Novel Technologies and Strategies that Aim to Optimize Diagnosis via Pathology

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Workshop on Achieving Excellence in Cancer Diagnosis

Pathology plays a fundamental role in the patient journey

PATIENT SYMPTOMS

BIOPSY

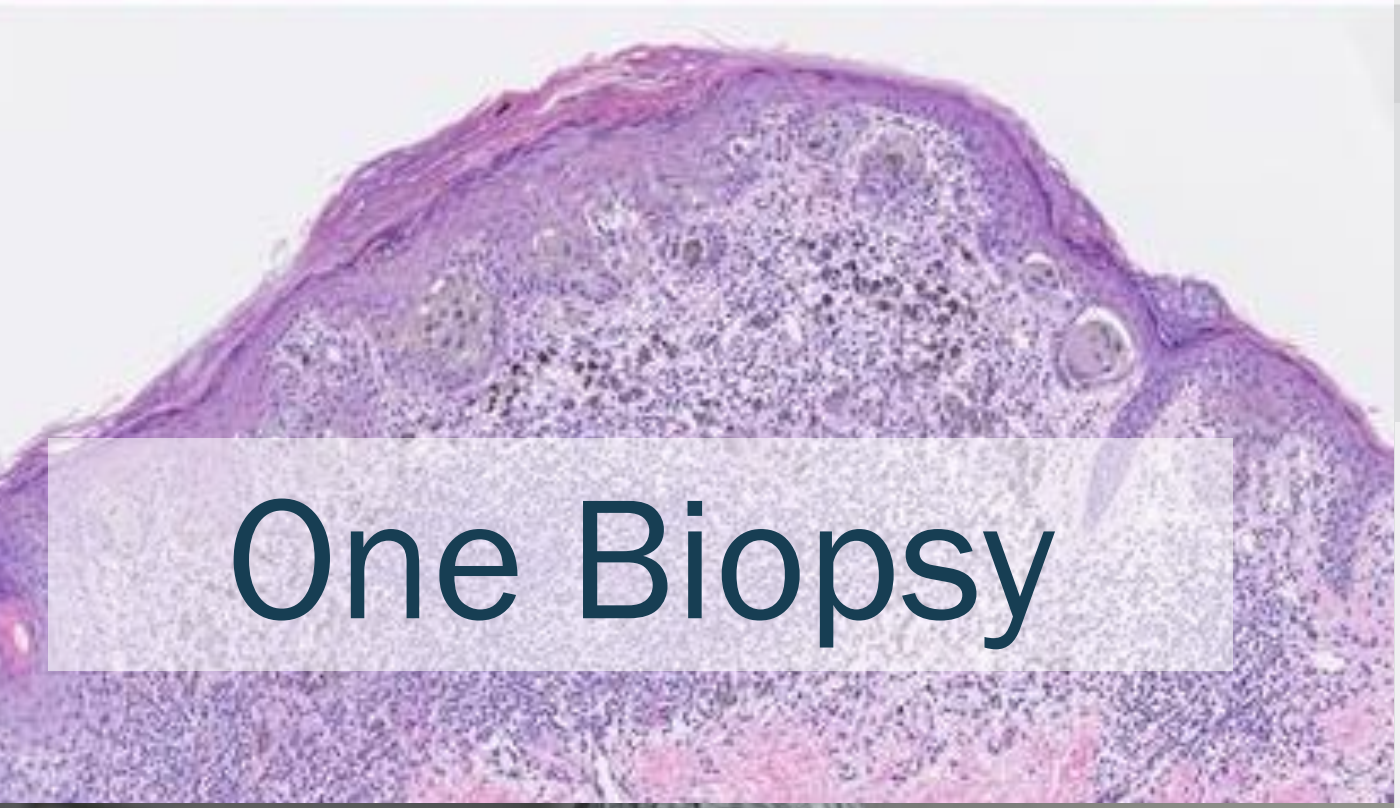
PATHOLOGY ANALYSIS

RECOMMENDED TREATMENT

Does the patient have cancer?

How advanced is the disease?

Which treatments likely to be effective?



One Biopsy

36 Pathologists

Joann Elmore et al. Pathologists' diagnosis of invasive melanoma and melanocytic proliferations: observer accuracy and reproducibility study. BMJ 2017;357:j2813

Diagnostic terms given

MPATH-Dx class I
Common nevus, junctional
Dysplastic nevus - mild
Halo nevus (1)
Atypical melanocytic neoplasm, junctional (suggested treatm

MPATH-Dx class II
Spitz nevus (conventional), (junctional, compound, or intrade
Dysplastic nevus - moderate
Pigmented spindle cell nevus (junctional or compound
Atypical nevus not otherwise specified, including atypical nev
Atypical intraepithelial melanocytic proliferation (AIMP) (sugg
‹5 mm margins (narrow but complete))
Atypical melanocytic neoplasm, junctional (suggested treatme
(narrow but complete))

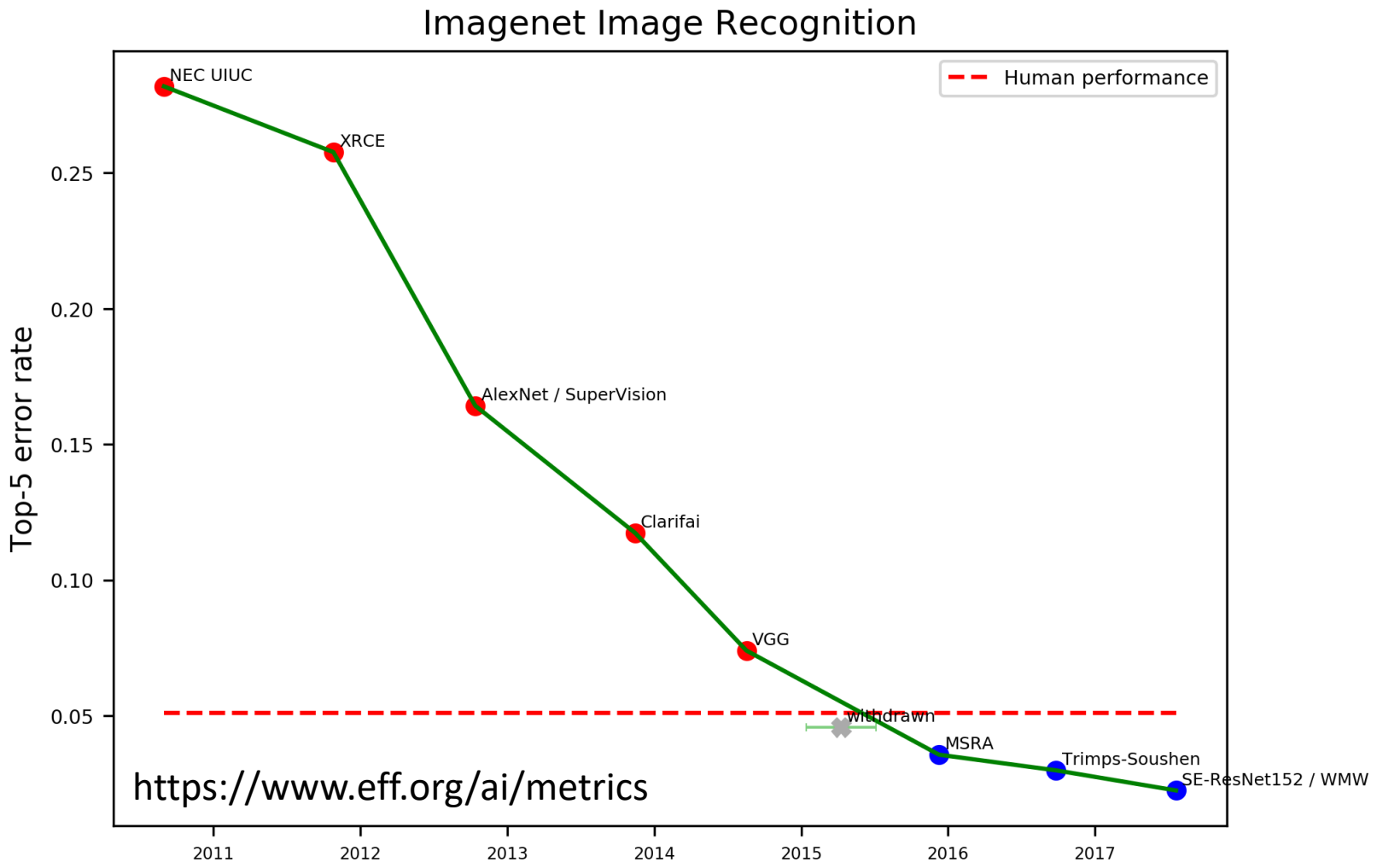
MPATH-Dx class III
Atypical/dysplastic Spitz lesion, (junctional, compound, or d
Melanoma in situ, common/pagetoid/superfical spreading
Dysplastic nevus - severe
Atypical nevus not otherwise specified, including atypical nev
Melanoma in situ, not otherwise specified
Atypical melanocytic neoplasm, junctional (suggested treatm
5mm (but ‹1 cm) margins)

MPATH-Dx class IV
Invasive melanoma, superficial spreading melanoma

MPATH-Dx class V
Invasive melanoma, heavily pigmented melanoma

18 DIFFERENT DIAGNOSES

Deep Learning for Computer Vision has shown Remarkable Progress in Recent Years



Alex Krizhevsky, Ilya Sutskever, Geoffrey E. Hinton. ImageNet classification with deep convolutional neural networks
https://dl.acm.org/doi/10.1145/3065386

The landscape of precision medicine testing is becoming increasingly complex

J.T. Jørgensen

Translational Oncology 14 (2021) 101063

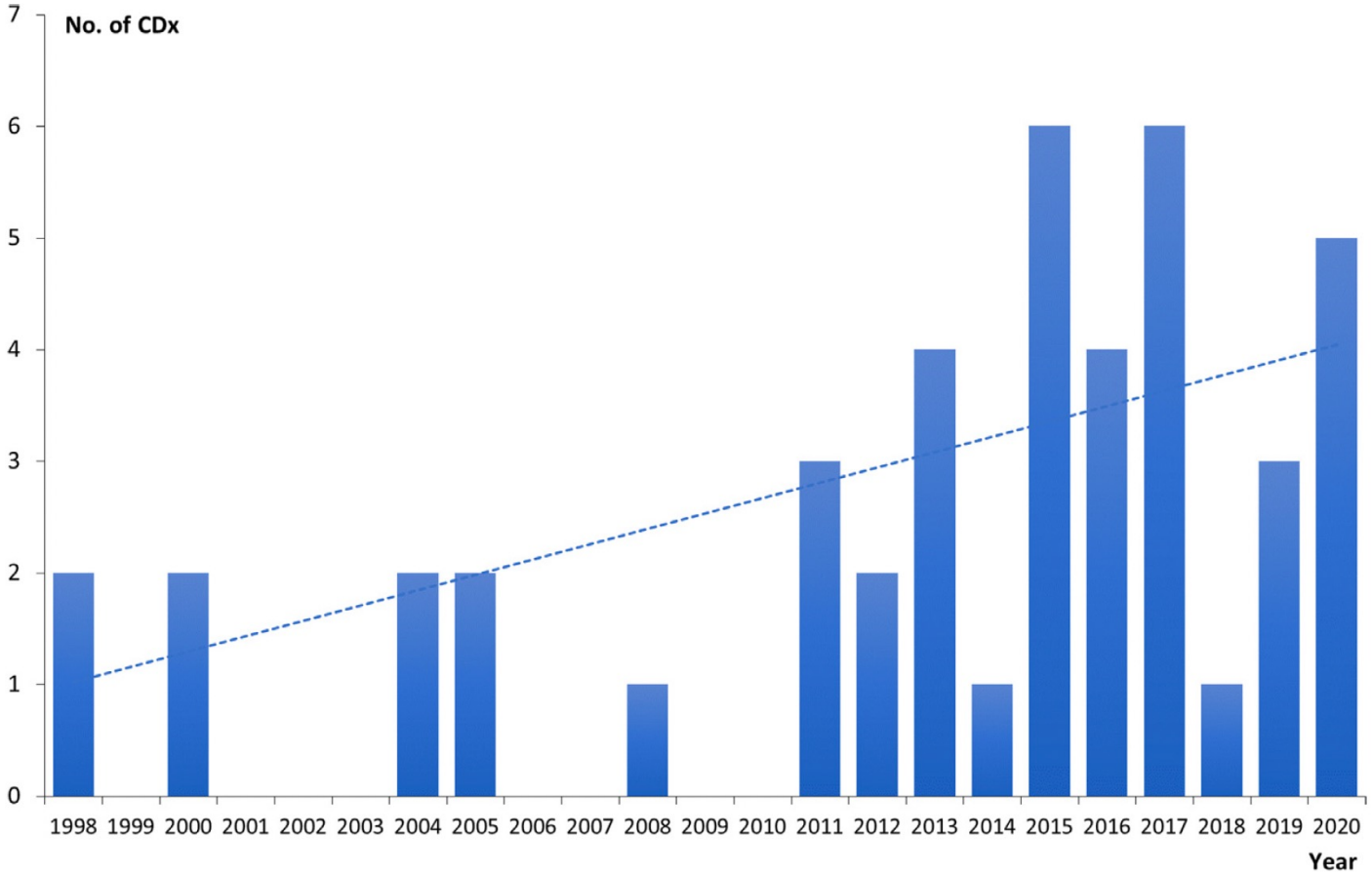
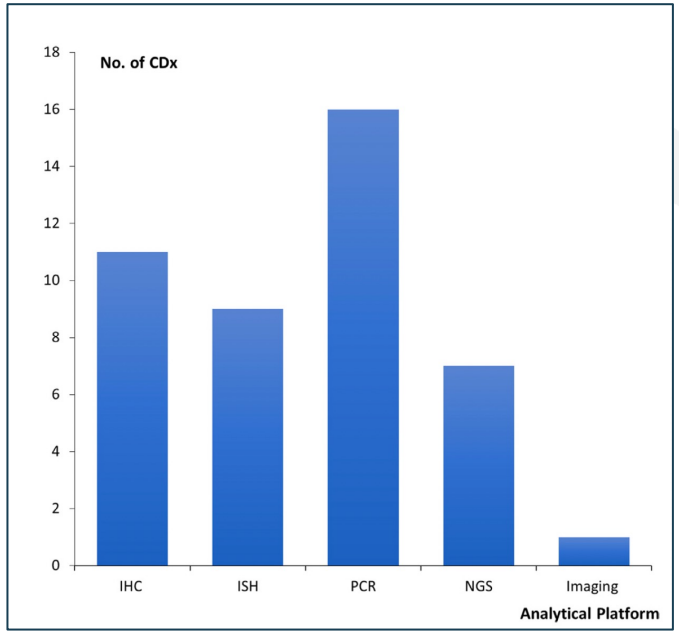
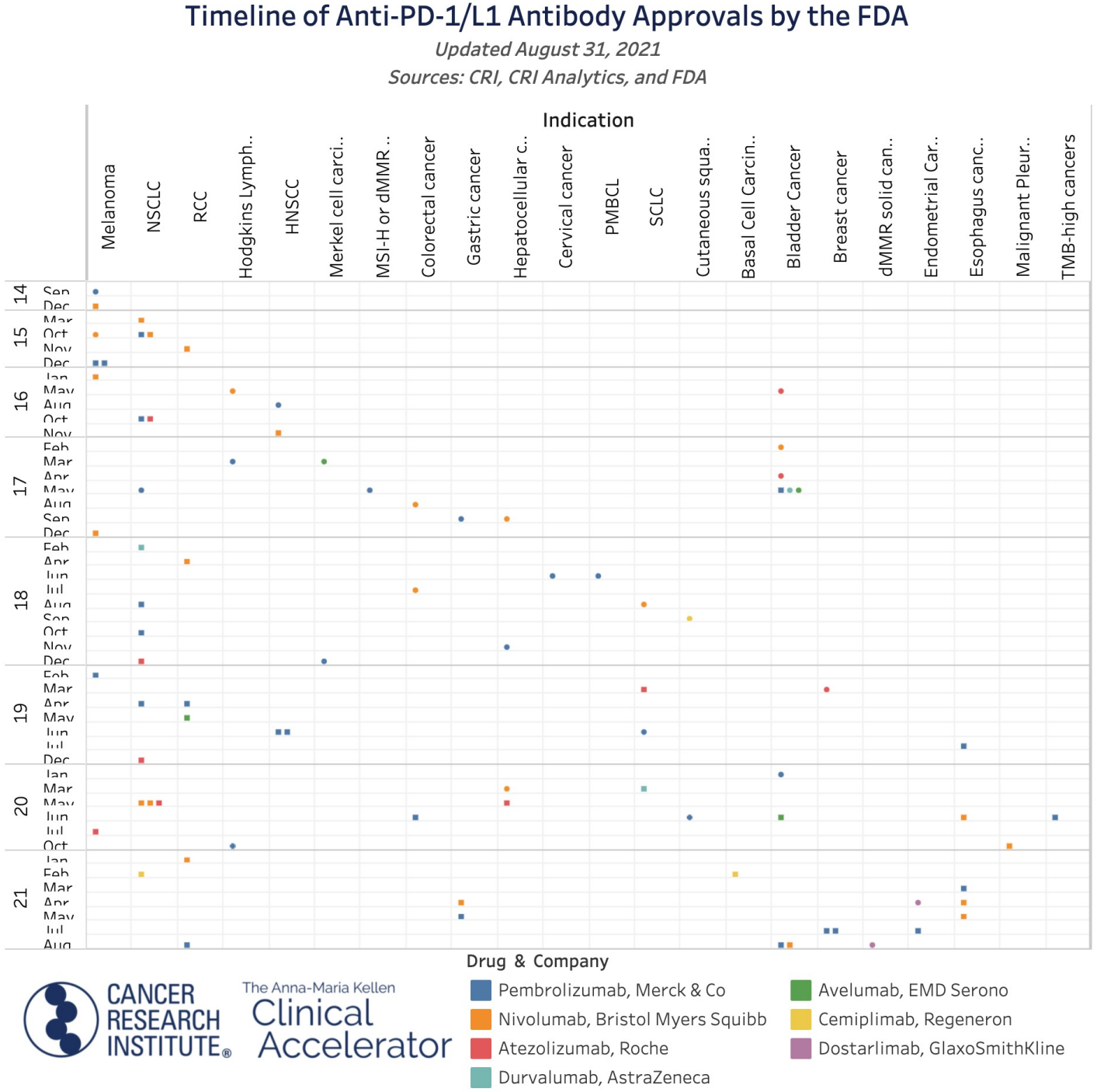


Fig. 1. FDA approval of companion diagnostic (CDx) assays by year. The total number of approvals by the end of 2020 are 44.





CANCER RESEARCH INSTITUTE®

The Anna-Maria Kellen Clinical Accelerator

https://www.cancerresearch.org/en-us/scientists/immuno-oncology-landscape/pd-1-pd-l1-landscape#timelines

Complex, Quantitative Criteria Required for Patient Selection

- Quantitative PD-L1 IHC CDx includes:
  - NSCLC - TPS 1%
  - Bladder - IC 5%
  - TNBC - IC 1%
  - Bladder - CPS 10%
  - Gastric - CPS 1%
  - Cervical - CPS 1%
  - HNSCC - CPS 1%
  - Esoph. - CPS 10%

CDx includes immune cell PDL1+ quantification from IHC

Traditional manual pathology review of PDL1-IHC performs very poorly on immune cells

PDL1 manual IHC scores on immune cells are unreliable

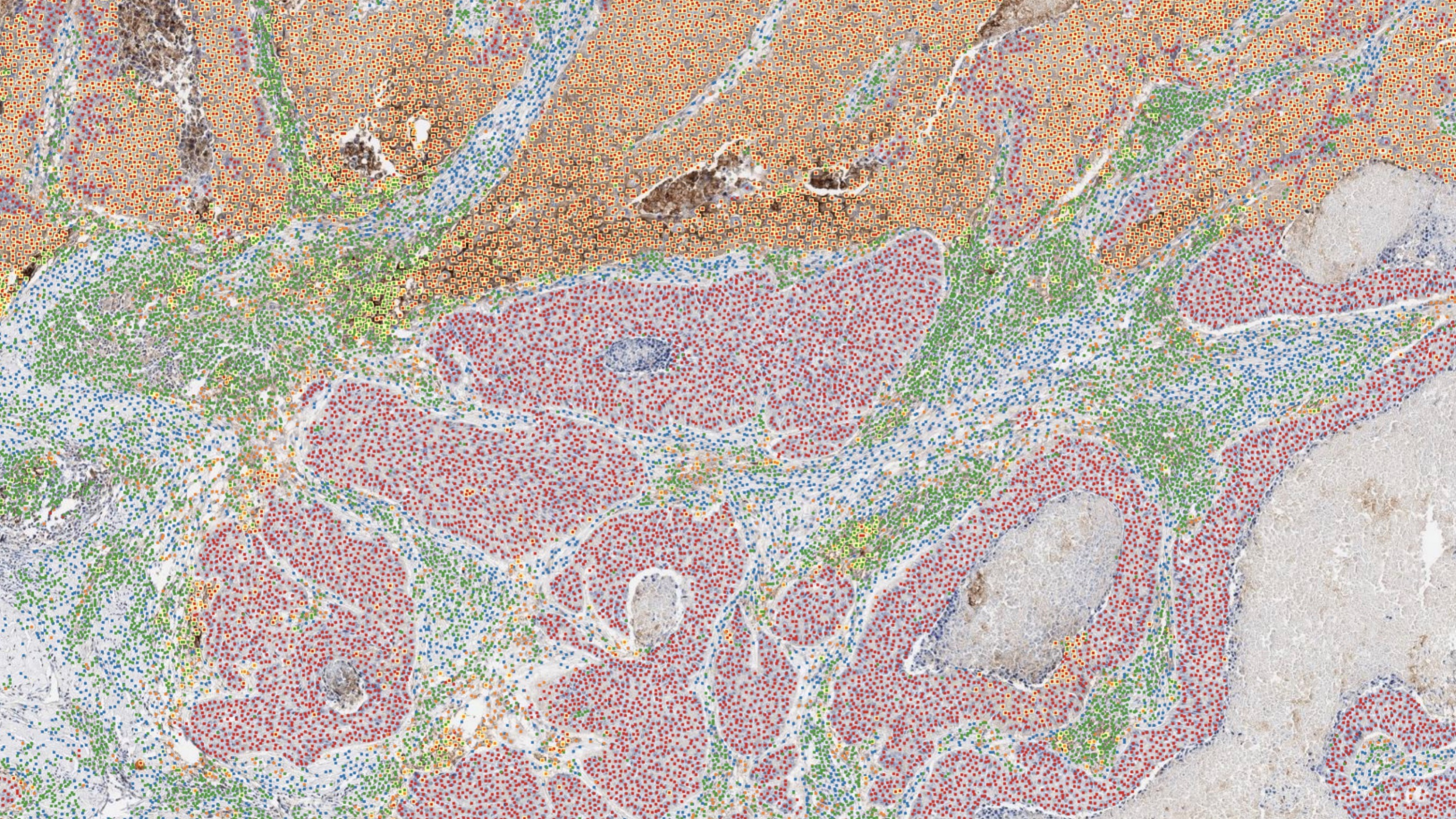
Table 2. ICC for the Pathologist Scores and Concordance Statistics

	Antibody, ICC (95% CI)				
Cells[a]	22c3	28-8	SP142	E1L3N	Summary, Mean (SD)
Tumor cells	0.882 (0.873-0.891)	0.832 (0.820-0.844)	0.869 (0.859-0.879)	0.859 (0.849-0.869)	0.86 (0.02)
Immune cells	0.207 (0.190-0.226)	0.172 (0.156-0.189)	0.185 (0.169-0.203)	0.229 (0.211-0.248)	0.19 (0.03)

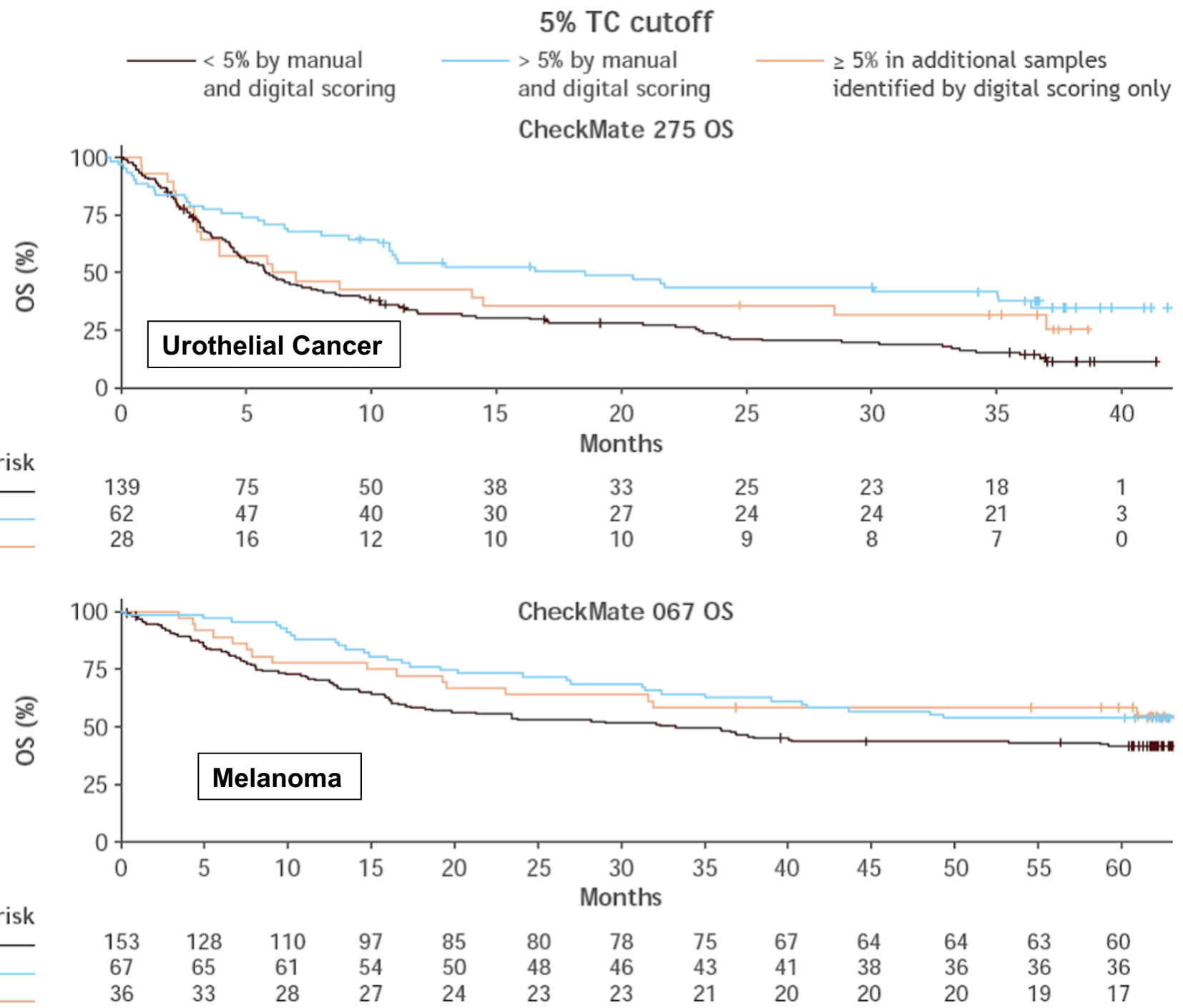
Abbreviation: ICC, intraclass correlation coefficient.

[a] N = 90.

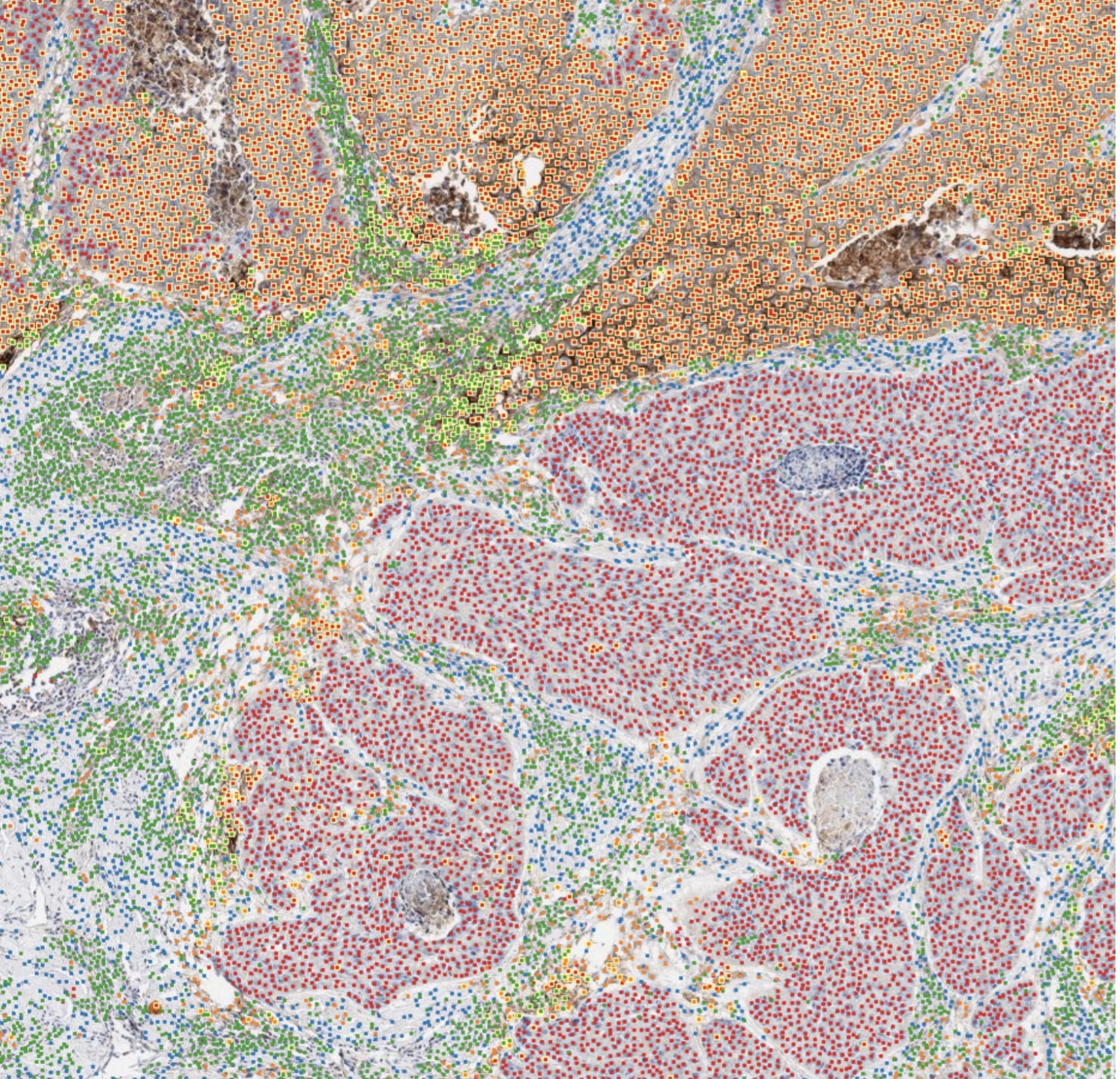
Rimm et al. (JAMA Oncol; 2017)



AI-powered PD-L1scoring identifies manual-negative patients with long term survival



Duan et al. Presented at the American Association for Cancer Research (AACR), June 2020



Potential of AI-Driven Pathology:

More accurate diagnosis

More lifesaving drug approvals

Matching patients with the most effective treatments

Thank you

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