

FROST: Frozen-section Rapid On-site Screening Tool for Basal Cell Carcinoma

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Disclosures

No relevant financial or non-financial interests to disclose

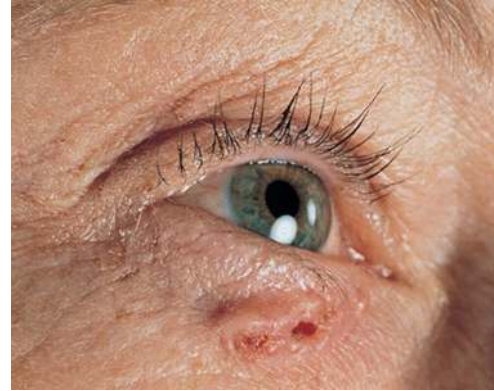
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Clinical Problem & Aim

The Frozen Section Challenge

- Clinically unforgiving
- Freezing artifacts
- Variable quality
- Sampling constraints under time pressure.

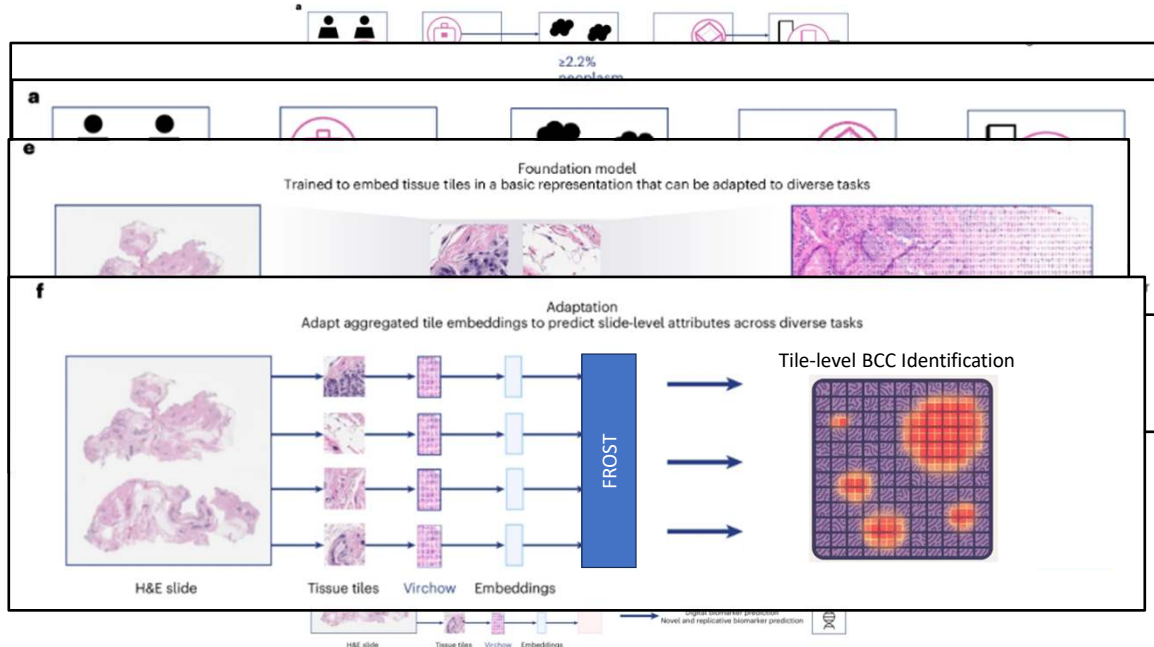


Our aim: Leverage widely available pathology foundation model to create a lightweight, offline, neural network classifier which can effectively identify BCC on frozen sections

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Article | [Open access](#) | Published: 22 July 2024

A foundation model for clinical-grade computational pathology and rare cancers detection



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Dataset

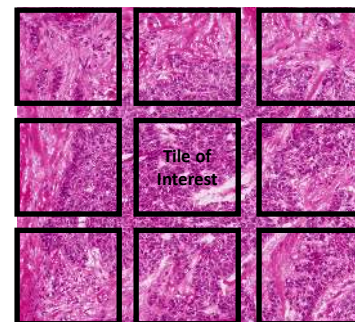


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FROST Architecture & Training Strategy

Model Design

- Lightweight classifier trained on Virchow embeddings
- Local attention model
- Dense output layer assigns tumor likelihood score for central tile

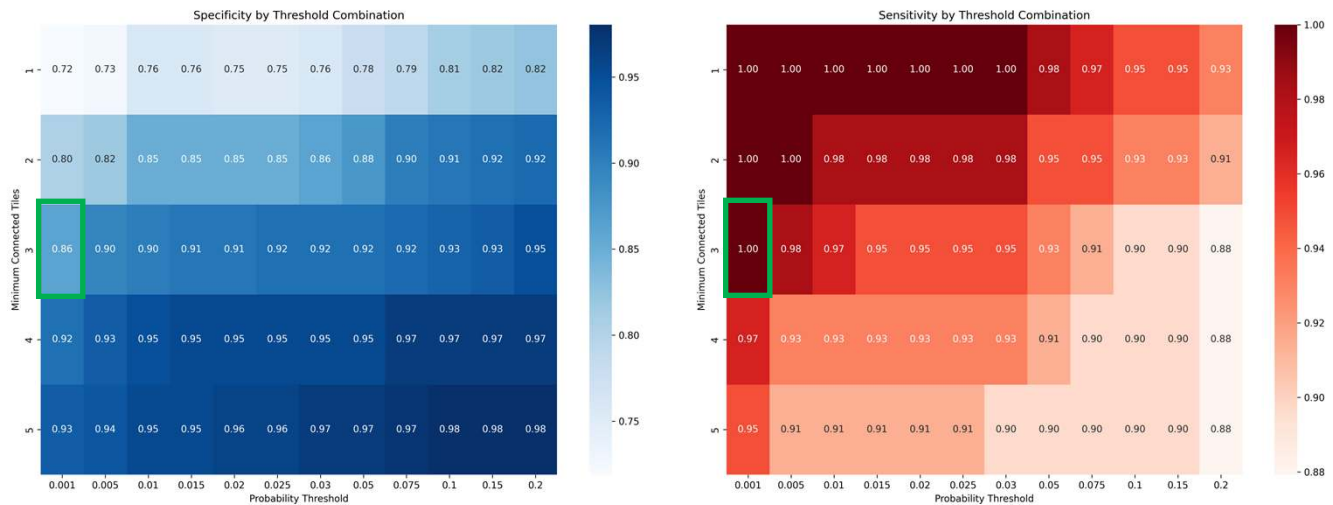


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Threshold Optimization & Operating Points

Minimum connected tiles and probability thresholds



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Results: Slide-Level Performance

1.00
Sensitivity
All 58 BCC-positive slides identified

0.863

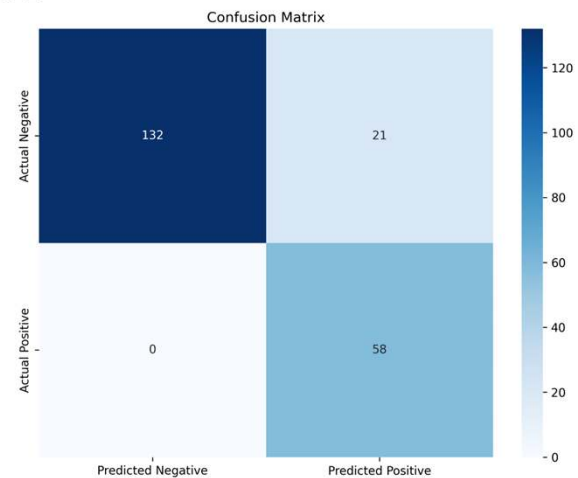
Specificity
Strong negative predictive performance

0.978

AUC-ROC
Excellent discriminative ability

1.00

NPV
Complete confidence in negative calls

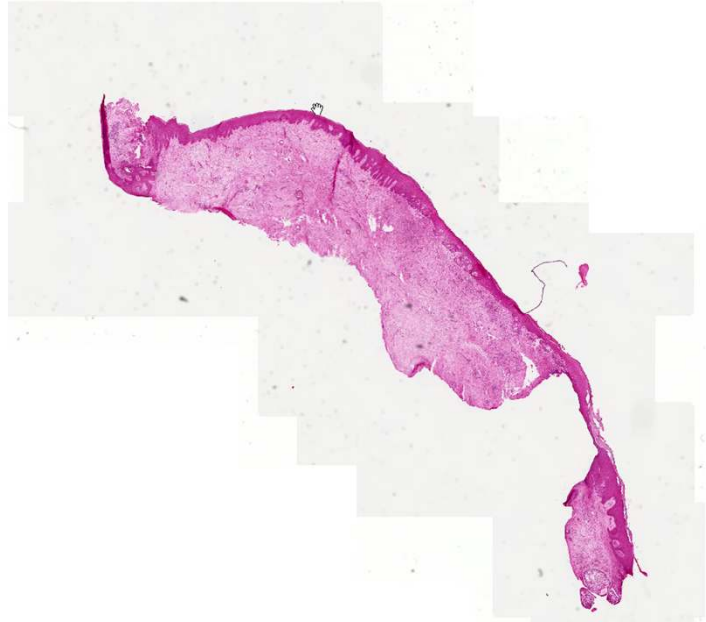
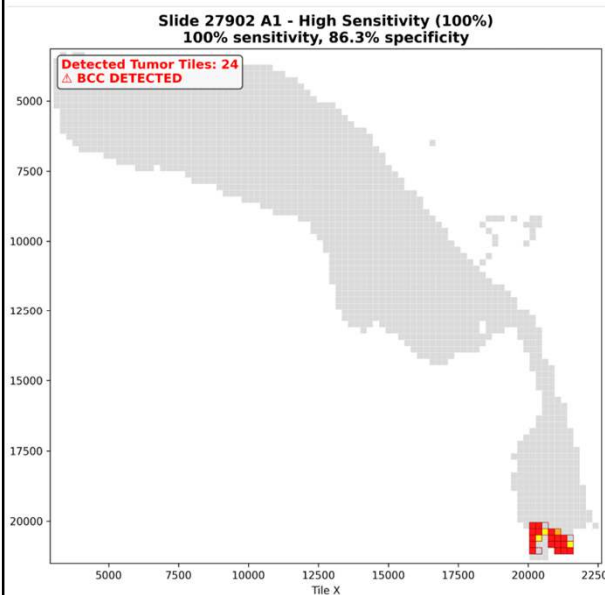


✔ A completely negative overlay strongly supports absence of BCC, while manageable false positives are quickly dismissed at pathologist review.

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Deployment Demo: Proof of concept

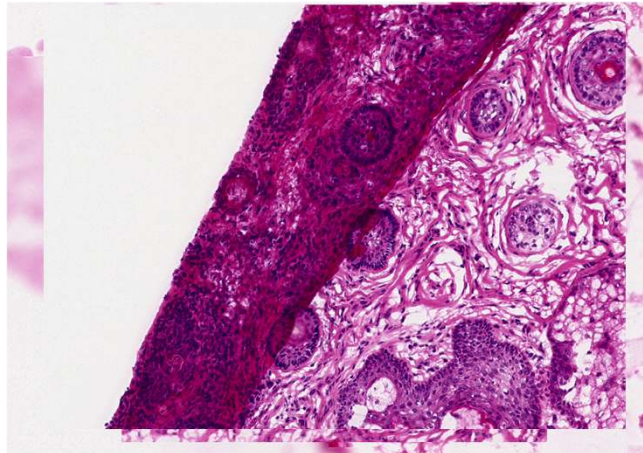


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Error Analysis & Current Limitations

False Positive Patterns

- Scanning artifacts
- Difficult cases with tissue folding



Single Institution

Limited to one center's scanner, staining protocols and case mix

Scanner Specific Artifacts

Model trained on characteristic freezing distortions, no hard negatives for focus errors

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Conclusions and future directions

- 1 — **Low Cost, Offline, High Sensitivity Screening Tool**
Complementing the pathologist's role in rapid assessment of frozen section
- 2 — ****AI-Assisted Coding****
Research team with minimal coding experience, secondary validation by software collaborators
- 3 — **Expanded Scope**
Extension to squamous dysplasia for comprehensive margin-oriented triage
- 4 — **Real-Time Integration with Edge-Compute**
Near-instantaneous processing for true intraoperative support

With freely accessible pathology foundation models and LLM access, similar projects extremely accessible. Pathologists gain agency to experiment.

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