

P2.193: Deep Learning-Based Automated Detection and Enumeration of Circulating Tumor Cells in NSCLC

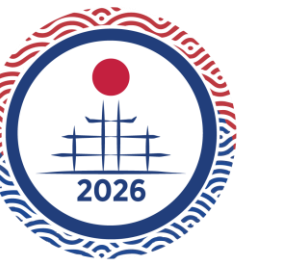


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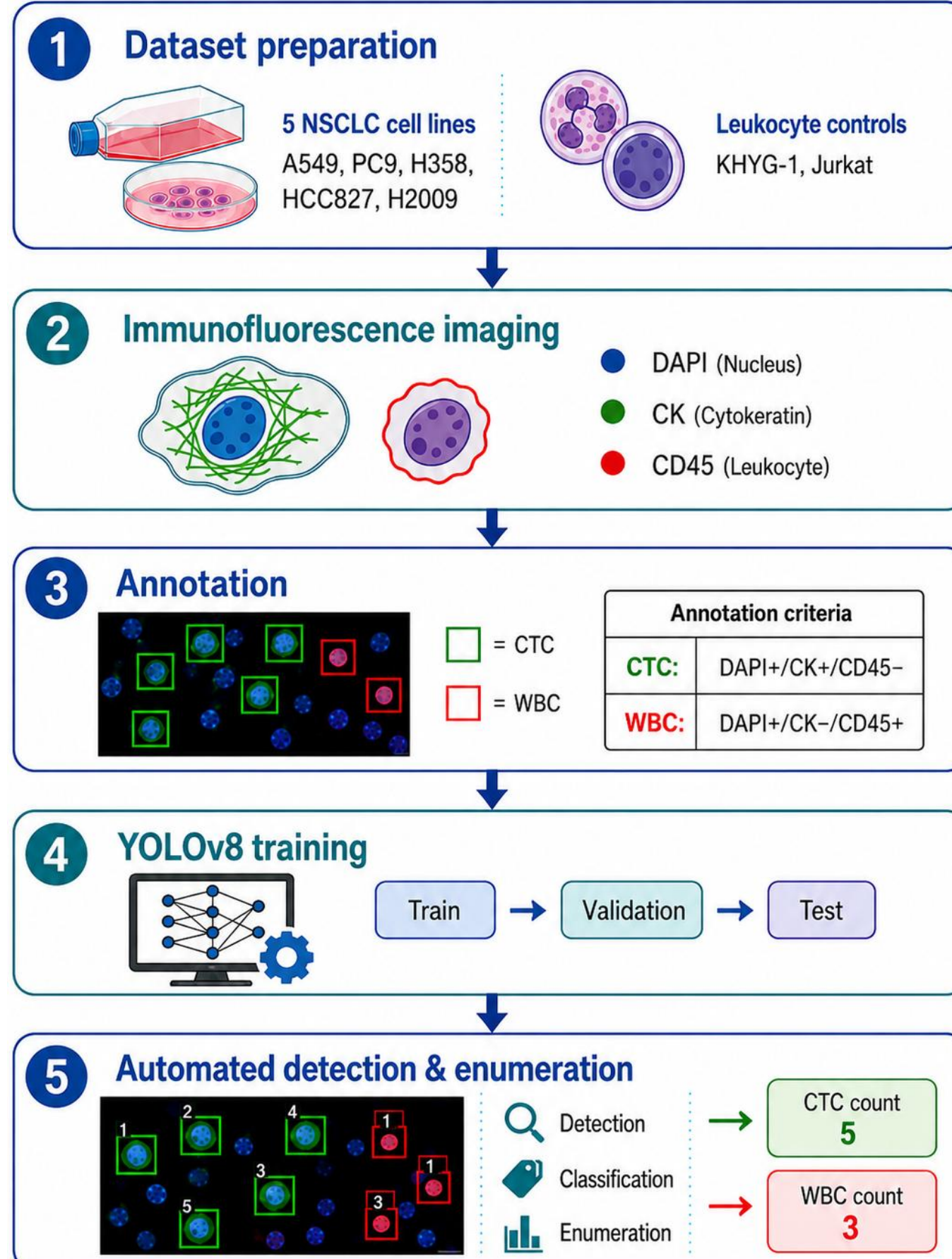
INTRODUCTION

- Accurate and reproducible CTC enumeration is essential for scalable liquid biopsy workflows.
- Manual identification from immunofluorescence images is time-consuming, operator-dependent, and difficult to standardize, particularly for rare CTC events.
- Automated image analysis could improve the speed, reproducibility, and scalability of CTC enumeration.

Objective

To develop a YOLOv8-based pipeline for automated detection and enumeration of CTCs from DAPI/CK/CD45 immunofluorescence images.

METHODS



YOLOv8 | 2000 × 2000 px | CTC/WBC | Conf. = 0.25
50 images | 7,213 annotations | Train/Val/Test = 22/5/23

DISCUSSION AND CONCLUSION

Key Takeaways

- YOLOv8 enabled automated CTC detection and enumeration from DAPI/CK/CD45 immunofluorescence images.
- The model achieved mAP@0.5 = 0.884 and F1 = 0.870, while substantially reducing manual analysis time.
- The pipeline may improve the reproducibility and scalability of CTC-based liquid biopsy analysis.

Current limitations

- Training data were primarily derived from established cell lines.
- Preliminary clinical evaluation was limited by the small cohort (n=3/group), with CTC-like detections also observed in healthy controls.
- Ambiguous staining patterns and clustered events remain potential sources of detection error.

Future Direction for Research

- Validate the model in larger, independent NSCLC cohorts.
- Further optimize rule-based post-processing to improve clinical specificity and robustness against ambiguous staining patterns and cell aggregates.
- Extend the model to additional biomarkers for CTC phenotyping and molecular stratification.

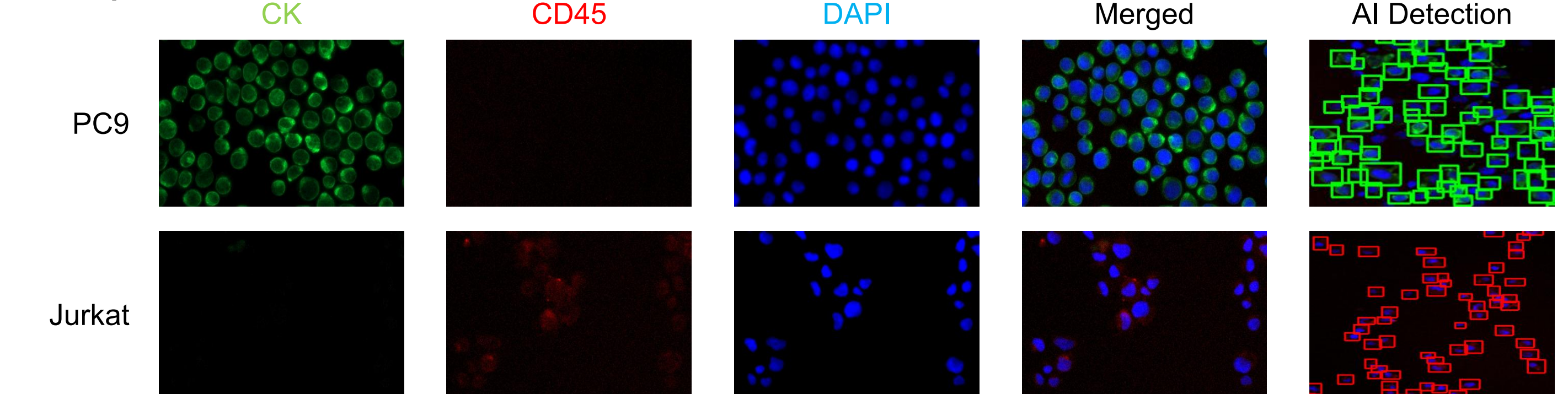
REFERENCES

References

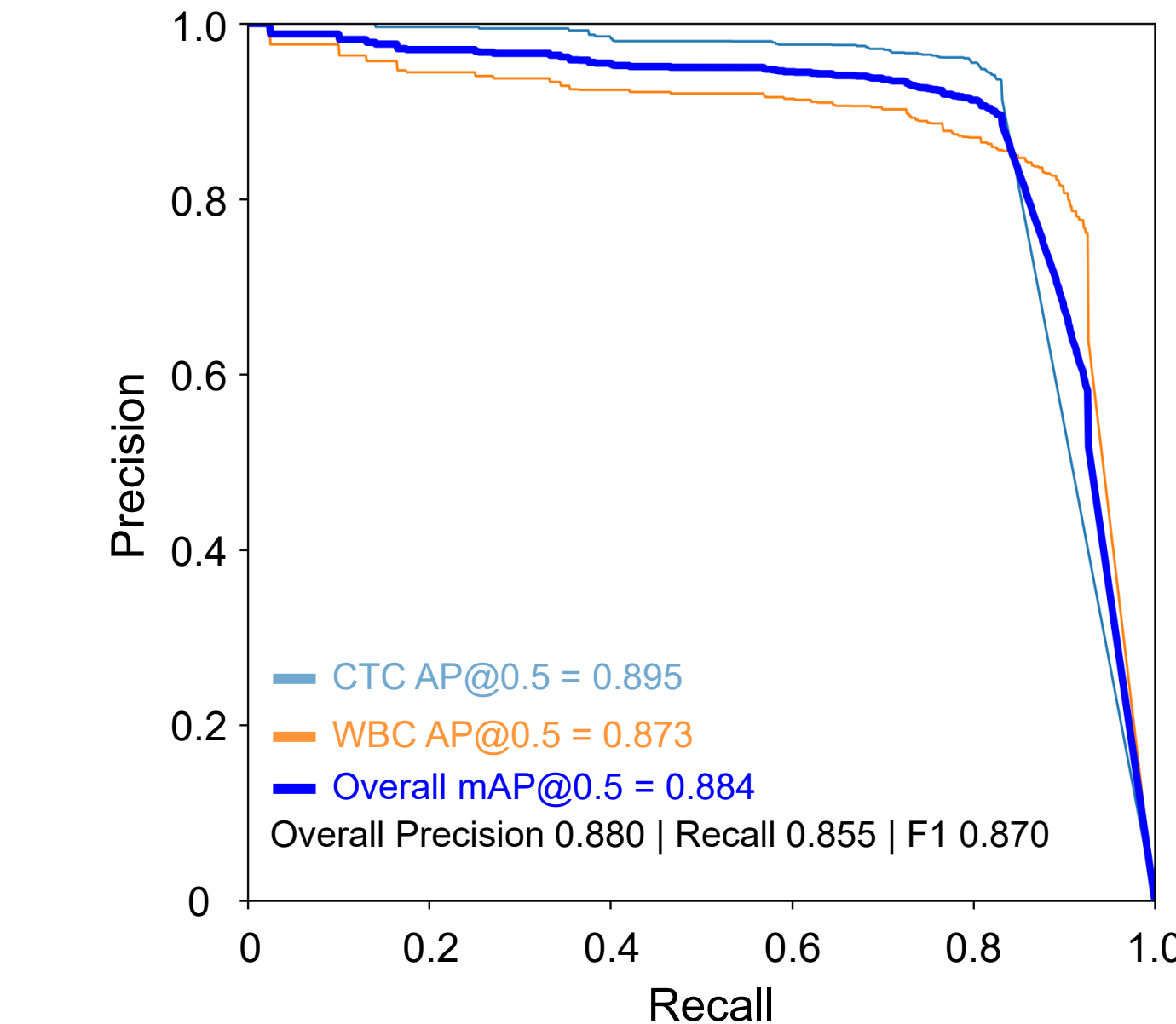
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RESULTS

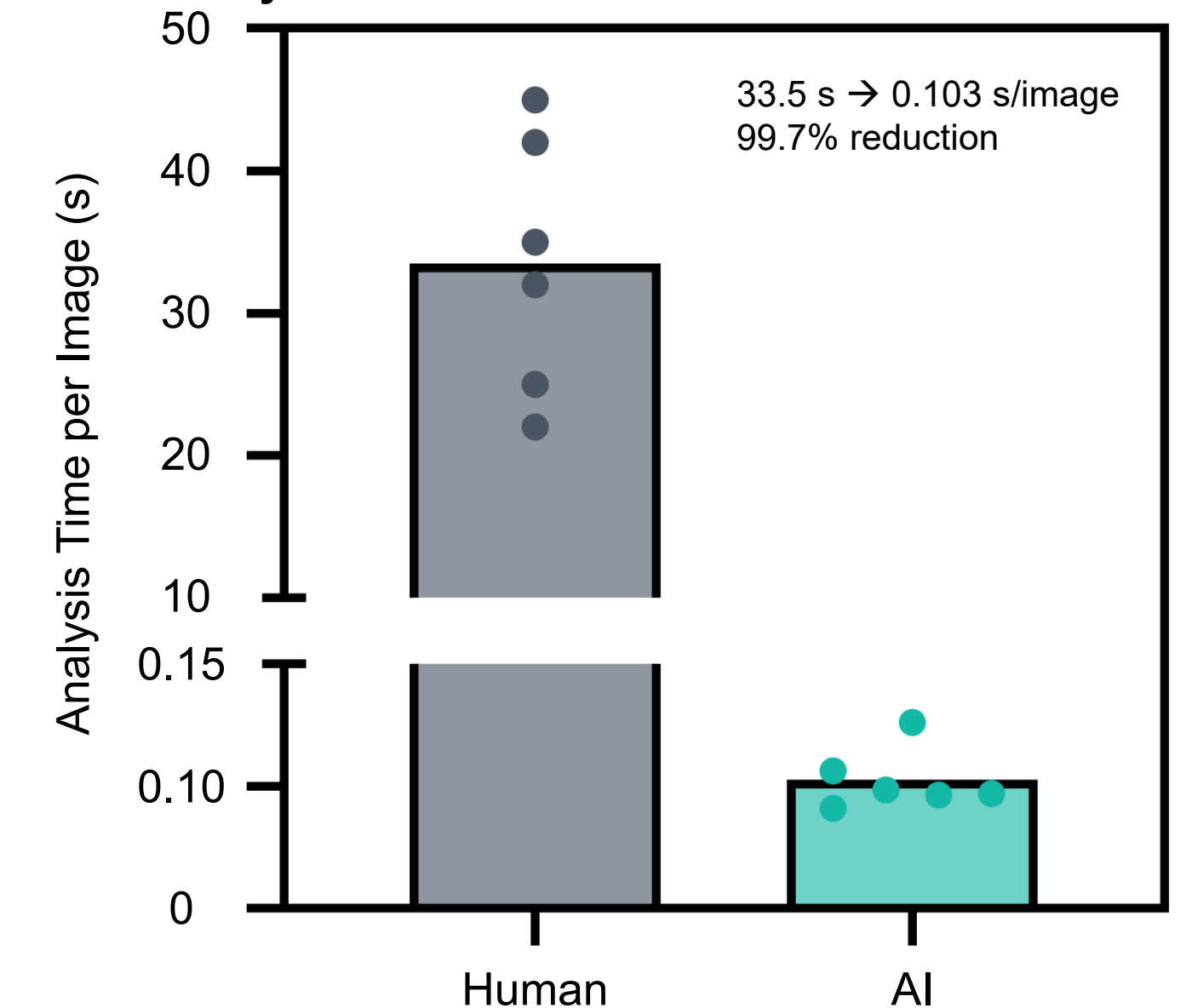
A. Representative AI Detection



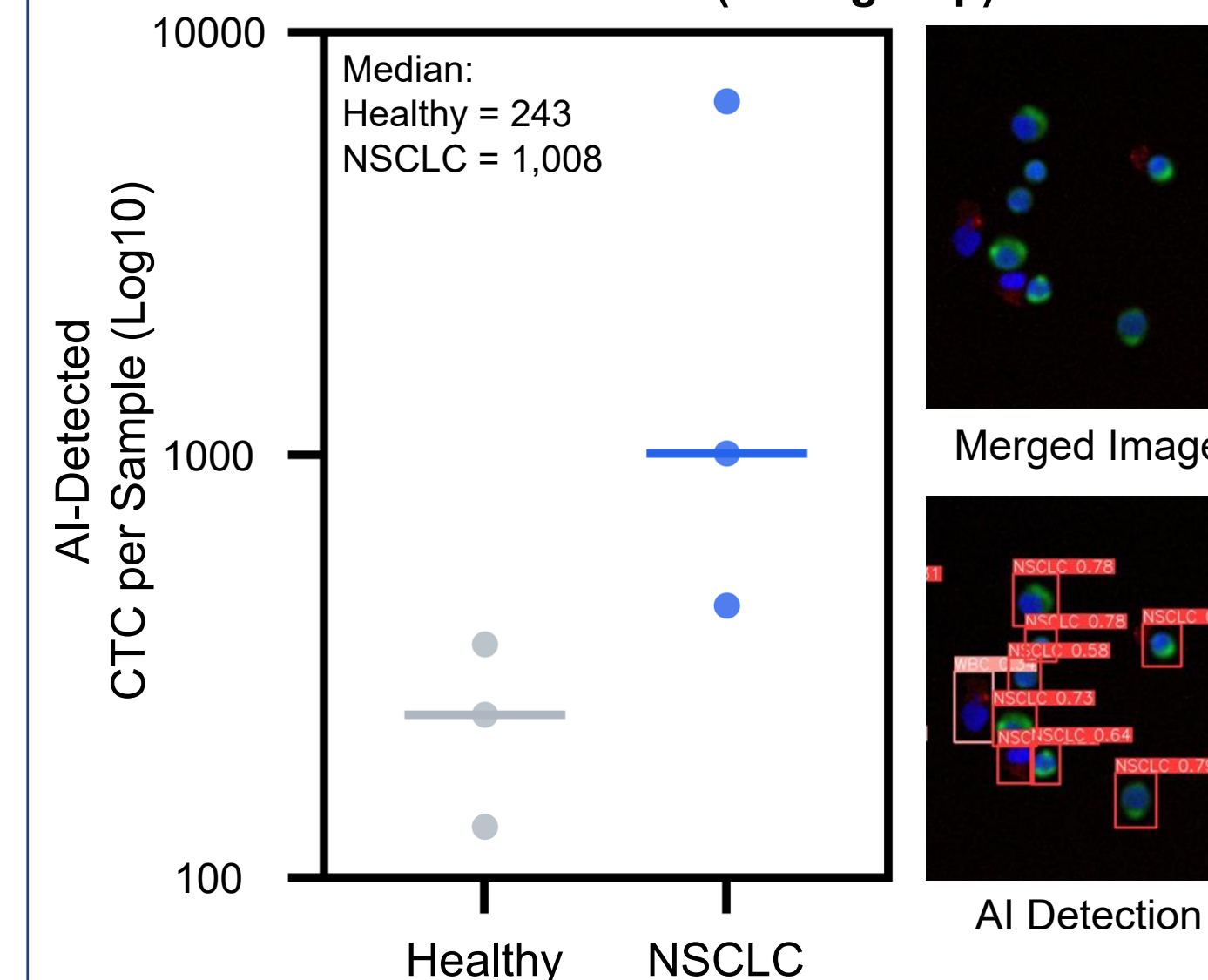
B. Detection Performance



C. Analysis Time



D. Pilot Clinical Evaluation (n = 3/group)



E. Representative Challenging Cases

