Point-of-care cancer screening using saliva transmission spectroscopy and machine learning

B-083

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AIM

Tier-1 cancer and other disease screening would benefit from point-of-care (POC) testing that is rapid, inexpensive, and highly specific to minimize unnecessary downstream workup.
We evaluated saliva transmission hyperspectral spectroscopy combined with machine learning algorithms as a POC screening approach.

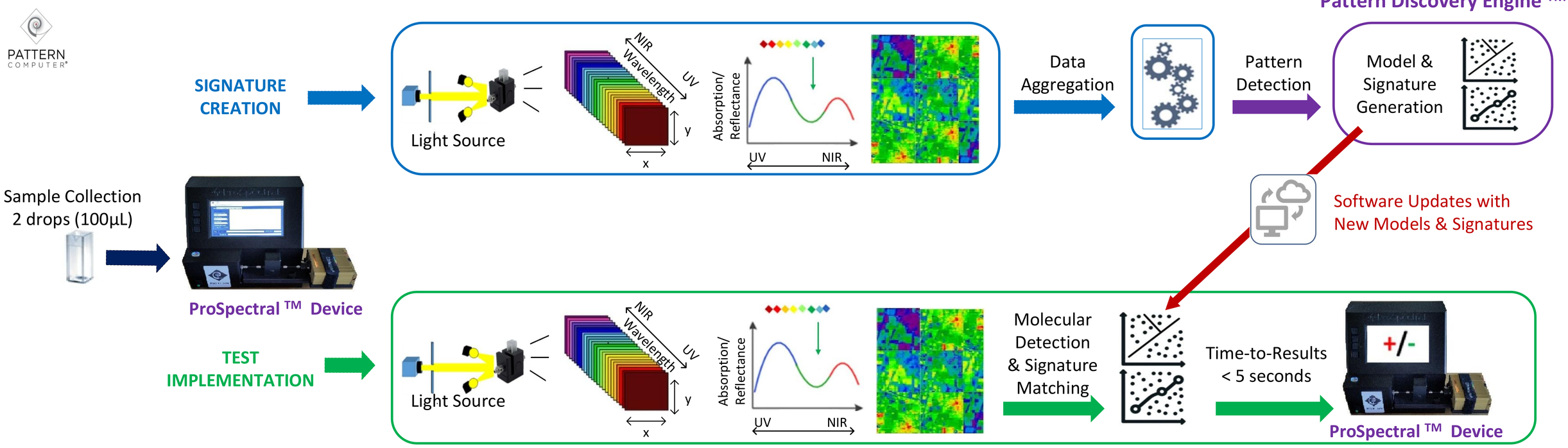
CONCLUSIONS

Saliva transmission hyperspectral spectroscopy with the Pattern Discovery Engine ™ (PDE) supports a practical, near-real-time POC paradigm for early cancer screening and triage.

Ongoing work will attribute discriminative spectral regions and identify contributing analytes and host-response biomarkers using orthogonal assays (e.g. fractionation and targeted mass spectrometry), improving interpretability and enabling prospective validation.

METHOD

Saliva was collected from outpatient consented participants in a lung cancer clinic (n=99) and a high-risk clinic (n=152) on an IRB-approved protocol (PREDICT NCT05802069). Two drops of saliva were scanned in ~3 seconds on a ProSpectral ™ hyperspectral spectrophotometric device to acquire transmission spectra.



RESULTS

Samples	Balanced Accuracy	Sensitivity	Specificity	F1-Score
251	61%	44%	91%	0.55

Across clinically relevant labeling i.e., cancer-positive (n=99 patients), hereditary cancer-predisposition but without diagnosis (n=86), no evidence of disease (NED) while on treatment (n=16), and NED at least 2 months after treatment completion (n=50), models achieved high median balanced accuracy and maintained discrimination under very high specificity settings suitable for tier-1 screening (very few false positives).
At comparable cohort scale, discrimination exceeded that reported for sequencing-based cfDNA methylation blood assays, while reducing time-to-signal from centralized laboratory workflows (~2-week turnaround) to seconds at the POC and avoiding reagent costs. Saturation analysis indicates that Specificity >98% is likely attainable with fewer than 500 samples, providing a path to a clinically actionable screening protocol in subsequent phases.

CONTACT INFORMATION

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