



SlideQC: an AI-Based Tool for Automated Quality Control of Whole-Slide Digital Pathology Images

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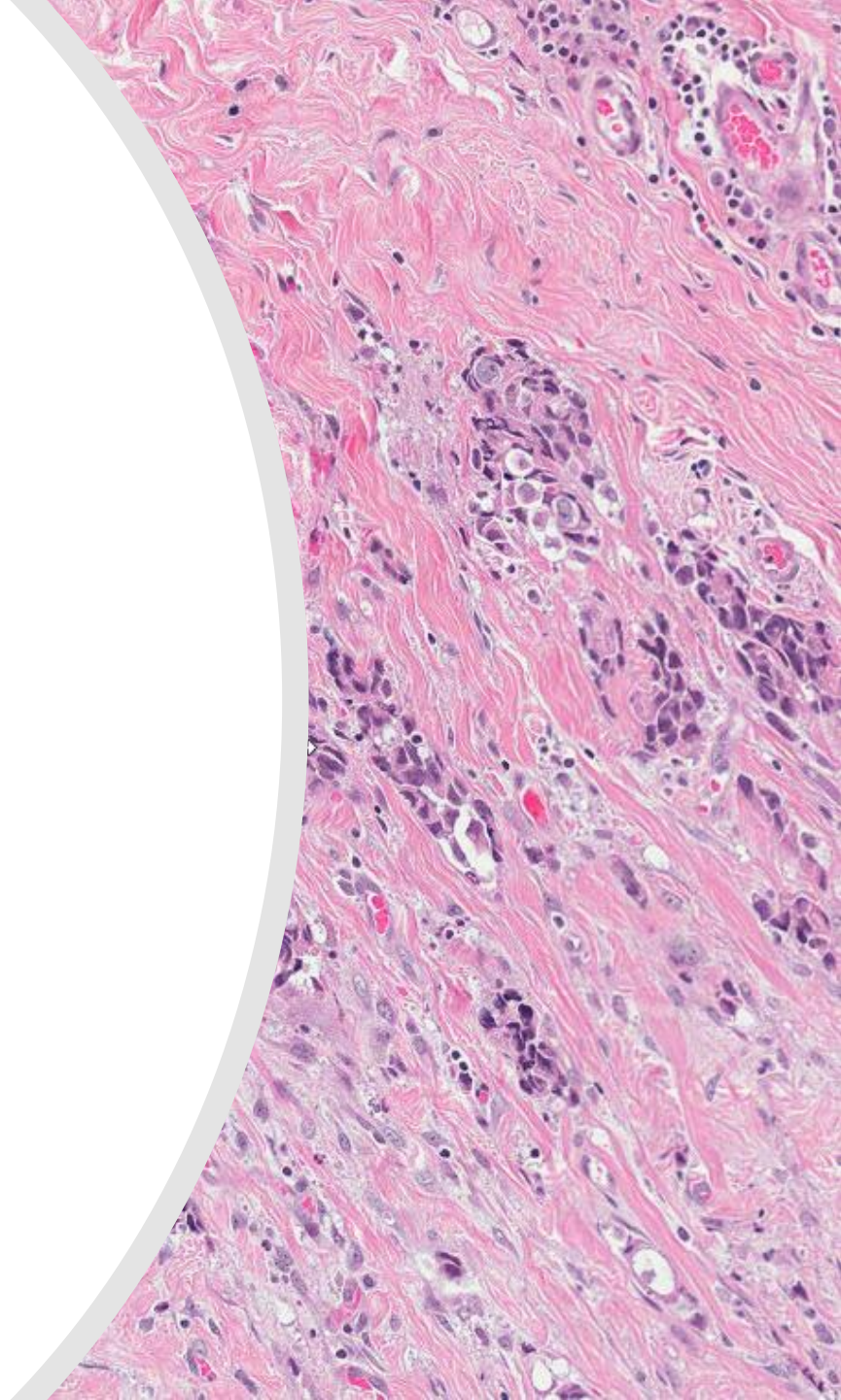
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INTRODUCTION

Artifacts may be introduced during tissue collection and processing, slide preparation, or when generating whole slide images (WSI). The presence of artifacts has a negative impact on the digital pathology workflow as they may hinder clinical reporting. Furthermore, artifacts may lead to false positive and false negative results when deploying image analysis algorithms or computer-aided diagnosis systems to WSI. Manual quality control of WSI is a time-consuming procedure and therefore automated quality control tools, which report and exclude artifacts, are highly desirable to streamline digital pathology workflows.

To automate the quality control step, we developed SlideQC, an AI-based quality control tool that automatically detects, reports, and outlines artifacts, such as air bubbles, dust/debris, folds, out-of-focus areas, and pen marks, on H&E stained WSI, in both research and clinical workflows.

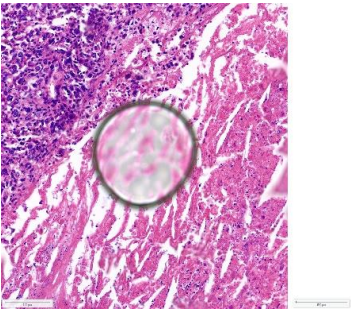
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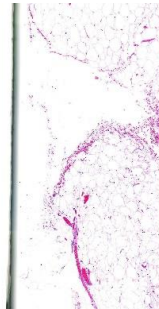
SLIDEQC DEVELOPMENT

1,984 Artifact and tissue annotations gathered from 254 H&E stained WSI

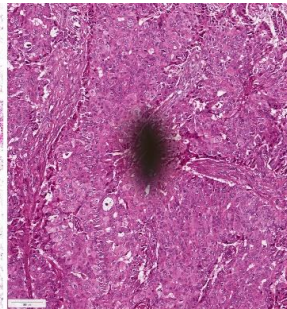
Air bubbles



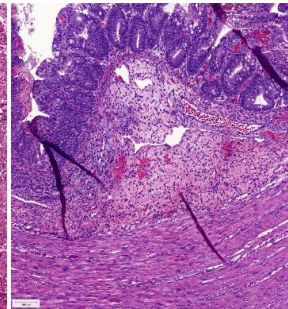
Coverslip



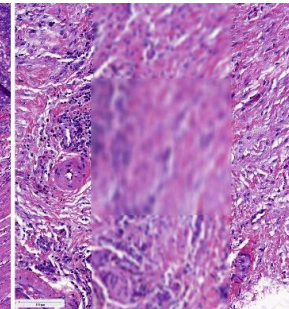
Dust



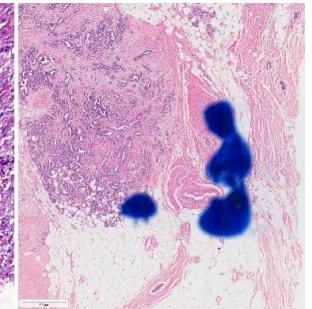
Folds



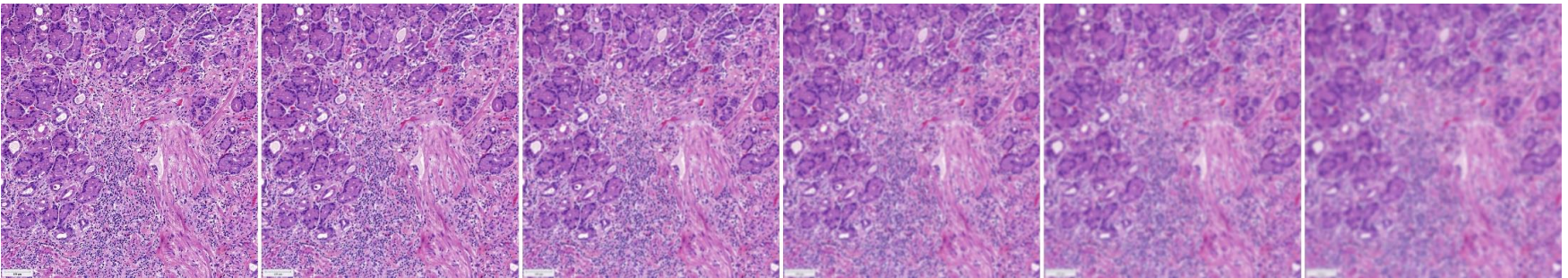
Out-of-focus



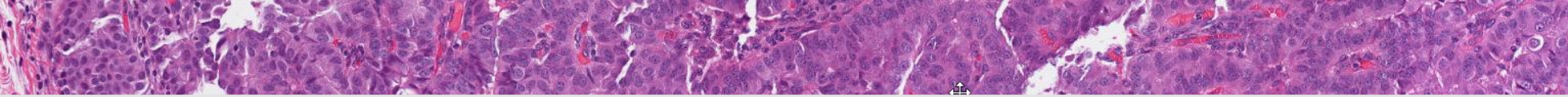
Pen marker



2,048 Synthetic out-of-focus annotations to boost out-of-focus detection



Increase in blur radius →

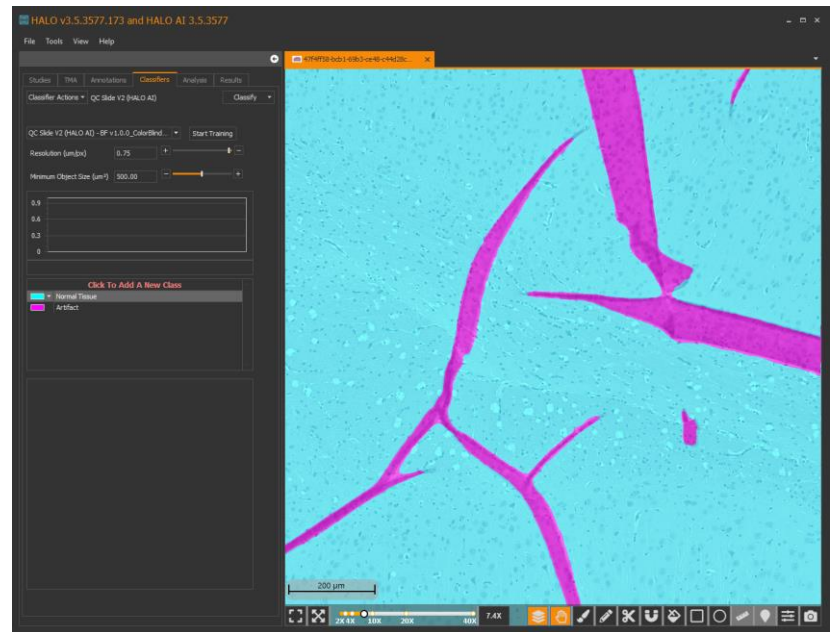


SLIDEQC DEVELOPMENT

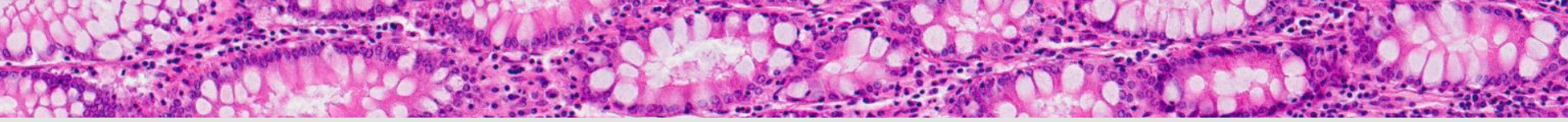
Distribution of training data by tissue type

Tissue	Images	Annotations
Breast	19	105
Colon	19	125
Ovary	34	361
Prostate	58	167
Skin	8	51
Small intestine	7	52
Stomach	8	54
Thyroid	4	53
Uterus	9	94
Other	88	922
Total	254	1,984

Distribution of SlideQC training data by tissue type

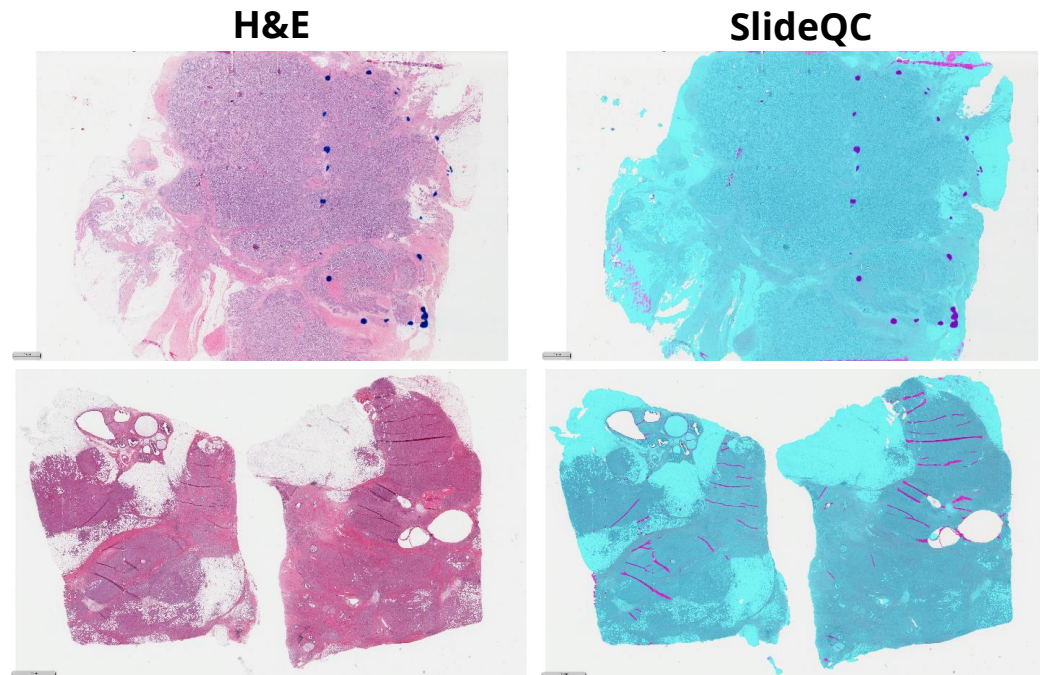


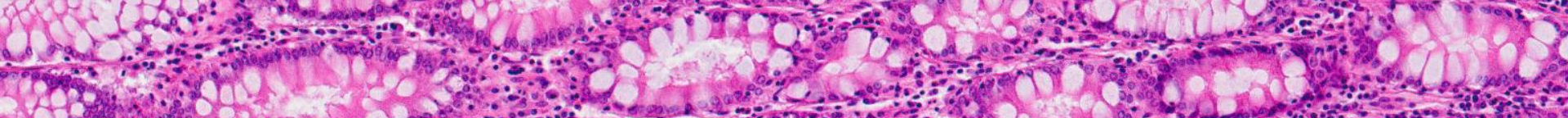
SlideQC user interface within Indica Labs' HALO® software



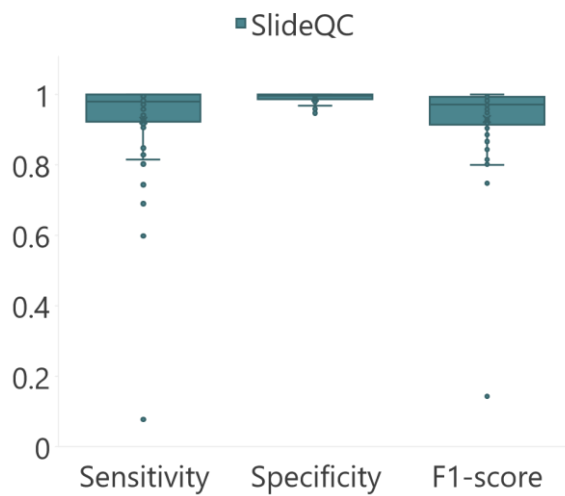
SLIDEQC PERFORMANCE EVALUATION

SlideQC performance on an external test cohort of 49 WSI H&E images sourced from the open-source database 'HistoQCRepo', across 375 annotations (acceptable tissue and artifact).



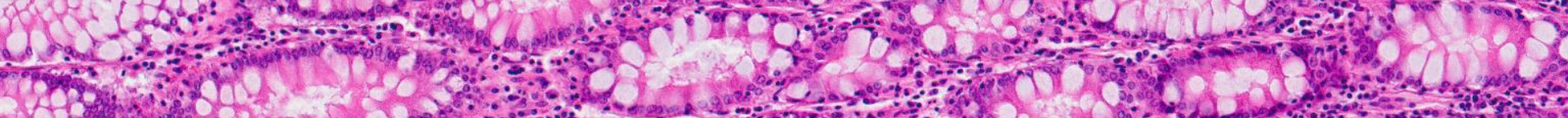


SLIDEQC PERFORMANCE EVALUATION



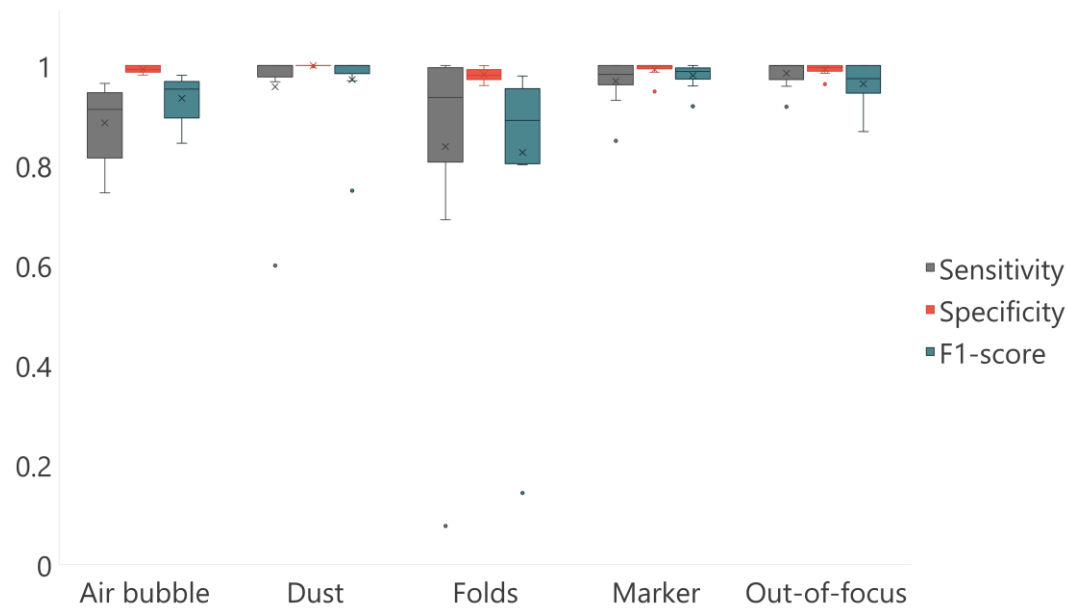
SlideQC Average Sensitivity, Specificity and F1-Score

Metric	Average ± SD
F1-Score	0.93 ± 0.13
Sensitivity	0.93 ± 0.15
Specificity	0.99 ± 0.01



SLIDEQC PERFORMANCE EVALUATION

Sensitivity, Specificity and F1-score per Artifact Type



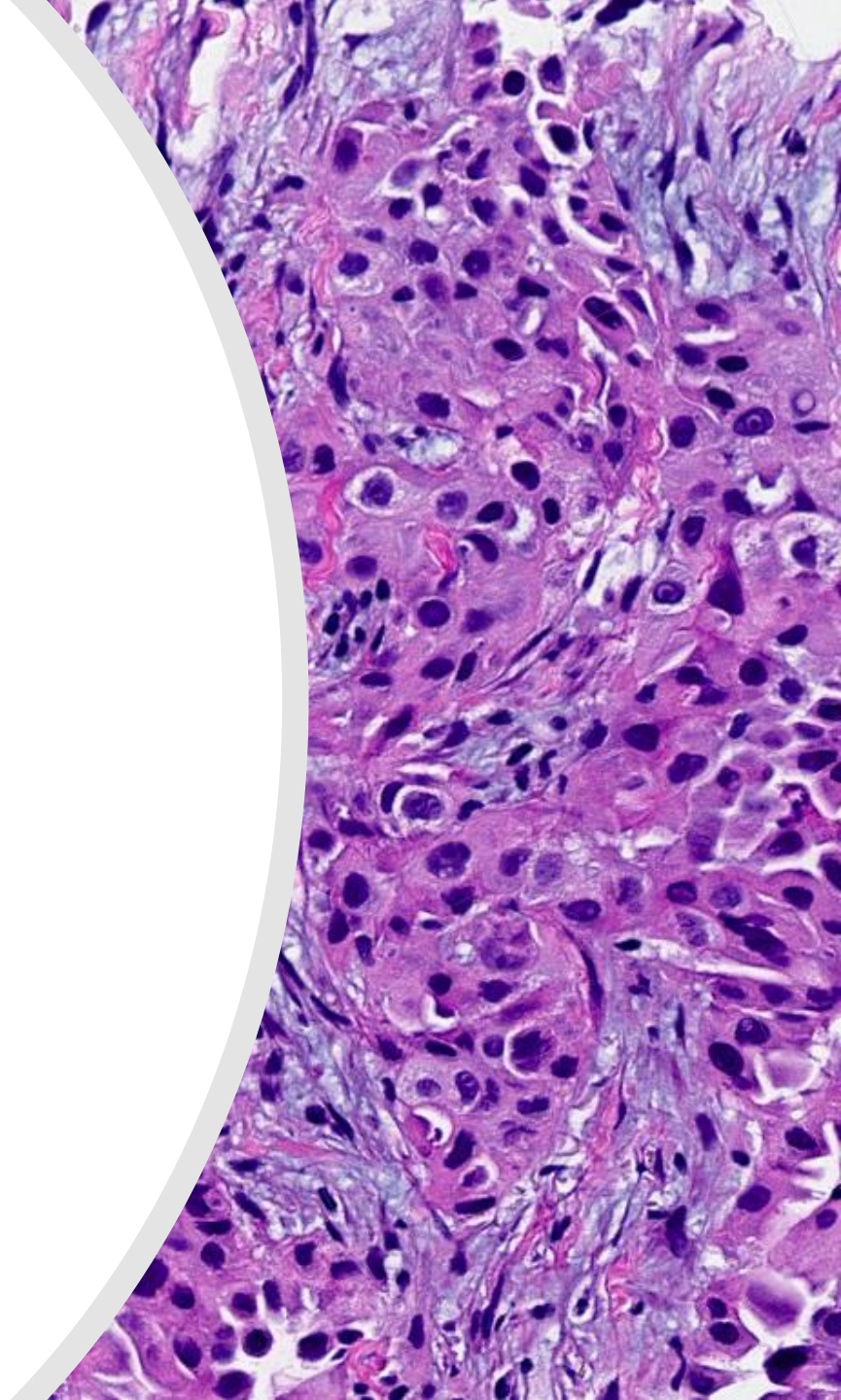
Average ± SD	Sensitivity	Specificity	F1-score
Air bubble	0.88 ± 0.08	0.99 ± 0.01	0.93 ± 0.05
Dust	0.96 ± 0.12	1.00 ± 0.0	0.97 ± 0.07
Folds	0.84 ± 0.26	0.98 ± 0.01	0.83 ± 0.23
Marker	0.97 ± 0.05	0.99 ± 0.02	0.98 ± 0.02
Out-of-focus	0.98 ± 0.03	0.99 ± 0.01	0.96 ± 0.04

SlideQC is commercially available for research applications with HALO AI or for clinical applications using HALO AP®

CONCLUSIONS

SlideQC achieved high sensitivity, specificity, and F1-score on an external test cohort. SlideQC can add efficiency gains by performing automated quality control on all slides within a workflow rather than the current practice of manual assessment on a subset of the slides in clinical pathology departments. SlideQC can allow the triaging, alerting and sorting of slides containing a high level of artifact within a digital pathology workflow. The tool can also be used to exclude artifacts from downstream analysis by subsequent image analysis algorithms.

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PRODUCT INFORMATION

Learn more about the AI-powered SlideQC network by emailing info@indicalab.com.

Learn more about the [HALO Link](#) and [HALO AP®](#) image analysis platforms on the [Indica Labs website](#), or email info@indicalab.com.

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