Leiden University Medical Center

AIRMEC

AI for clinical data analysis: showcase of HECTOR

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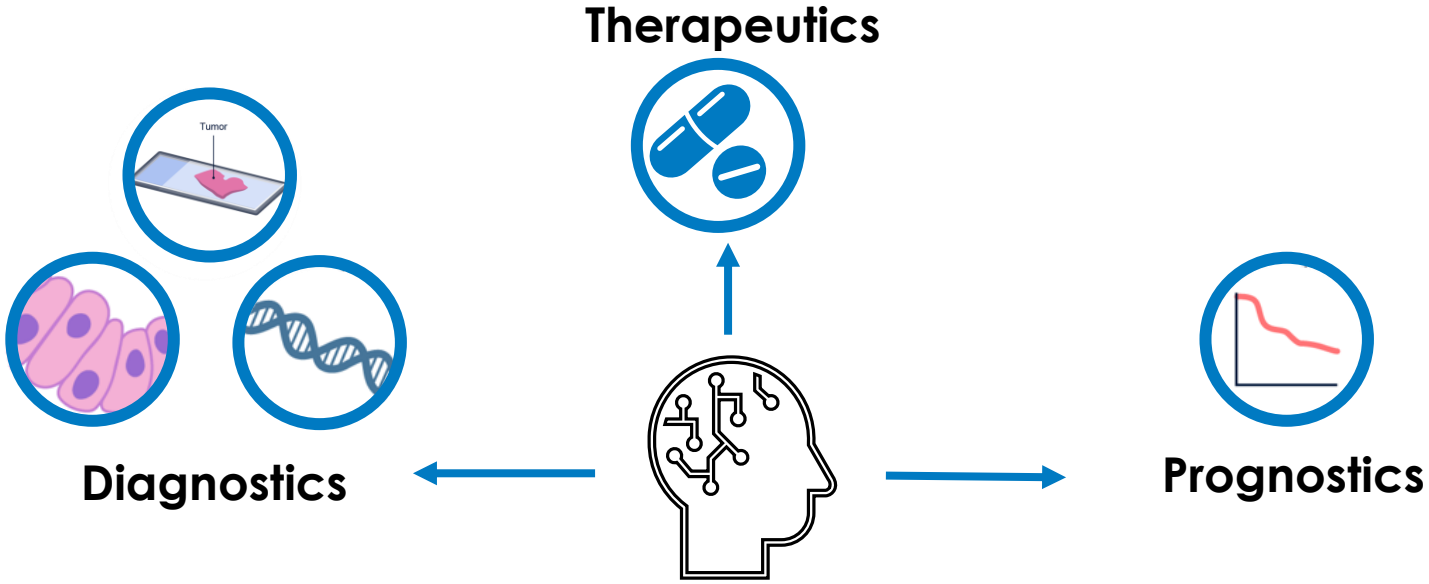
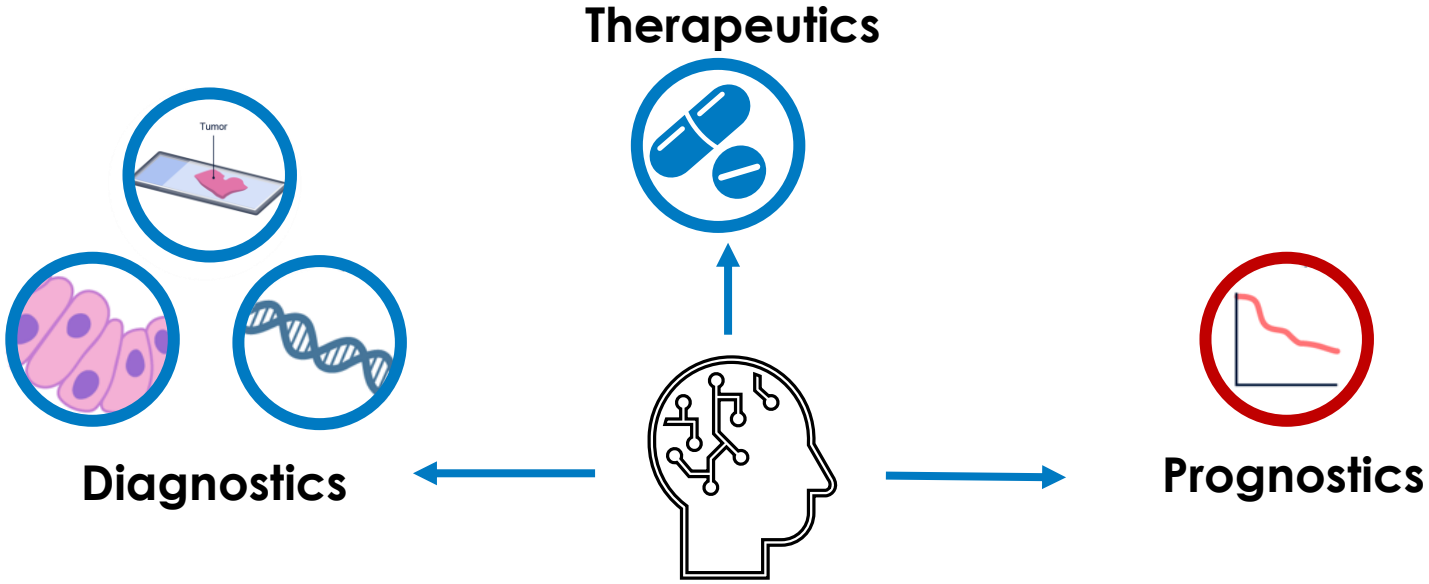
Outlook of applications of AI



- Shorter turn-around time
- Cheaper
- More accurate
- Deeper biological understanding
- Drug development support

Outlook of applications of AI



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Introduction to HECTOR

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Histopathology-based
Endometrial
Cancer
Tailored
Outcome
Risk

nature medicine

Article

https://doi.org/10.1038/s41591-024-02993-w

Prediction of recurrence risk in endometrial cancer with multimodal deep learning

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Check for updates

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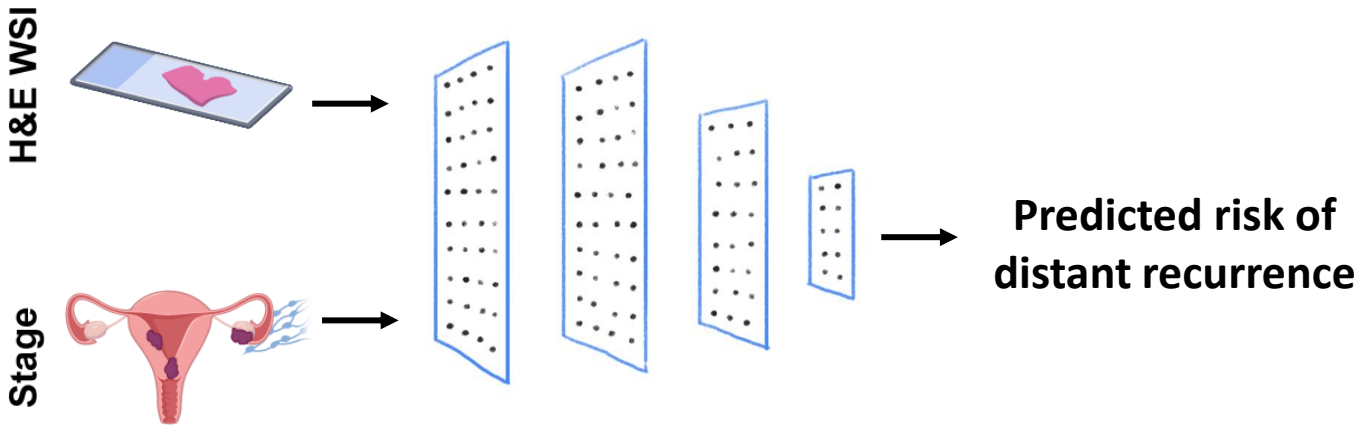
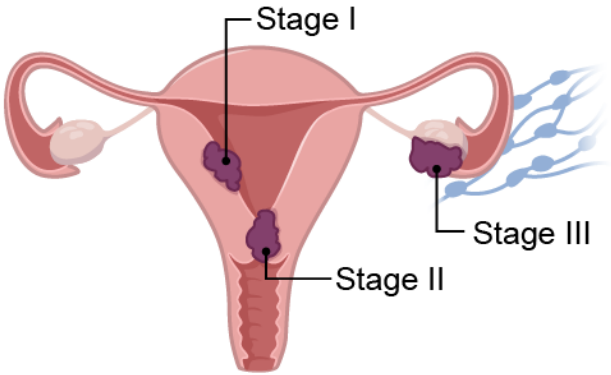


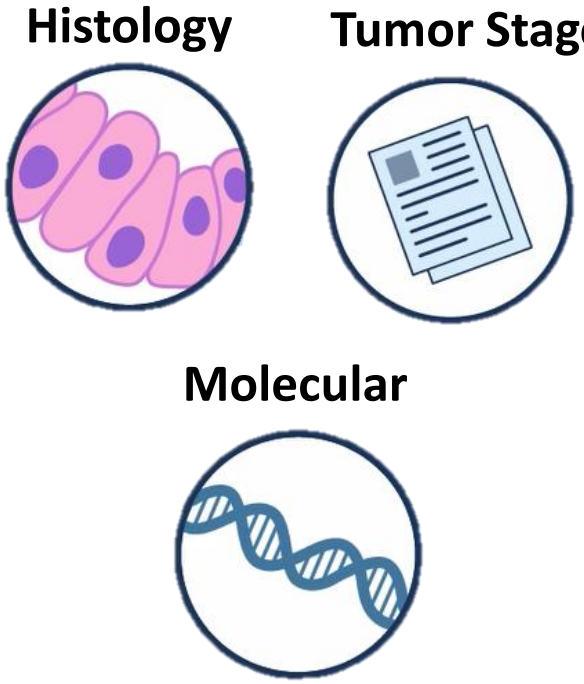
Why HECTOR?

Clinical case



- **Endometrial Cancer (EC)** is the most common gynecological cancer (400,000/year)
- Primary treatment is surgery. 10-20% develop **distant recurrence**.
- Who? Which adjuvant treatment?

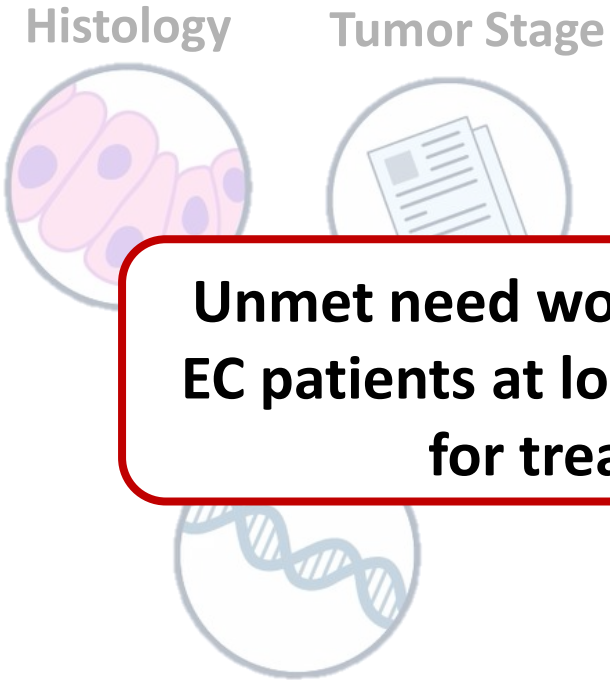
Clinical case



- Current risk identification based on
  - Stage
  - Histology (grade, histological type, LVSI)
  - Molecular class (*POLE*mut, MMRd, p53abn)

- Limiting reproducibility due to
  - Variability & expertise
  - Costs
  - Turn-around-time

Clinical case



- Current risk identification based on
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  - Costs
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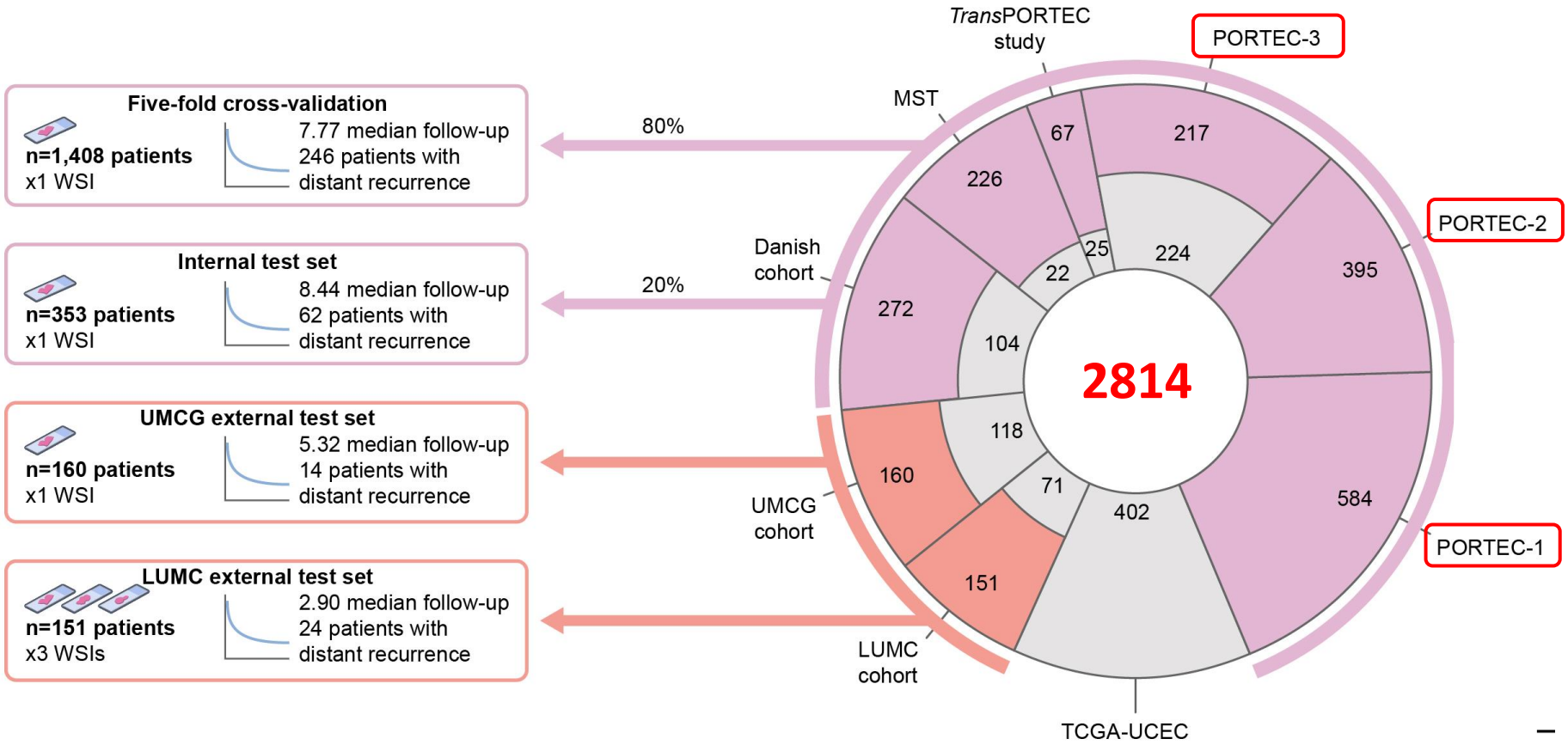
Unmet need worldwide of accurately identifying EC patients at low-high risk of distant recurrence, for treatment-decision making

What data did we use?

Fully digitized dataset

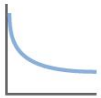


What is the accuracy of HECTOR?

Results C-indices

Five-fold cross-validation

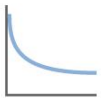
n=1,408 patients
x1 WSI



7.77 median follow-up
246 patients with
distant recurrence

Internal test set

n=353 patients
x1 WSI



8.44 median follow-up
62 patients with
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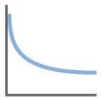
UMCG external test set

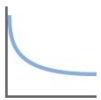
n=160 patients
x1 WSI



5.32 median follow-up
14 patients with
distant recurrence

LUMC external test set

n=151 patients
x3 WSIs



2.90 median follow-up
24 patients with
distant recurrence

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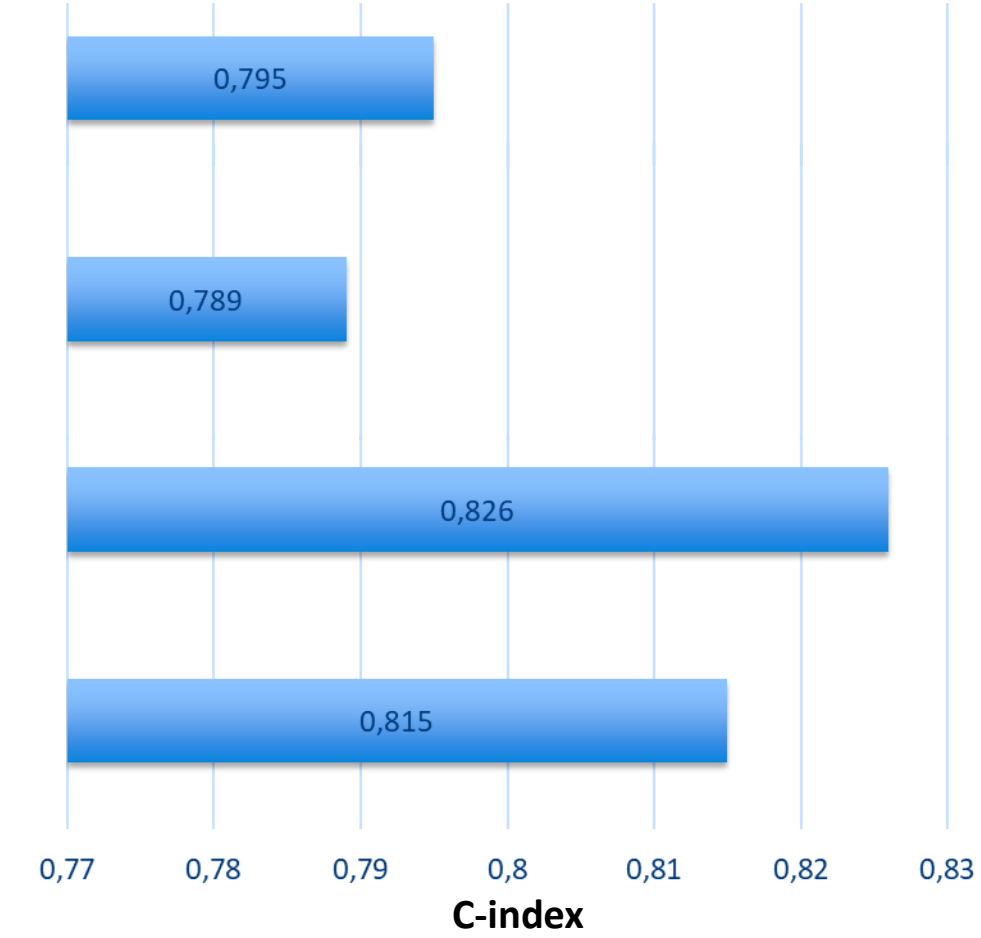
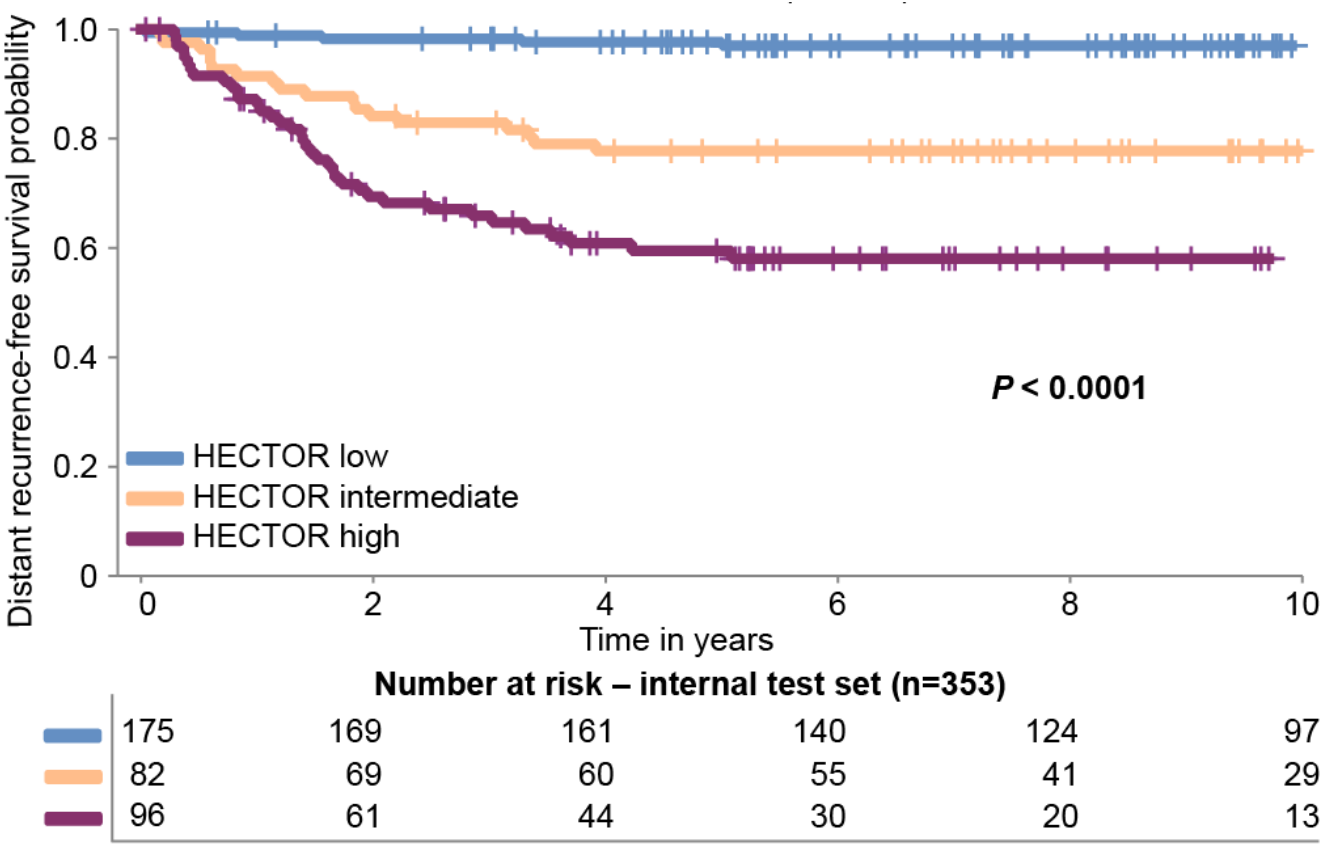
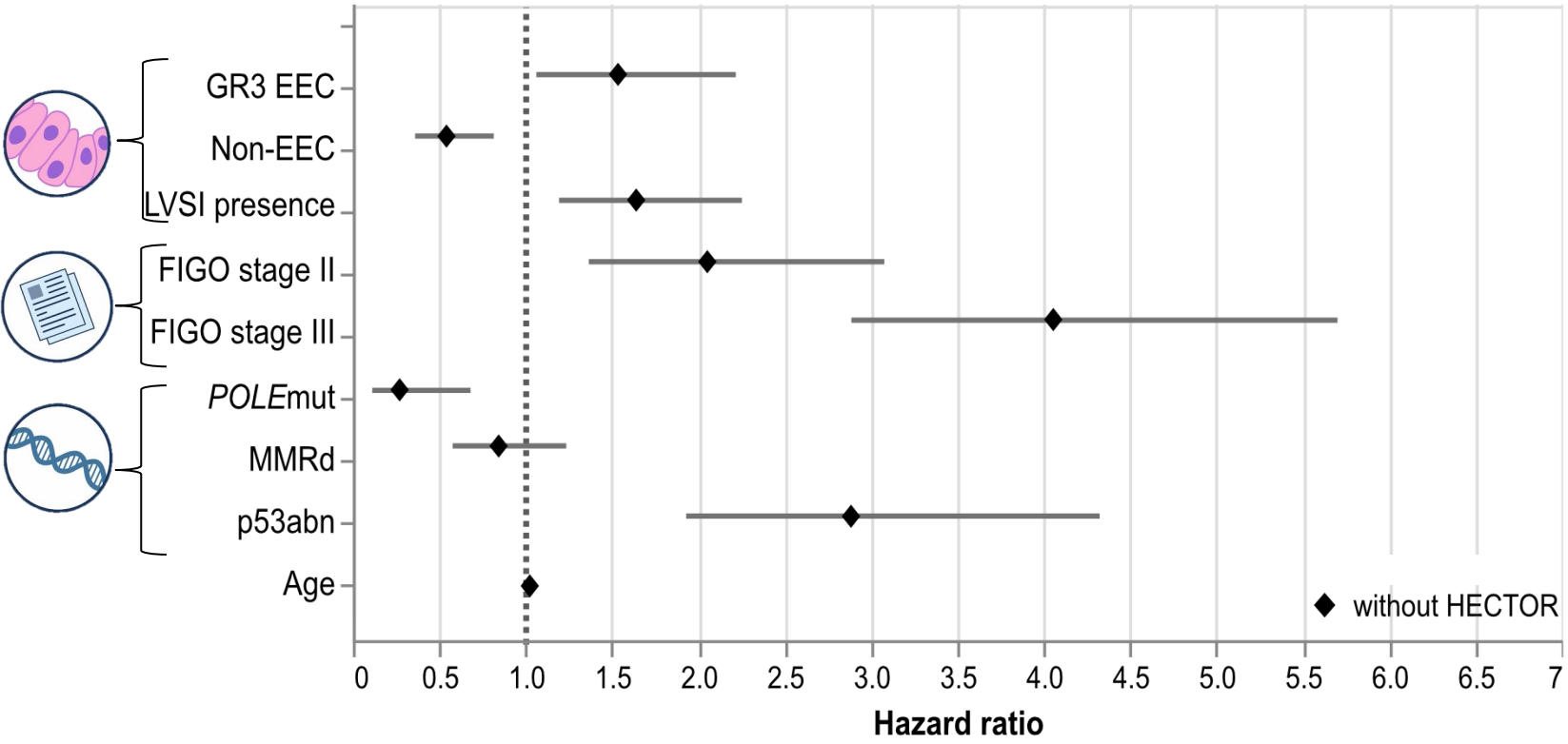


Performance in internal test set



As compared to the gold standard in the clinic?

Comparison with gold standard



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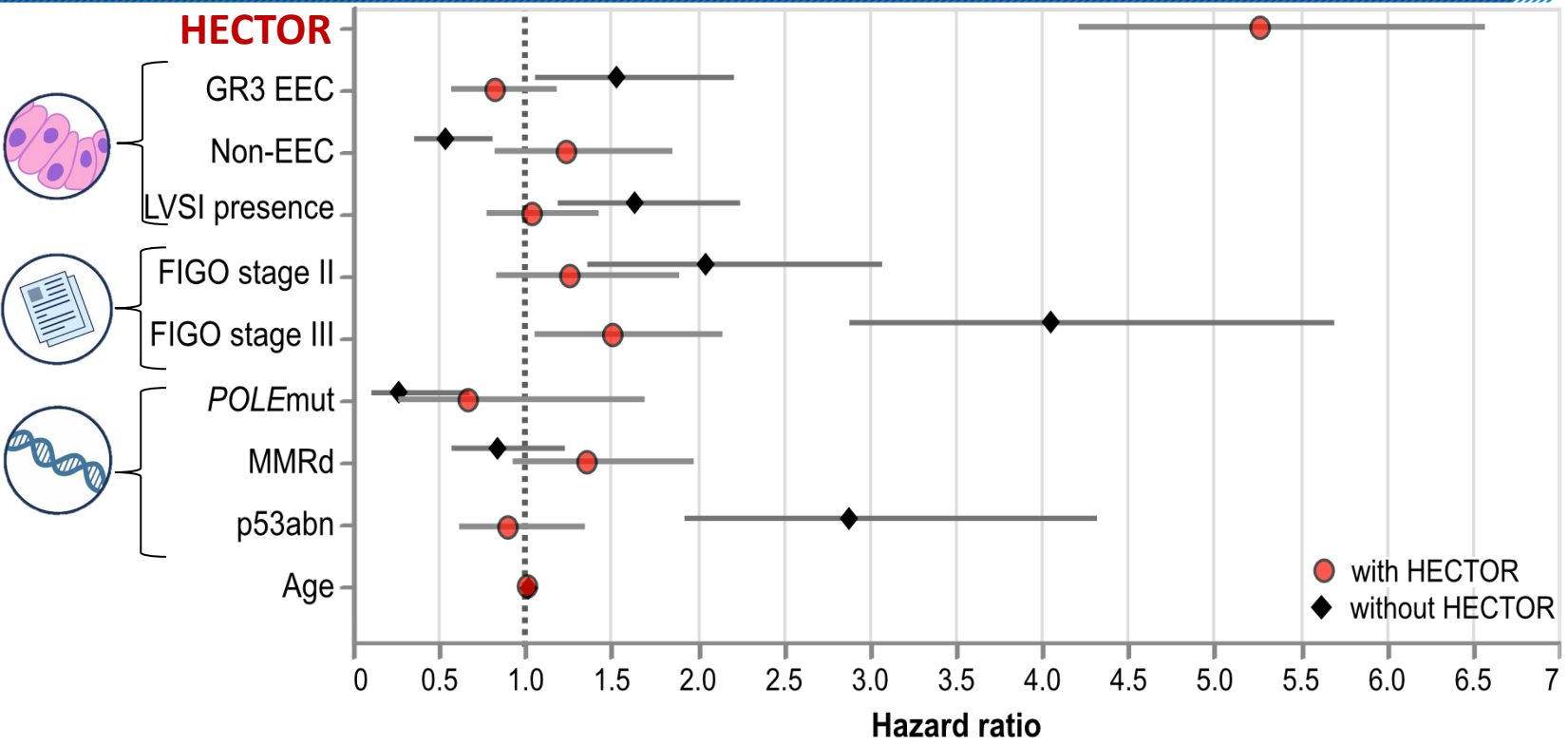

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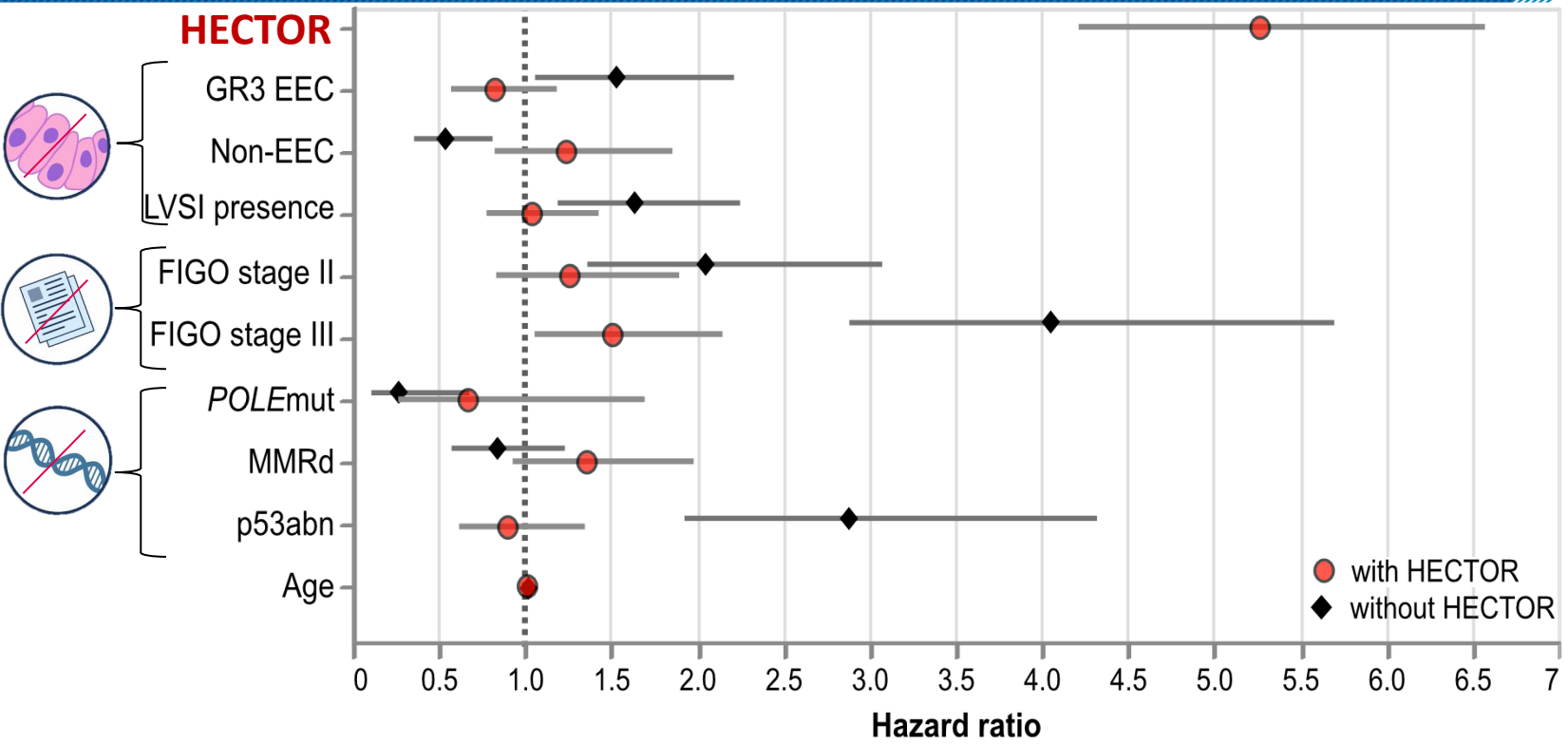
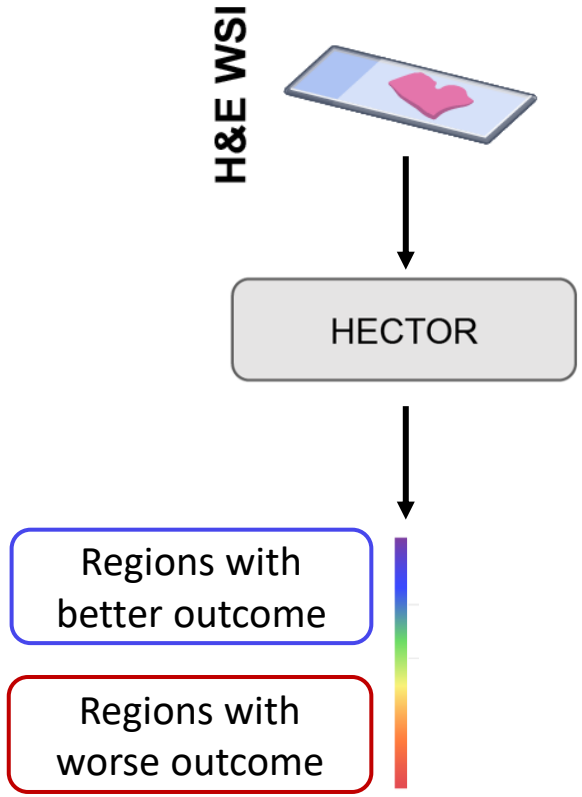
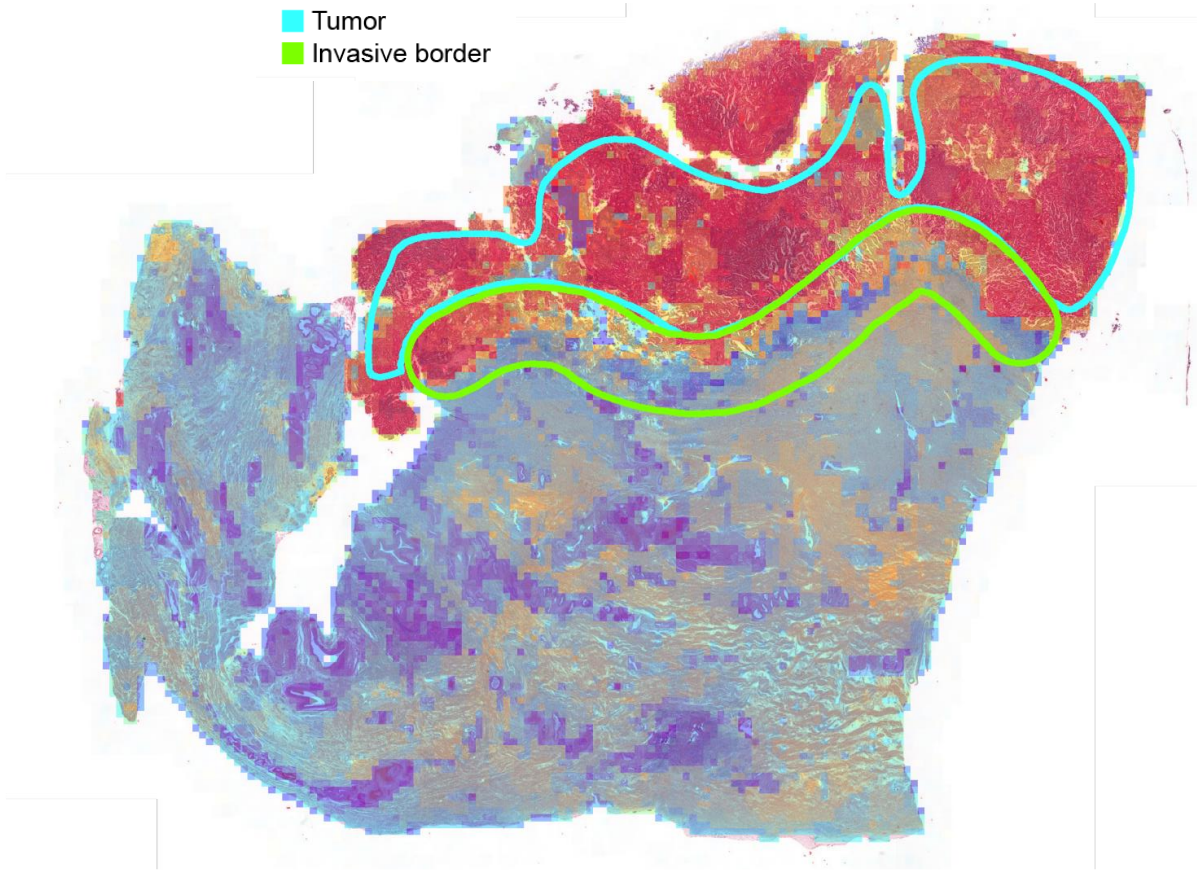


Are HECTOR predictions reliable?
Can we deepen our biological understanding?

Morphological correlates





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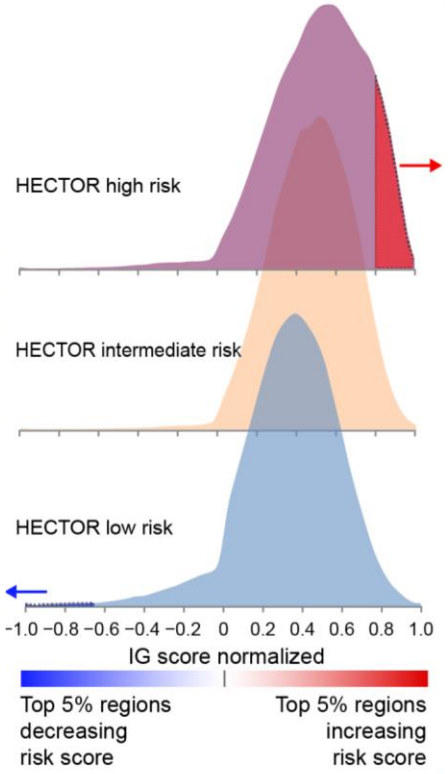
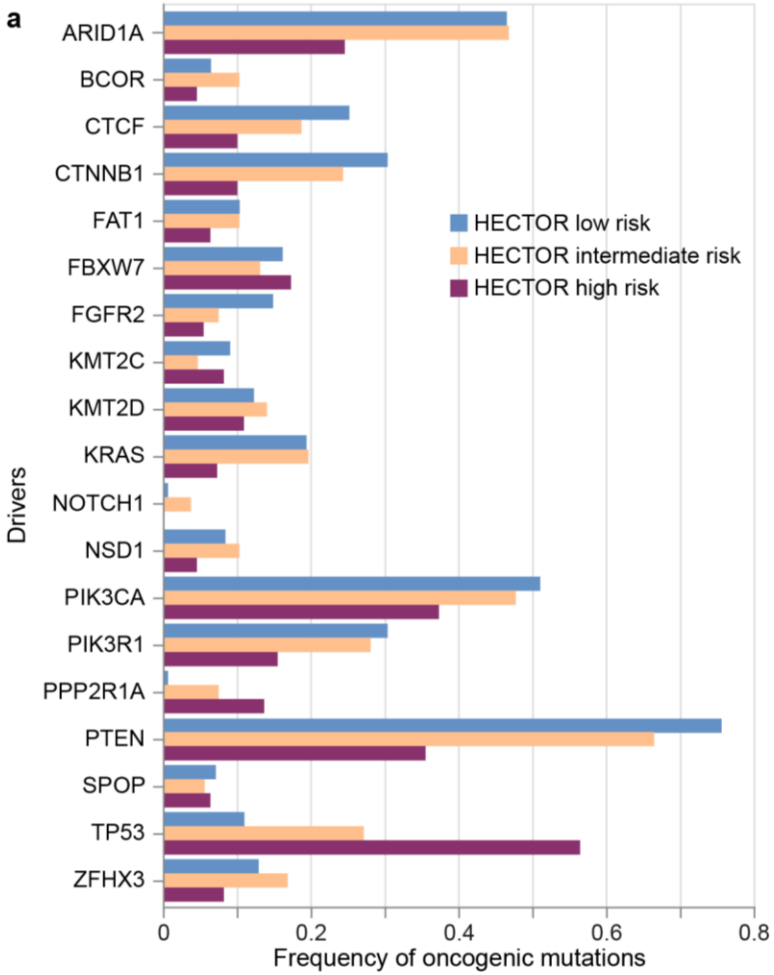
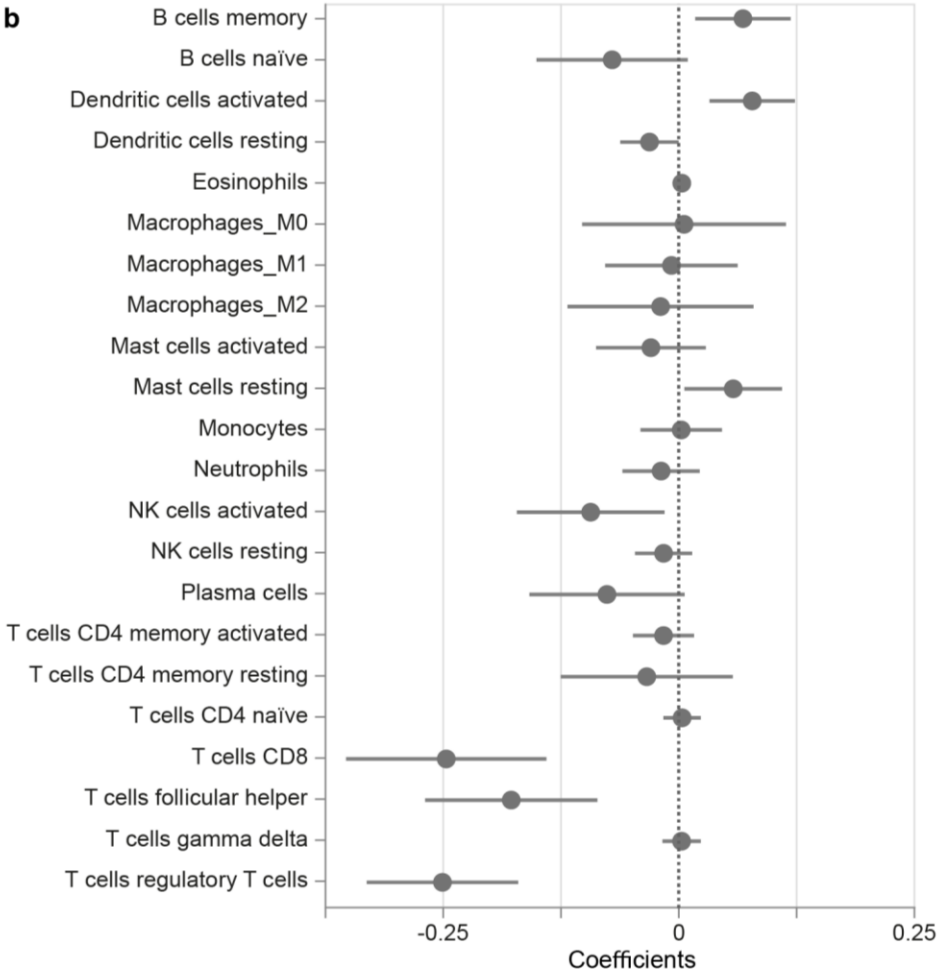


Correlates with gene mutation & immune cell subset





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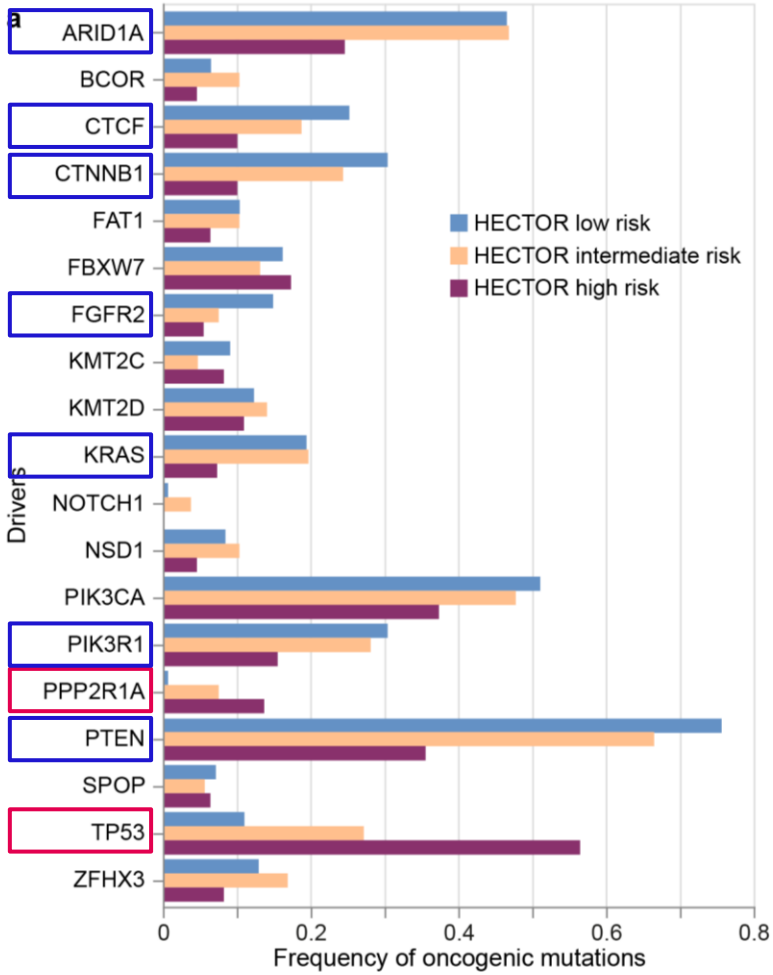

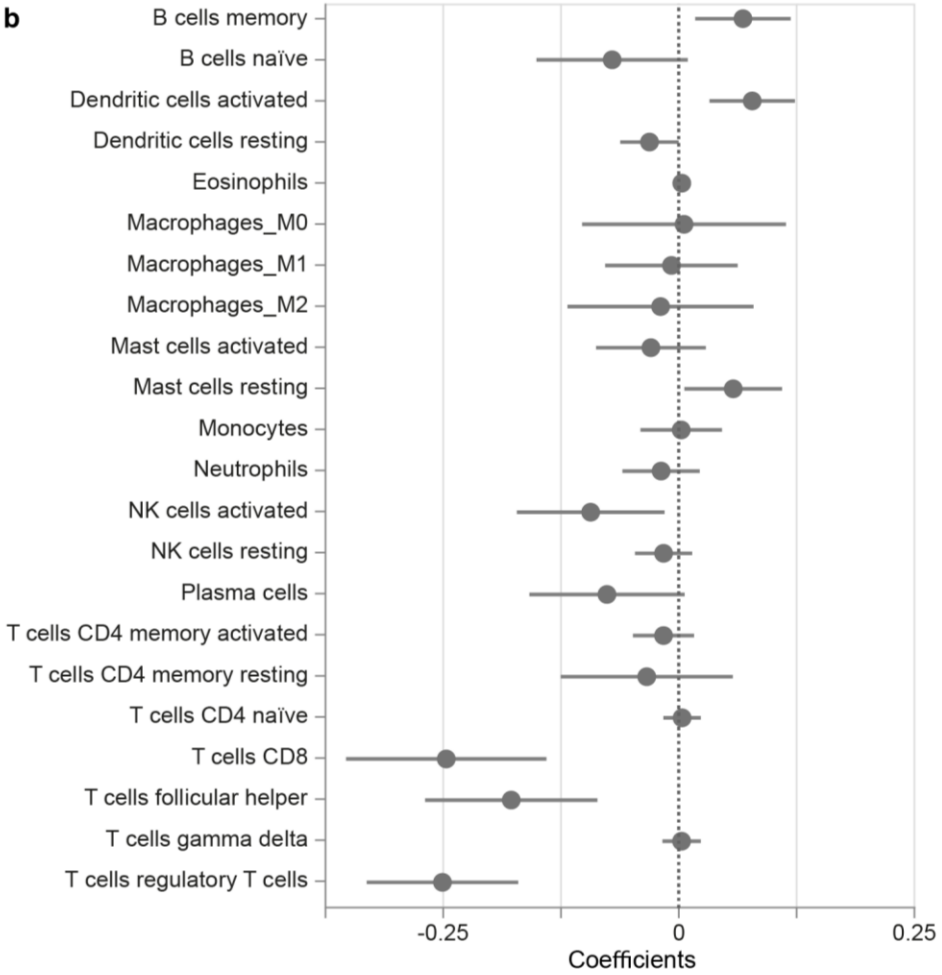

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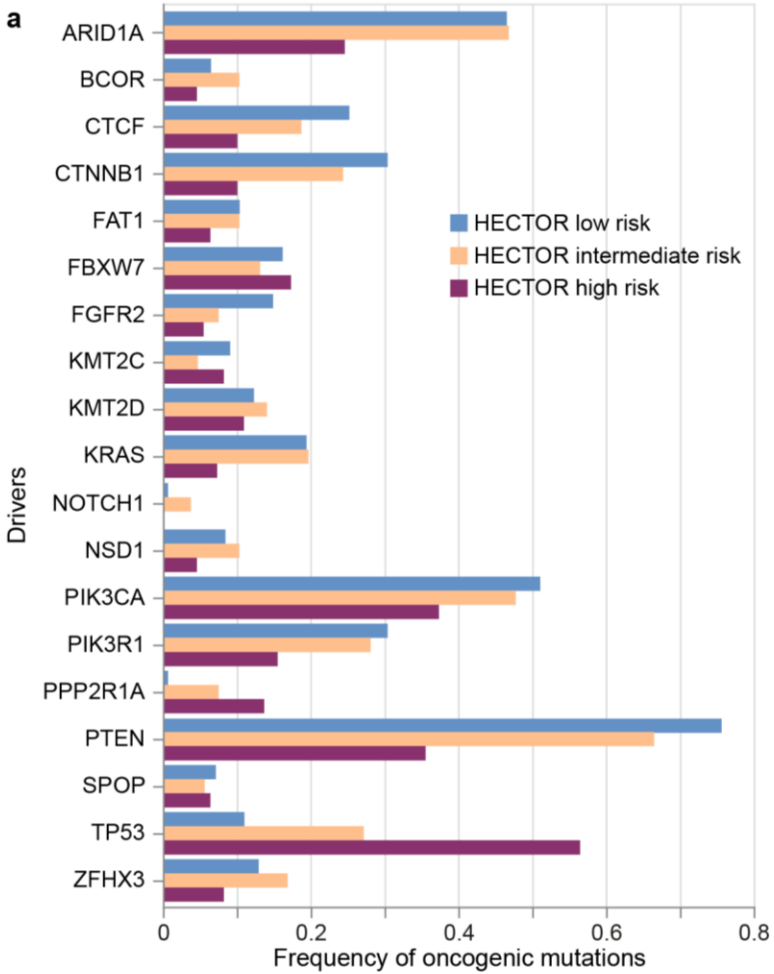
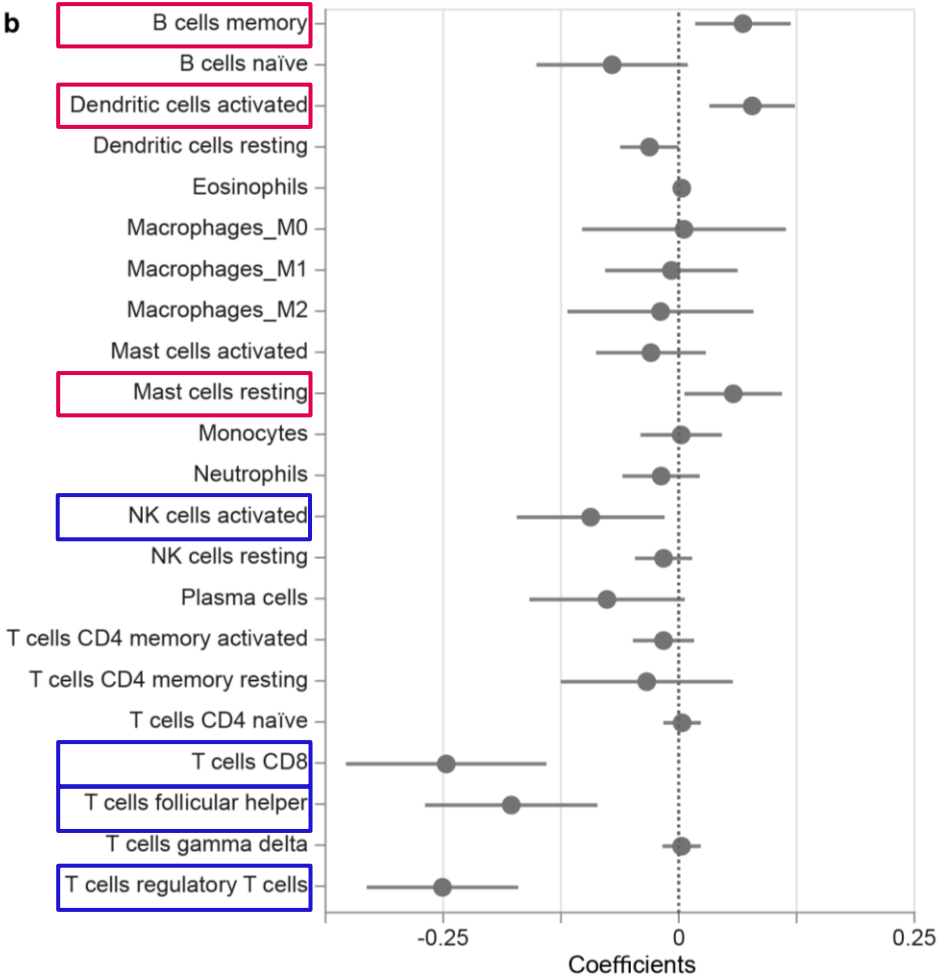
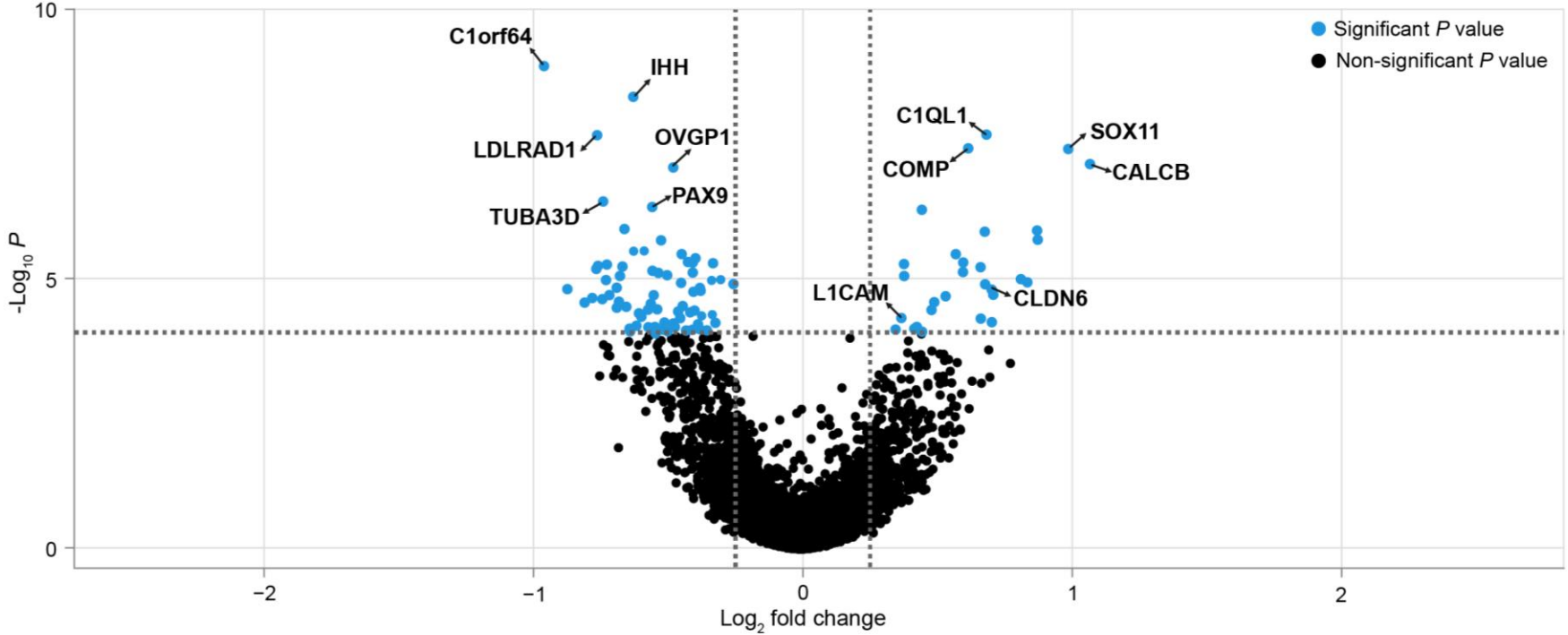


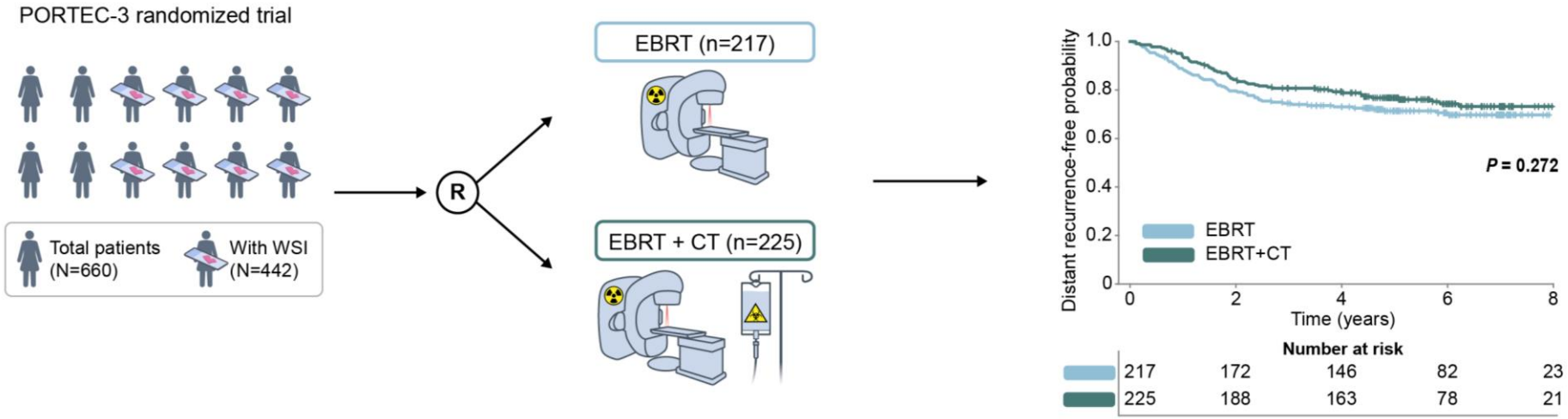


Correlates with differential gene expression



Could HECTOR support treatment decision making?

Benefit of adjuvant chemotherapy



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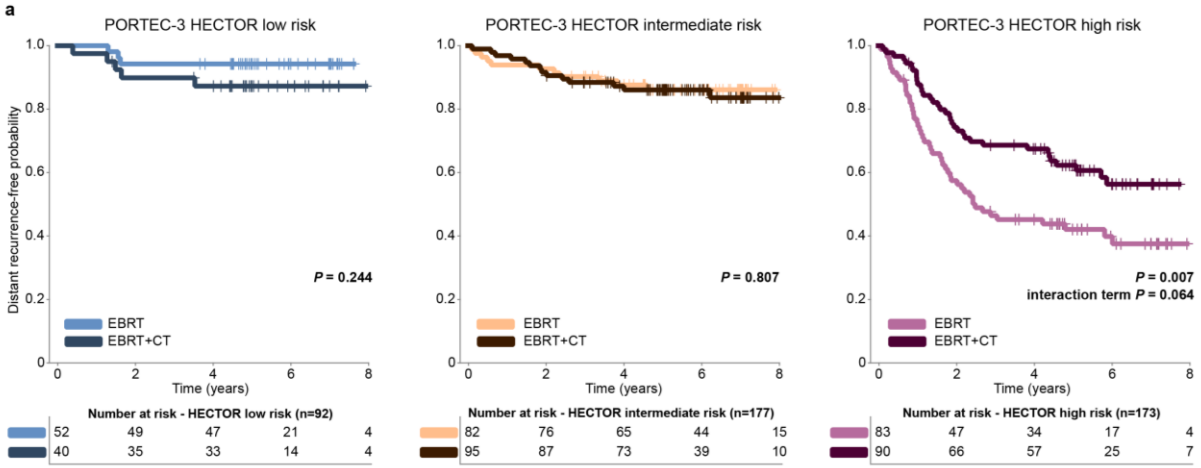

Conclusion & discussion

Conclusions

- HECTOR **accurately** predicted distant recurrence risk in EC, outperforming standard clinical risk factors, prospective validation needed

- Domain expertise, computational power, and high-quality dataset with collaboration were **essential**

- HECTOR could be used to **triage patients** at low and high risk of distant recurrence for **systemic therapy treatment**

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