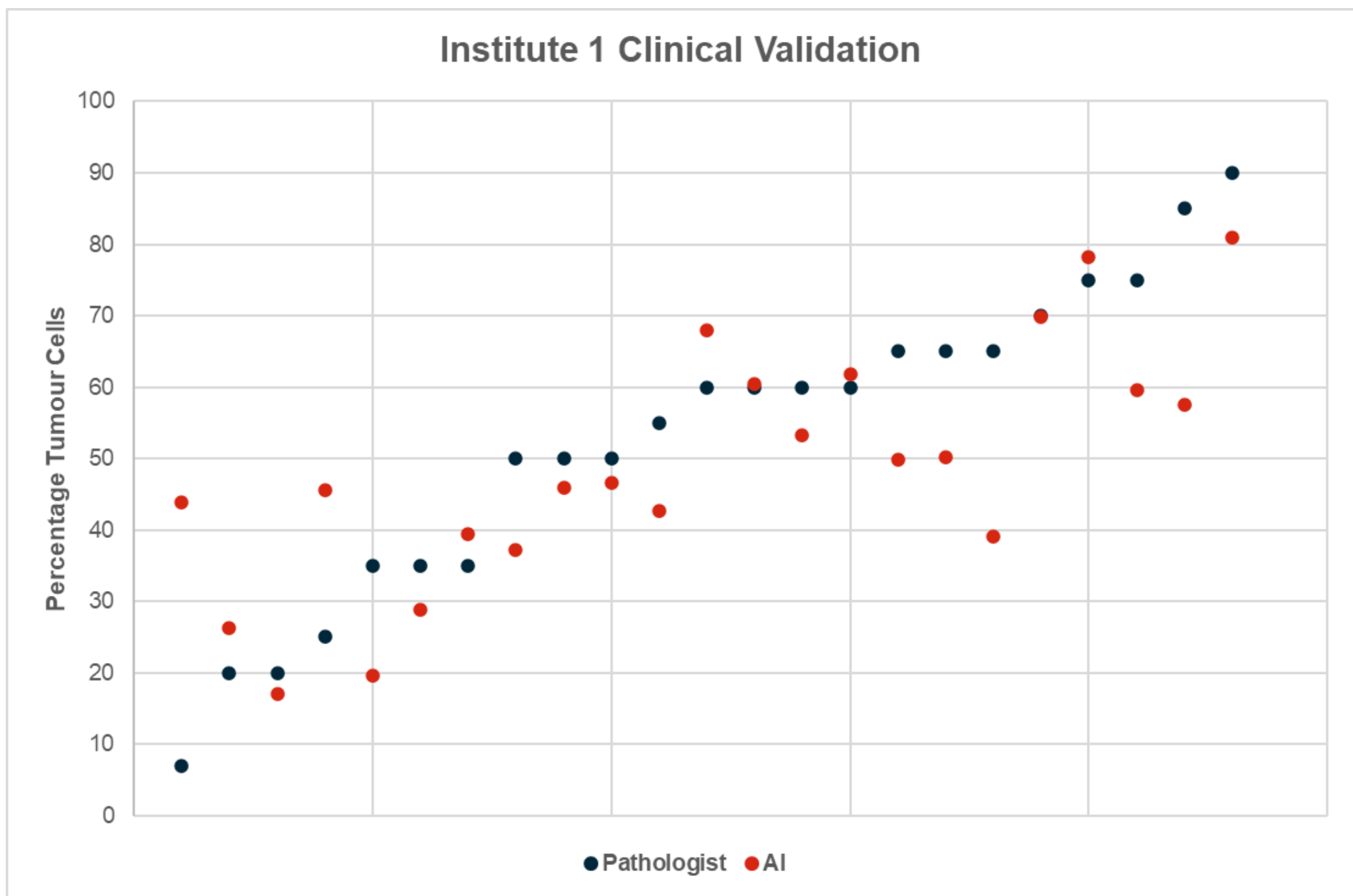
	Precision	Recall	F1-Score
‘Tumour’ Class	0.92	0.92	0.90
‘Other’ Class	0.88	0.90	0.87
Cell Phenotyper	0.88	0.90	0.89

INTERNAL CLINICAL VALIDATION

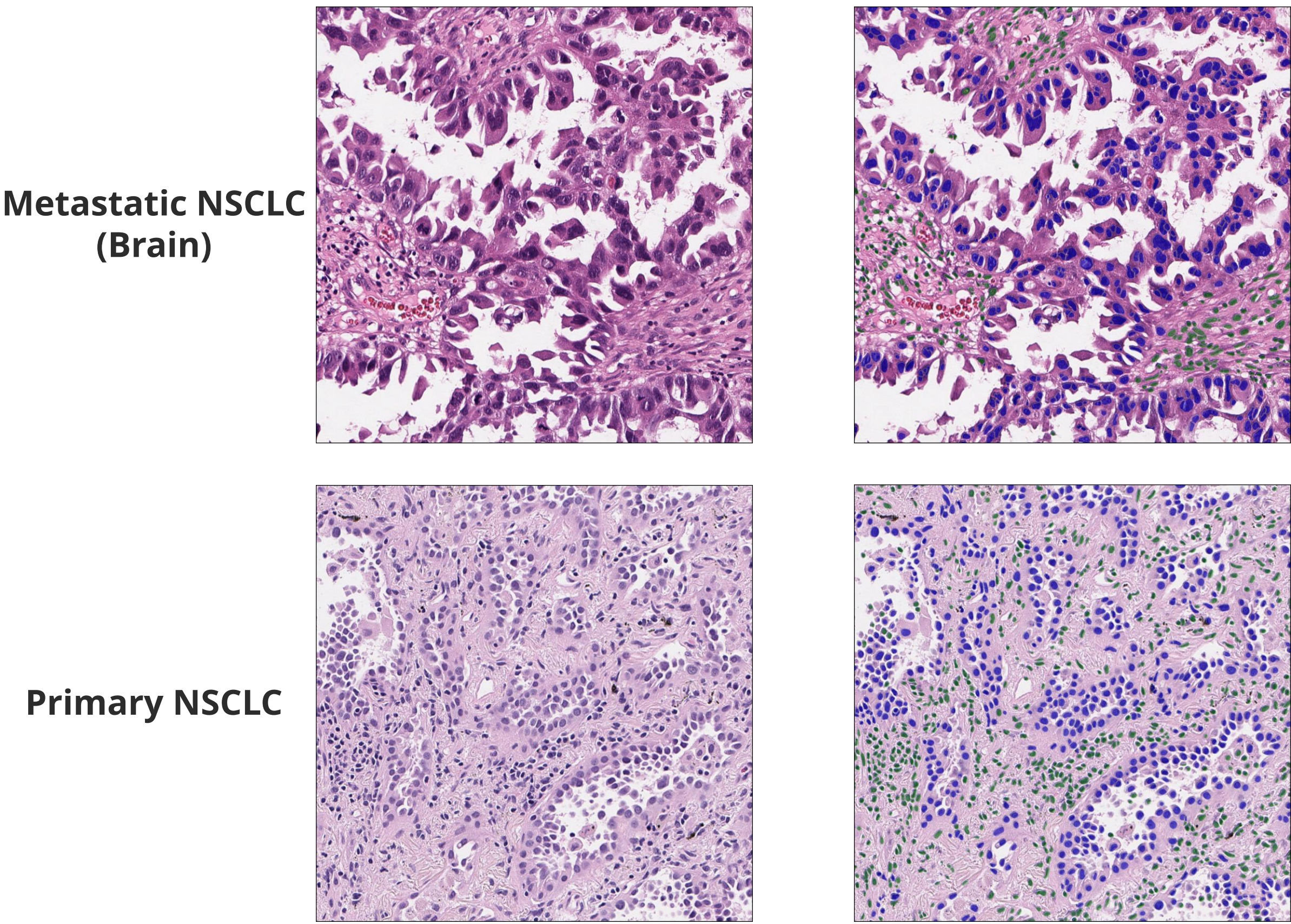
HALO Lung Macrodissect AI was validated on 23 images unseen during algorithm development.



- Regions of interest were marked for macrodissection by pathologists during their routine clinical workflow.
- The percentage of tumour cells identified by the classifier was compared with a pathologist’s estimate.



- In regions marked for macrodissection, the median tumor cell percentage score from the pathologist was 60% [IQR, 35-65%] compared with 47% [IQR, 39-60%] from the algorithm.
- The interclass coefficient score was 0.69
- The median difference between estimates was 8% [IQR 4-15%].
- Of the 23 cases, 19 (83%) of the AI scores were within 15% of the pathologist’s estimate.



CONCLUSIONS

Tumour cell percentage scores from HALO Lung Macrodissect AI agree with pathologist estimates in routine lung ADC cases annotated for macrodissection. Cell level validation shows that the algorithm detects tumour cells with a high level of accuracy. Use of this classifier in a diagnostic setting can support pathologists by saving time, standardising results, and improving the quality of molecular readouts.