A Scalable Artificial Intelligence Framework for Rapid EGFR Mutation Screening in Lung Cancer

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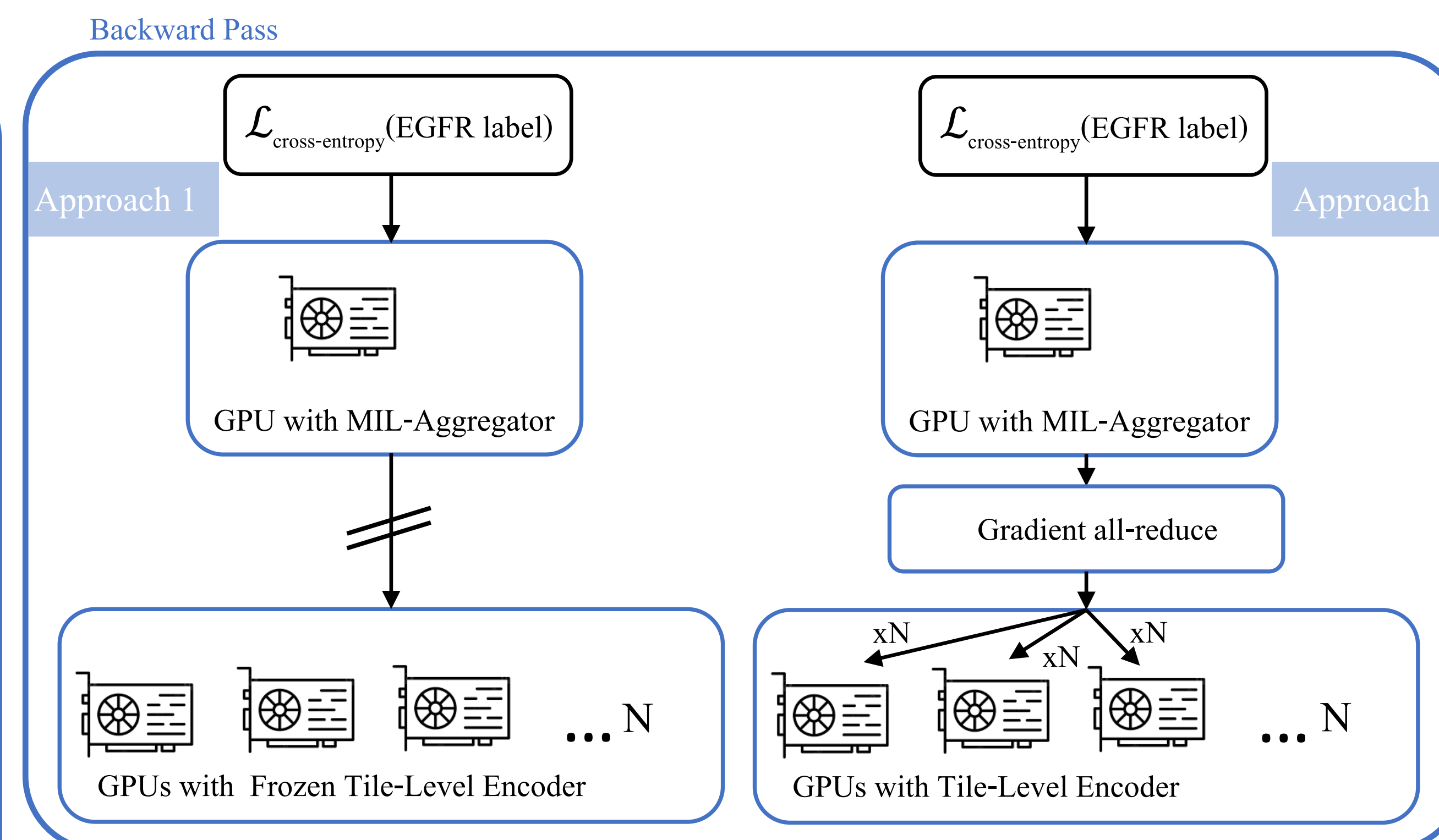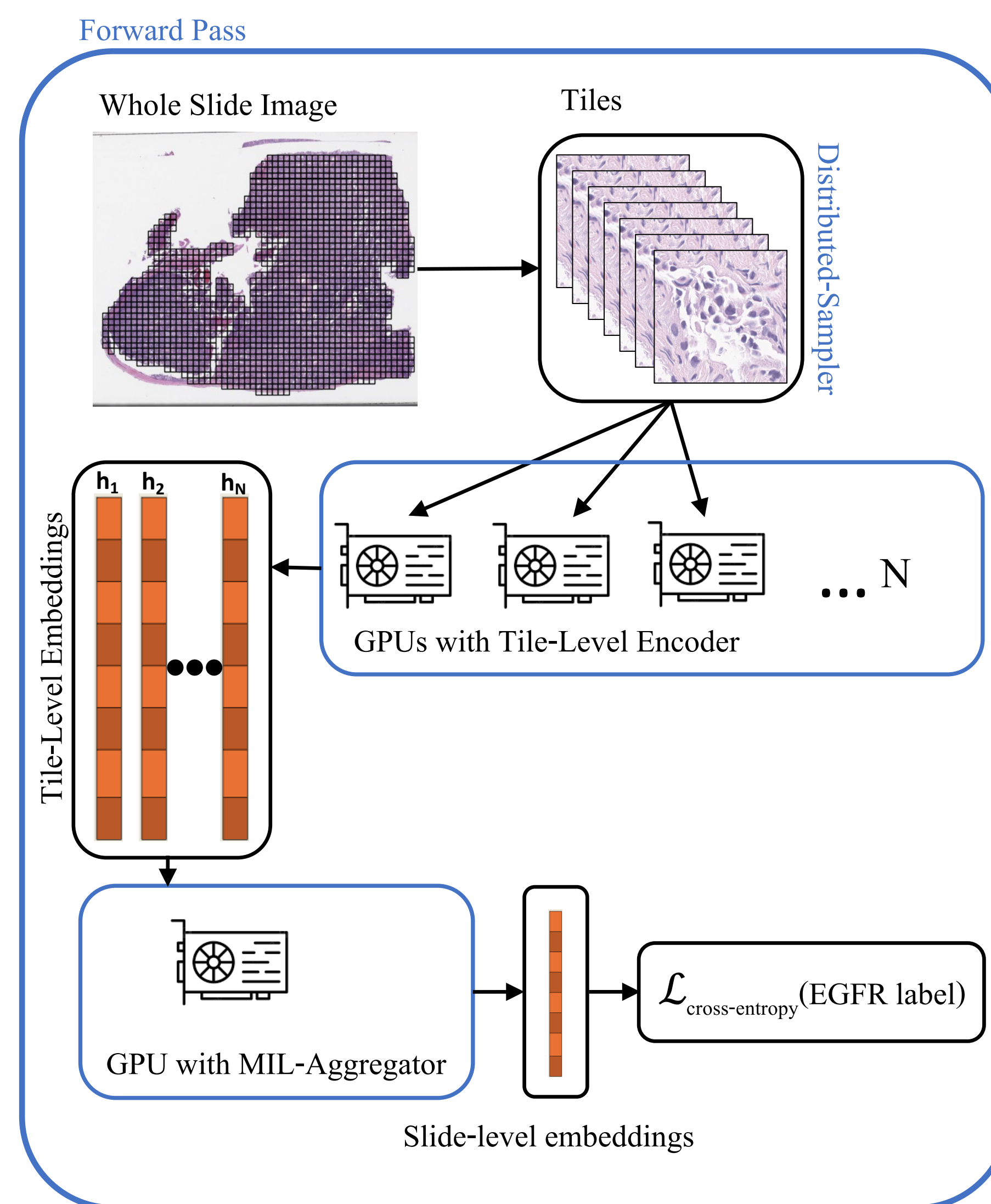
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NEURAL INFORMATION PROCESSING SYSTEMS

Vancouver, 2024

Memorial Sloan Kettering Cancer Center™

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Forward Pass / Backward Pass framework diagram

We present two AI approaches for EGFR mutation screening in lung cancer using H&E-stained whole slide images. Our methods achieve 0.90 AUC on independent testing with 2-minute inference time per slide. The in-real-time pipeline processes slides within 20-45 minutes of scanning, compared to conventional molecular testing that takes 2-18 days.

Approach 1
Two-step process: Pre-trained vision transformer (frozen) + MIL

Approach 2
End-to-end training: Joint optimization of encoder and MIL

Dataset	Approach 1			Approach 2		
	AUC	Sens	Spec	AUC	Sens	Spec
Model Selection (n=260)	**0.96**	0.83	0.92	0.90	0.88	0.93
Independent Testing (n=6300)	0.89	0.72	0.96	**0.90**	0.84	0.95
TCGA-LUAD (n=519)	0.78	0.60	0.81	**0.86**	0.78	0.74
IRT (n=1000)	0.80	0.65	0.80	**0.83**	0.62	0.83

Note: Bold AUC values indicate better performance

EGFR Testing Methods: Turnaround Time

- AI-Based Method: 20 min
- Idylla™ PCR Test: 2 days
- IMPACT Testing: 18 days
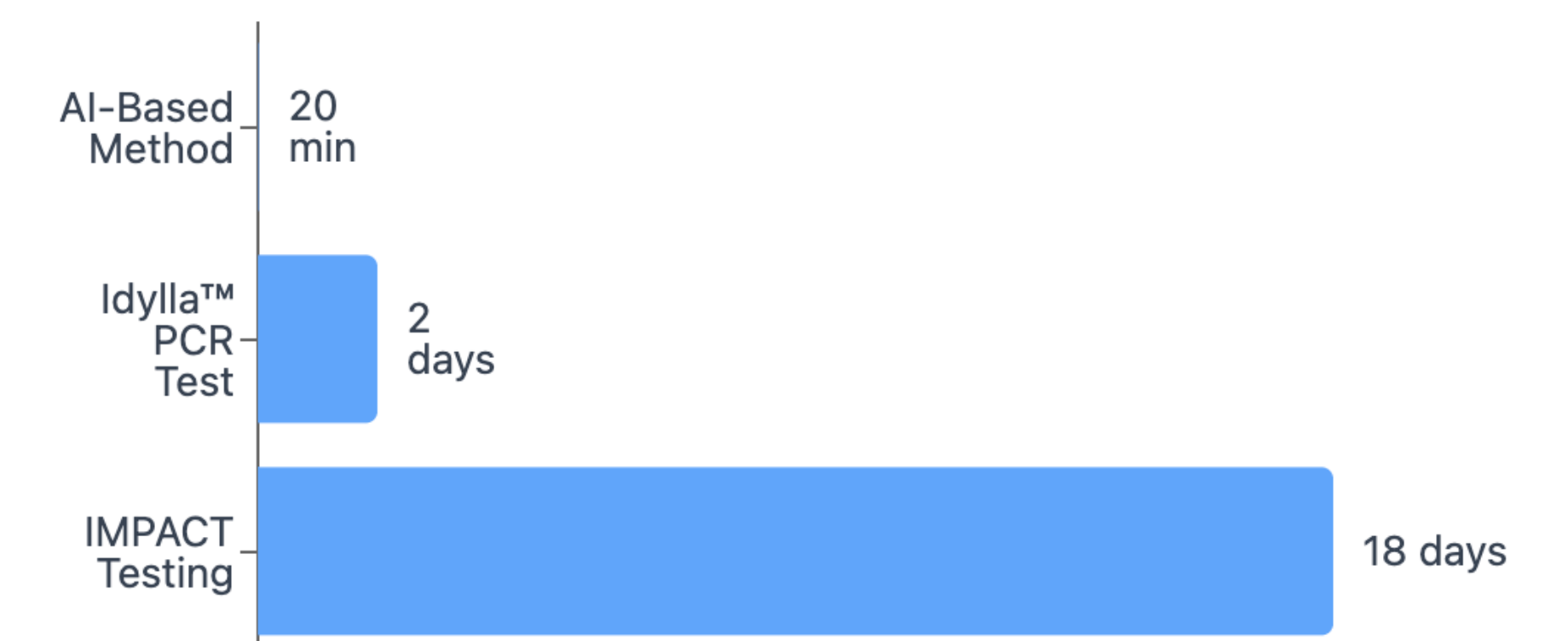
Note:

The AI-based method processes all slides within 30-45 minutes (median: 20 minutes), compared to days for conventional methods.

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