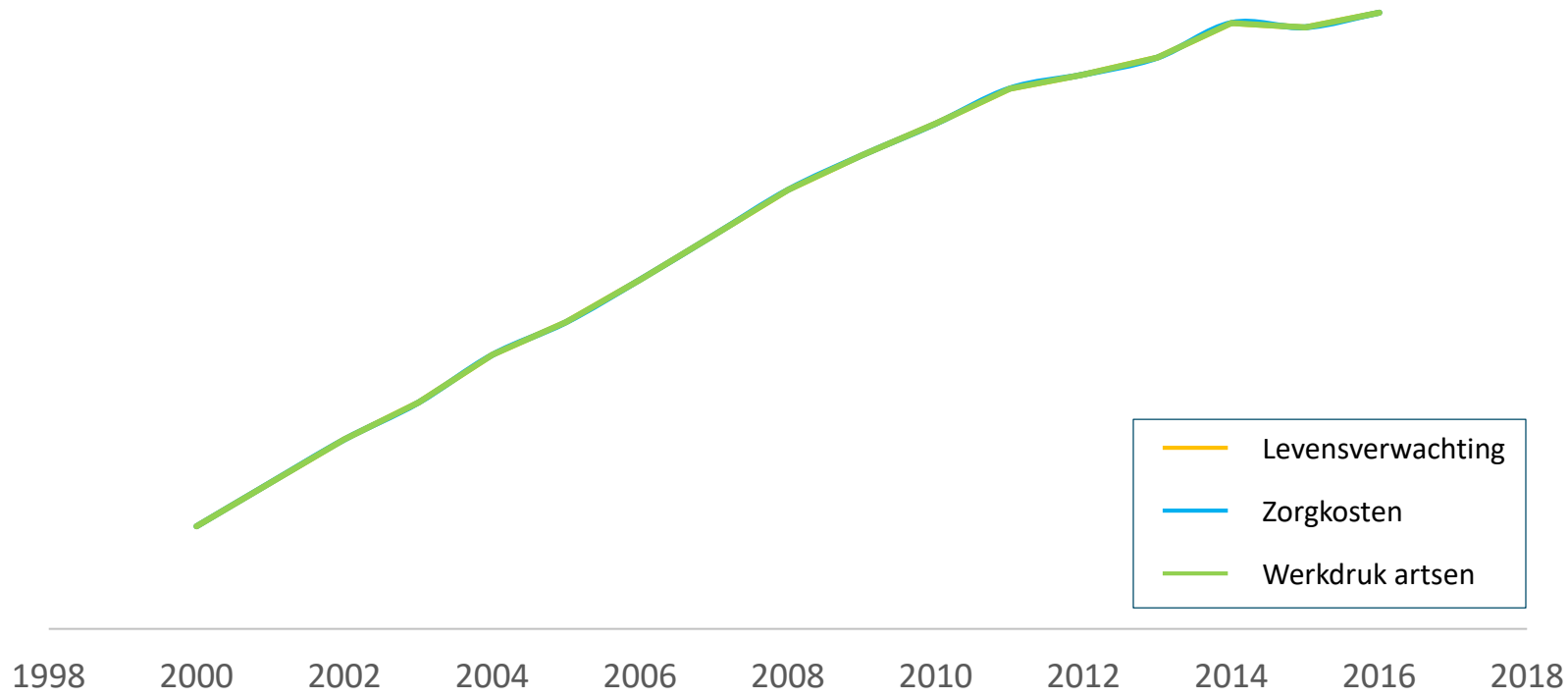
De opmars van zelflerende computers in de zorg

Moeten artsen al vrezen voor hun baan?

Geert Litjens
Afdeling Pathologie en Radiologie, Radboudumc

Radboudumc


Levensverwachting
Zorgkosten
Werkdruk artsen
1998
2000
2002
2004
2006
2008
2010
2012
2014
2016
2018


NOS
Zorgkosten in tien jaar tijd flink gestegen
nrc.nl
Noodrem op stijging van zorgkosten
AD
Huisartsen vrezen fouten door overbelasting
Opinie Hans Wiegel
Stijging zorgkosten moet stoppen
De Telegraaf
Zorgkosten stegen vorig jaar met 2 miljard
deVolkskrant
COLUMN JOOST ZAAT
Zeg maar wat een leven mag kosten
Joost Zaat 6 mei 2018, 17:56

TOPICS NIEUWSBRIEF DIGITA

Het Parool
Vrij, Onverveerd

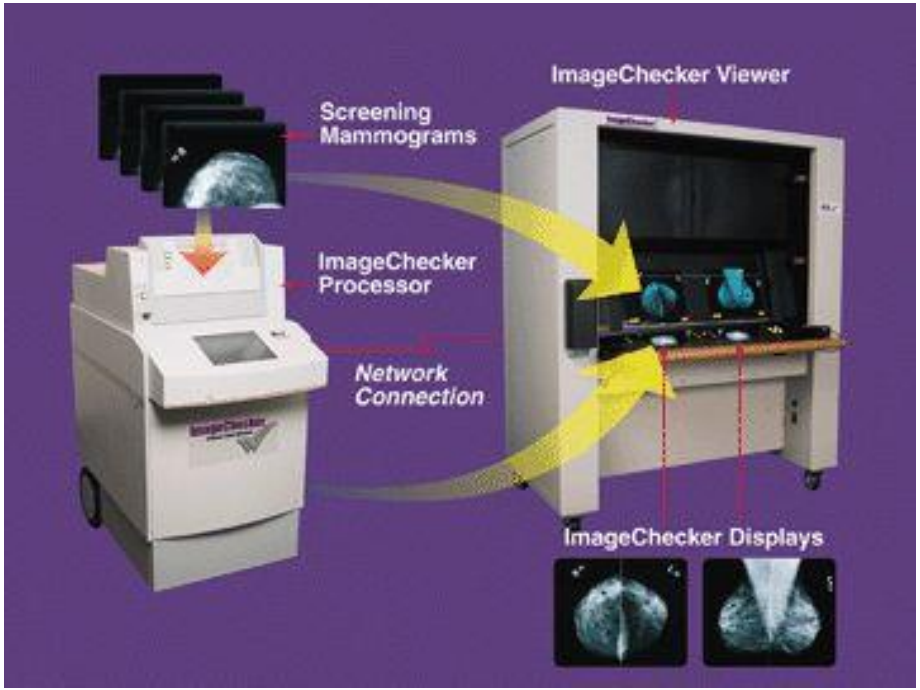
HOME AMSTERDAM OPINIE STADSGIDS

Hoera, de robots komen eraan!

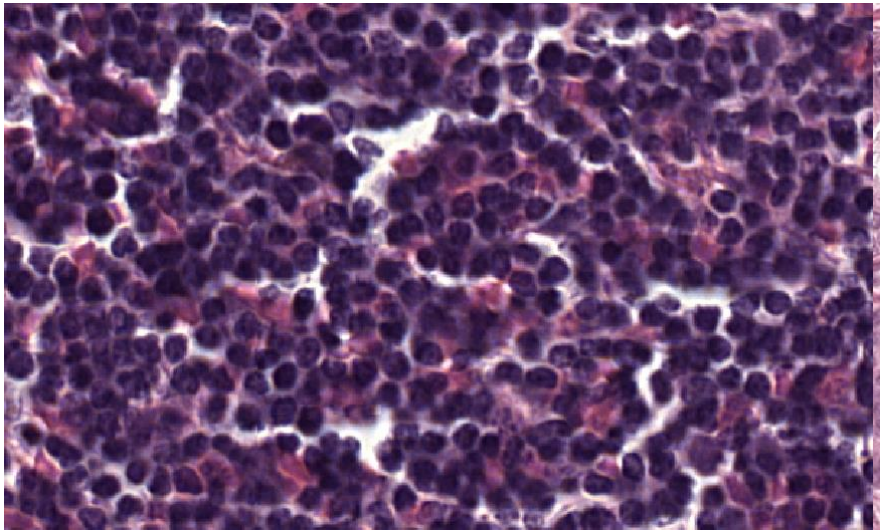
Radboudumc

Kunstmatige intelligentie

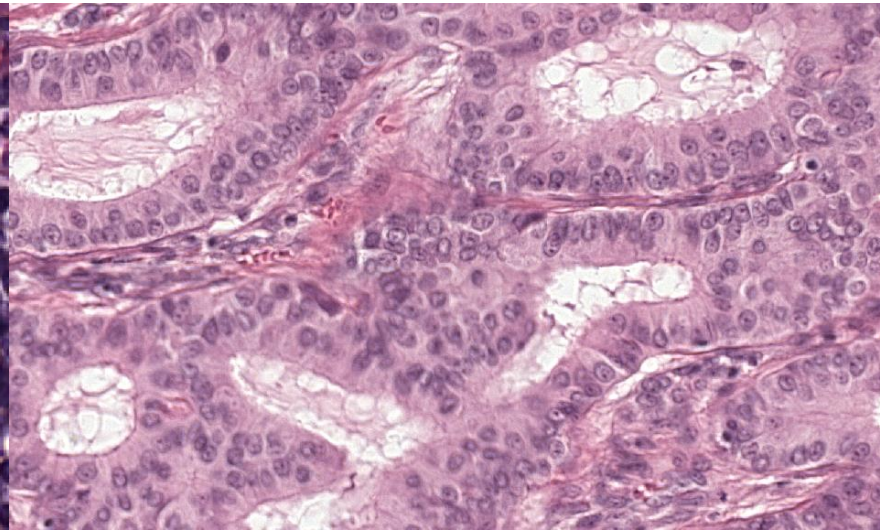
Computer-ondersteunde diagnose



Hoe maakte je zo’n systeem?



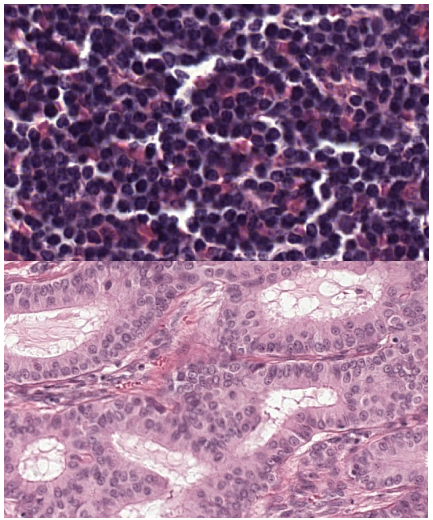
Normale cellen



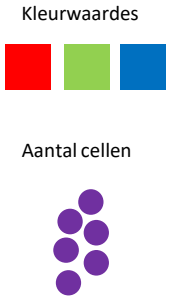
Borstkanker

Hoe maakte je zo'n systeem?

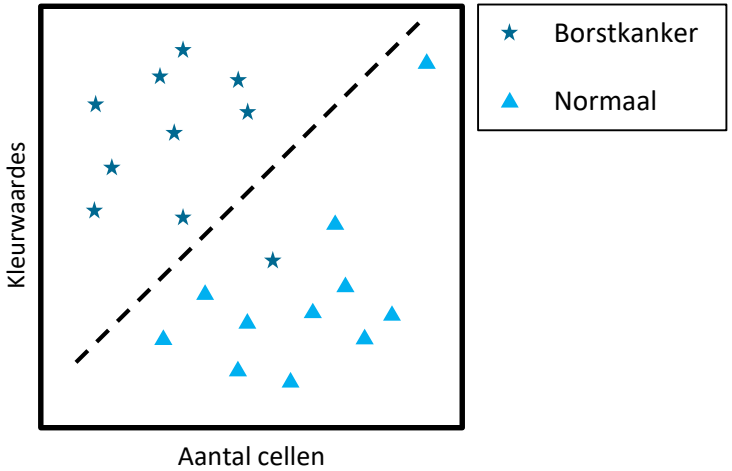
Voorbeelden



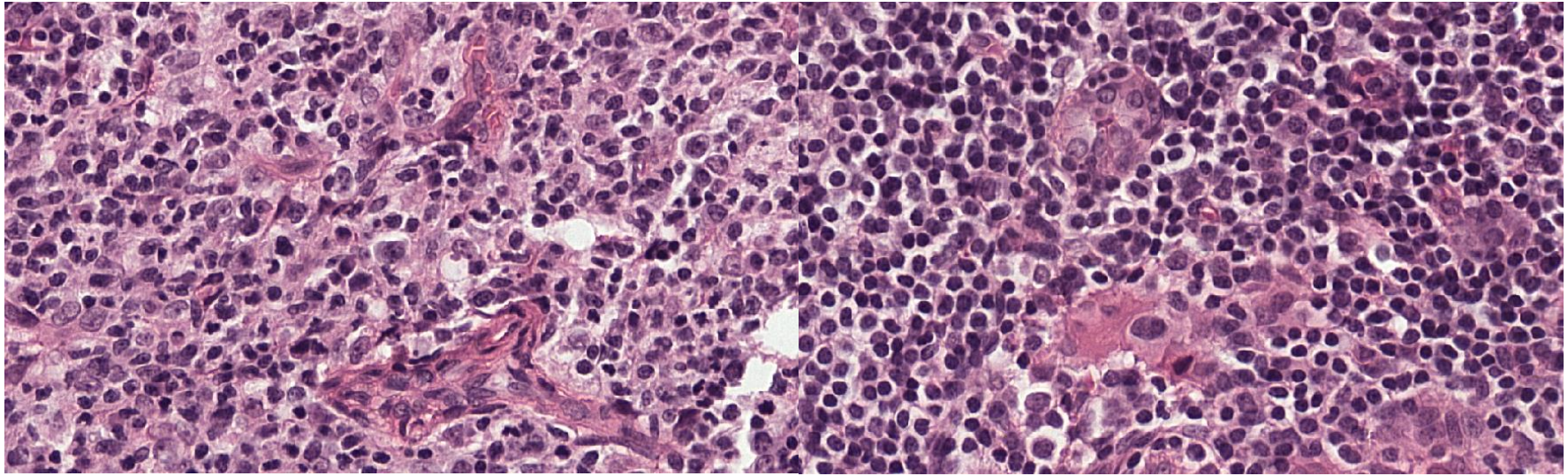
Kenmerken



Classificeren



Hoe maakte je zo’n systeem?



Normale cellen

Borstkanker

nature

THE INTERNATIONAL WEEKLY JOURNAL OF SCIENCE

At last — a computer program that can beat a champion Go player PAGE 484

ALL SYSTEMS GO

CONSERVATION

SONGBIRDS À LA CARTE

Illegal harvest of millions of Mediterranean birds

PAGE 452

RESEARCH ETHICS

SAFEGUARD TRANSPARENCY

Don't let openness backfire on individuals

PAGE 459

POPULAR SCIENCE

WHEN GENES GOT 'SELFISH'

Dawkins's calling card forty years on

PAGE 462

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28 January 2016 £8.0

Vol. 529, No. 7587

NATURE | NEWS

عربي

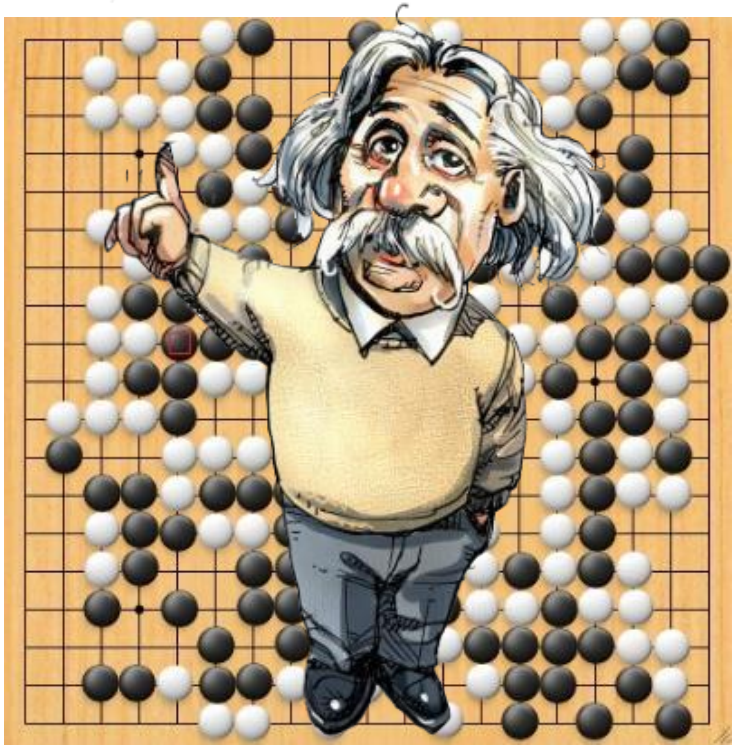
Google AI algorithm masters ancient game of Go

Deep-learning software defeats human professional for the first time

Elizabeth Gibney

27 January 2016

30 zetten gemiddeld per beurt
40 beurten per spel

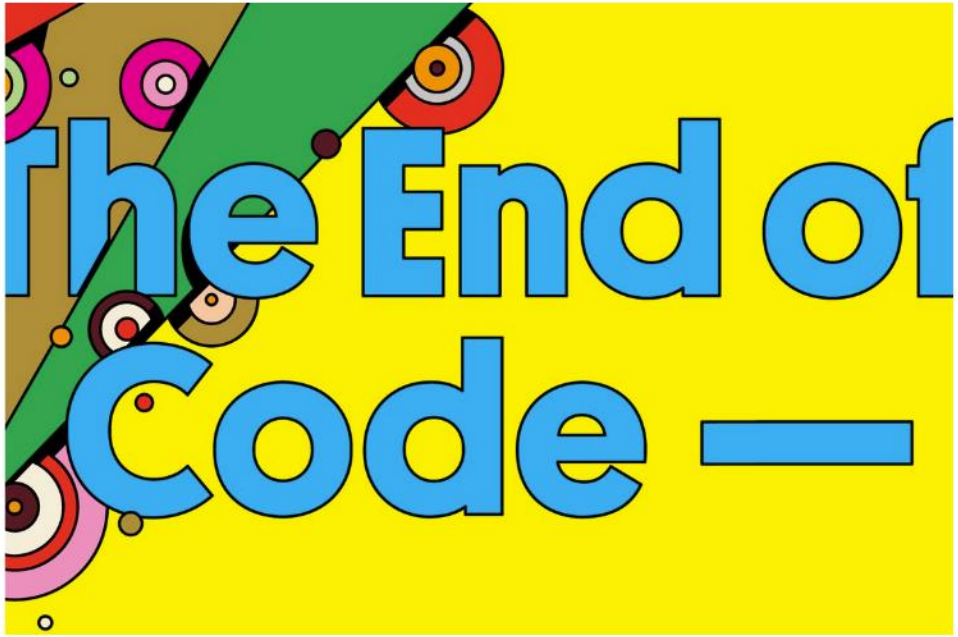


250 zetten gemiddeld per beurt
150 beurten per spel

Hoe maak je nu een KI system?

JASON TANZ IDEAS 05.17.16 06:50 AM

SOON WE WON'T PROGRAM COMPUTERS. WE'LL TRAIN THEM LIKE DOGS

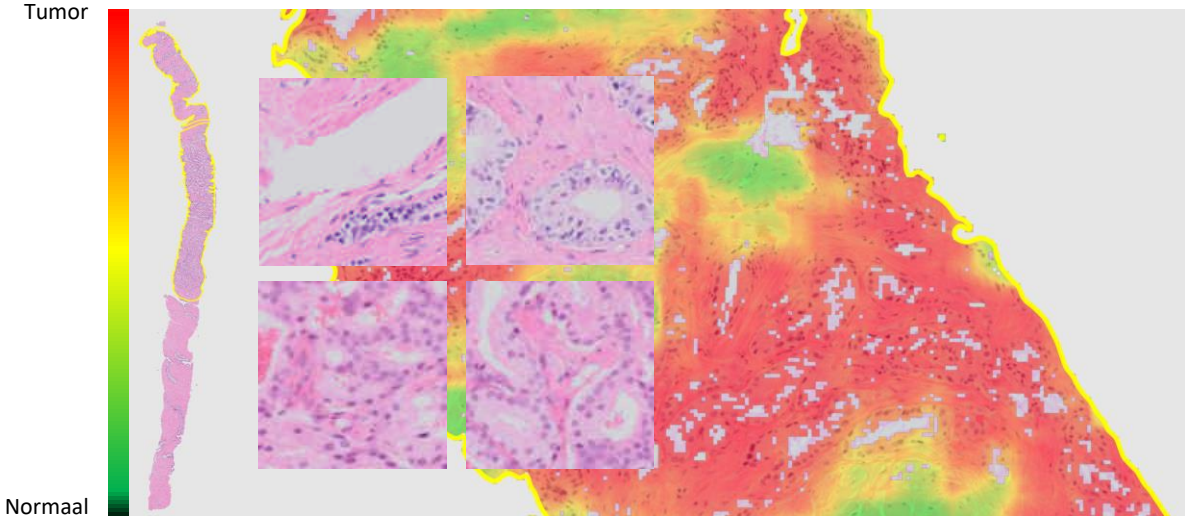


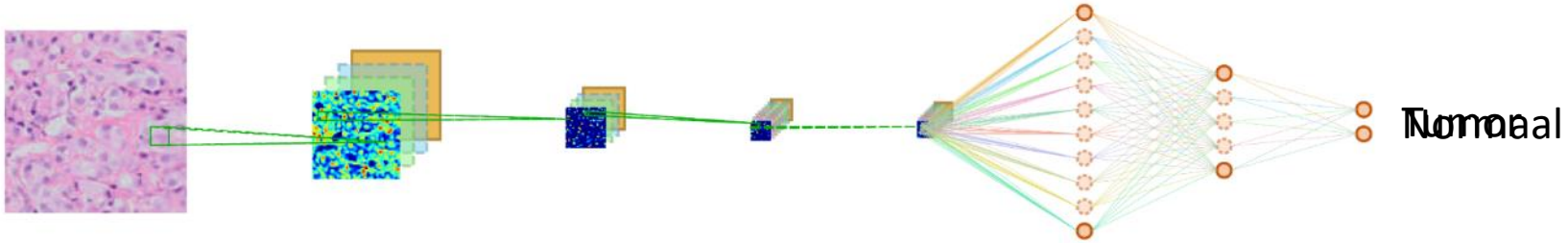
EDWARD C. MONAGHAN

BEFORE THE INVENTION of the computer, most experimental psychologists thought the brain was an unknowable black box. You could analyze a subject's behavior—*ring bell, dog salivates*—but thoughts, memories, emotions? That stuff was obscure and inscrutable, beyond the reach of science. So these behaviorists, as they called themselves, confined their work to the study of stimulus and response, feedback and reinforcement, bells and saliva. They gave up trying to

JASON TANZ IDEAS 05.17.16 06:50 AM

SOON WE WON'T PROGRAM COMPUTERS. WE'LL TRAIN THEM LIKE DOGS

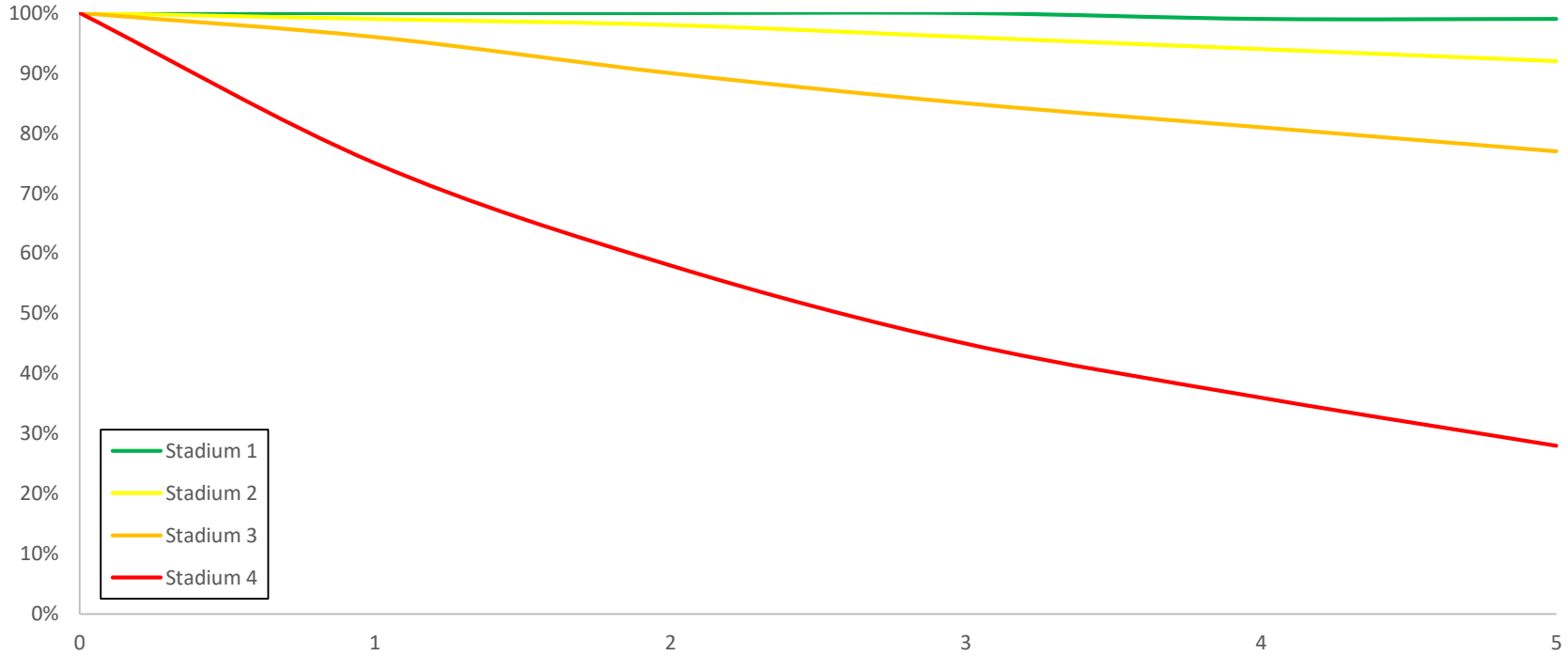




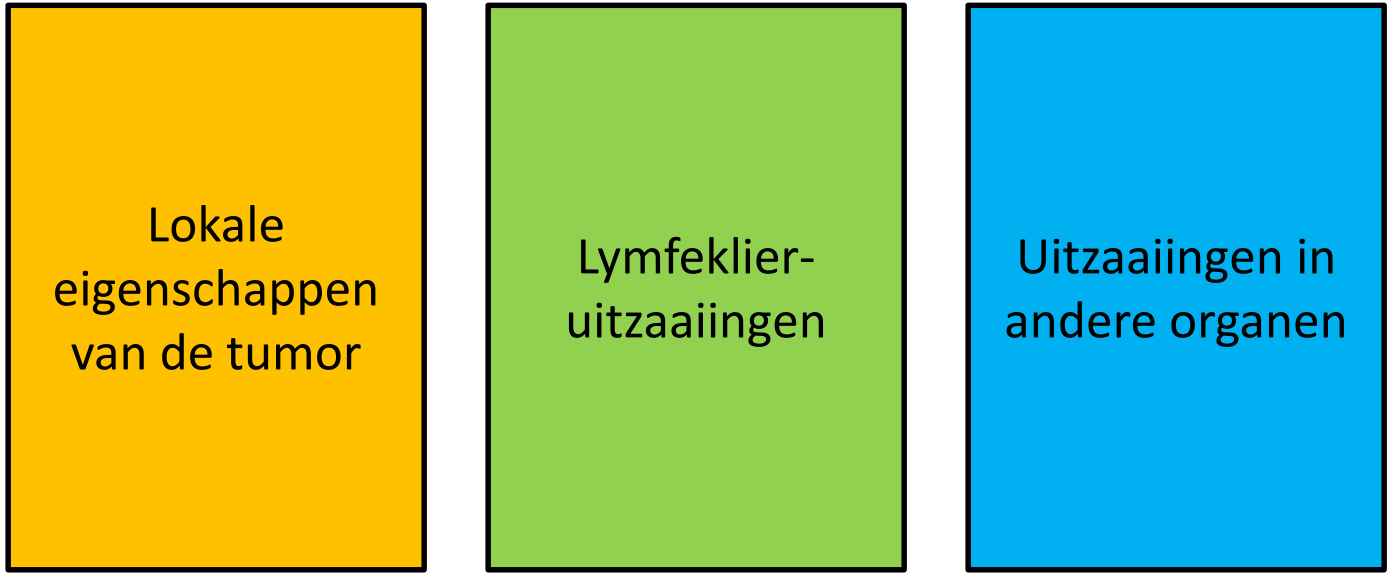
Litjens et al. *Sci Rep.* 2016

Radboudumc

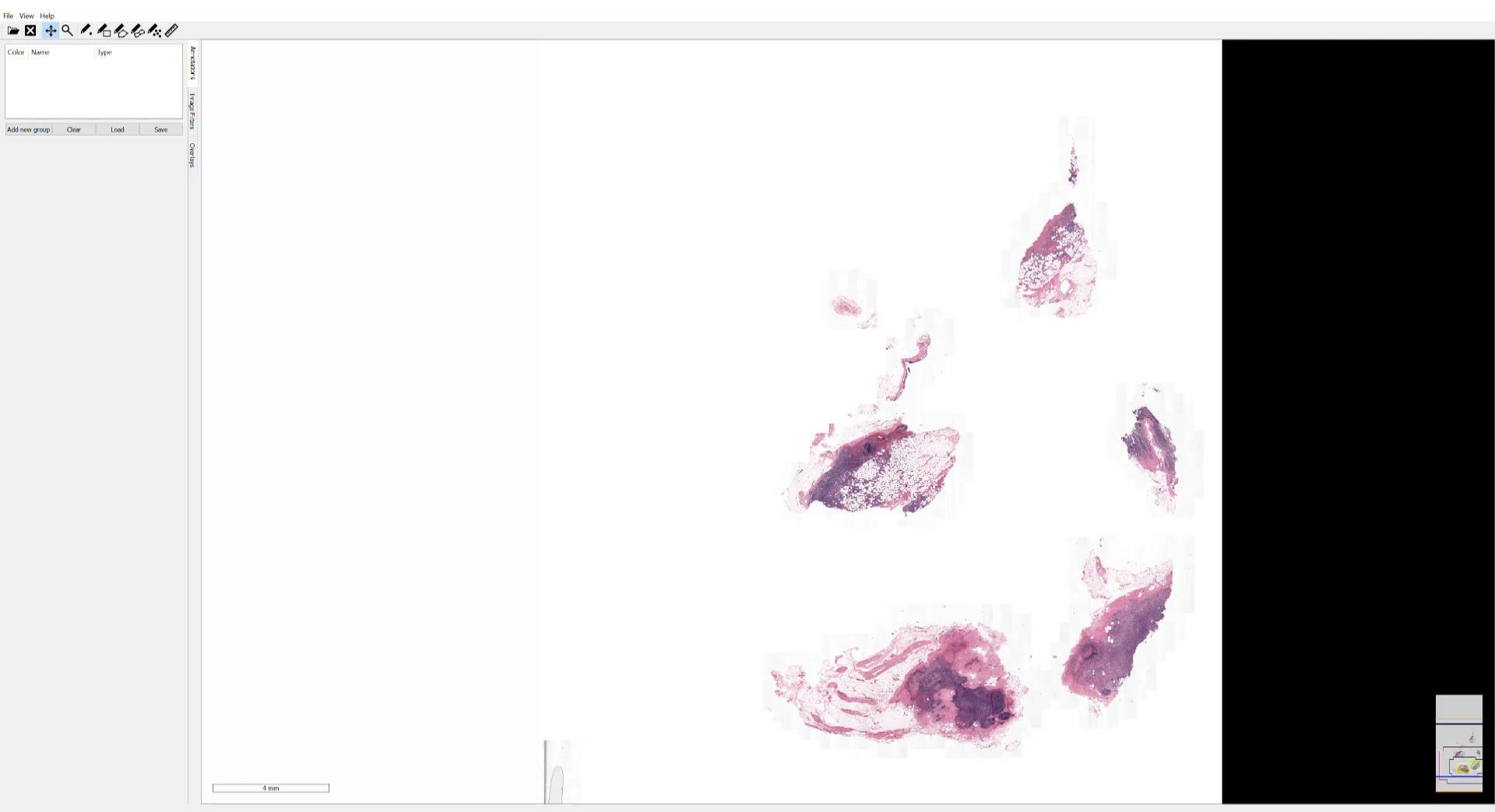
Overleving borstkanker



Stadiëring van borstkanker



Detectie van uitzaaiingen in lymfeklieren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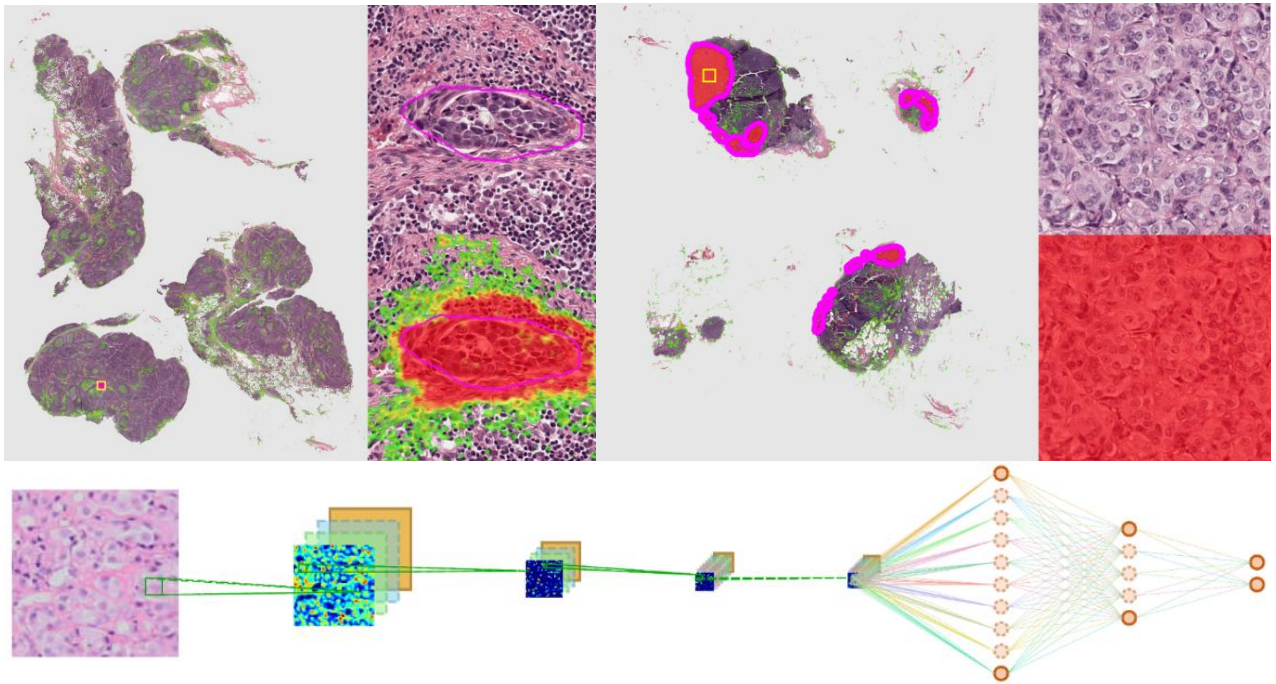
Detectie van uitzaaiingen in lymfeklieren



Data

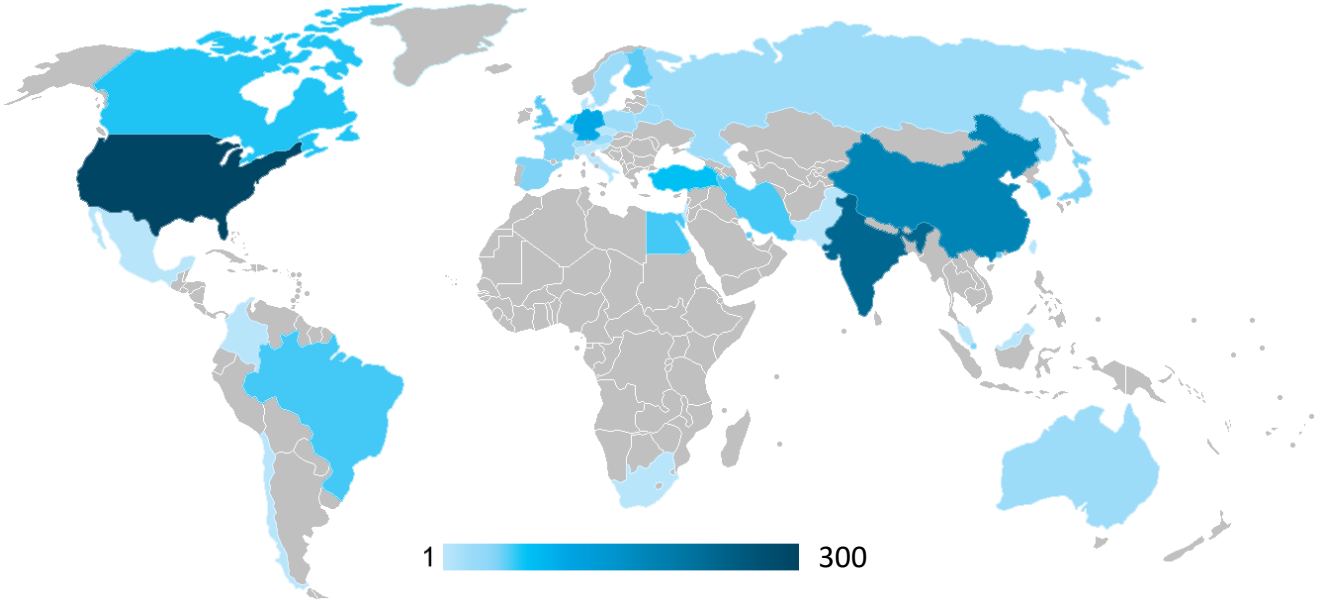
Centrum	Aantal coupes
CWZ (Nijmegen)	200
LabPON (Hengelo)	200
Rijnstate (Arnhem)	200
Radboudumc (Nijmegen)	450
UMCU (Utrecht)	350
Totaal	**1400**


CAMELYON16

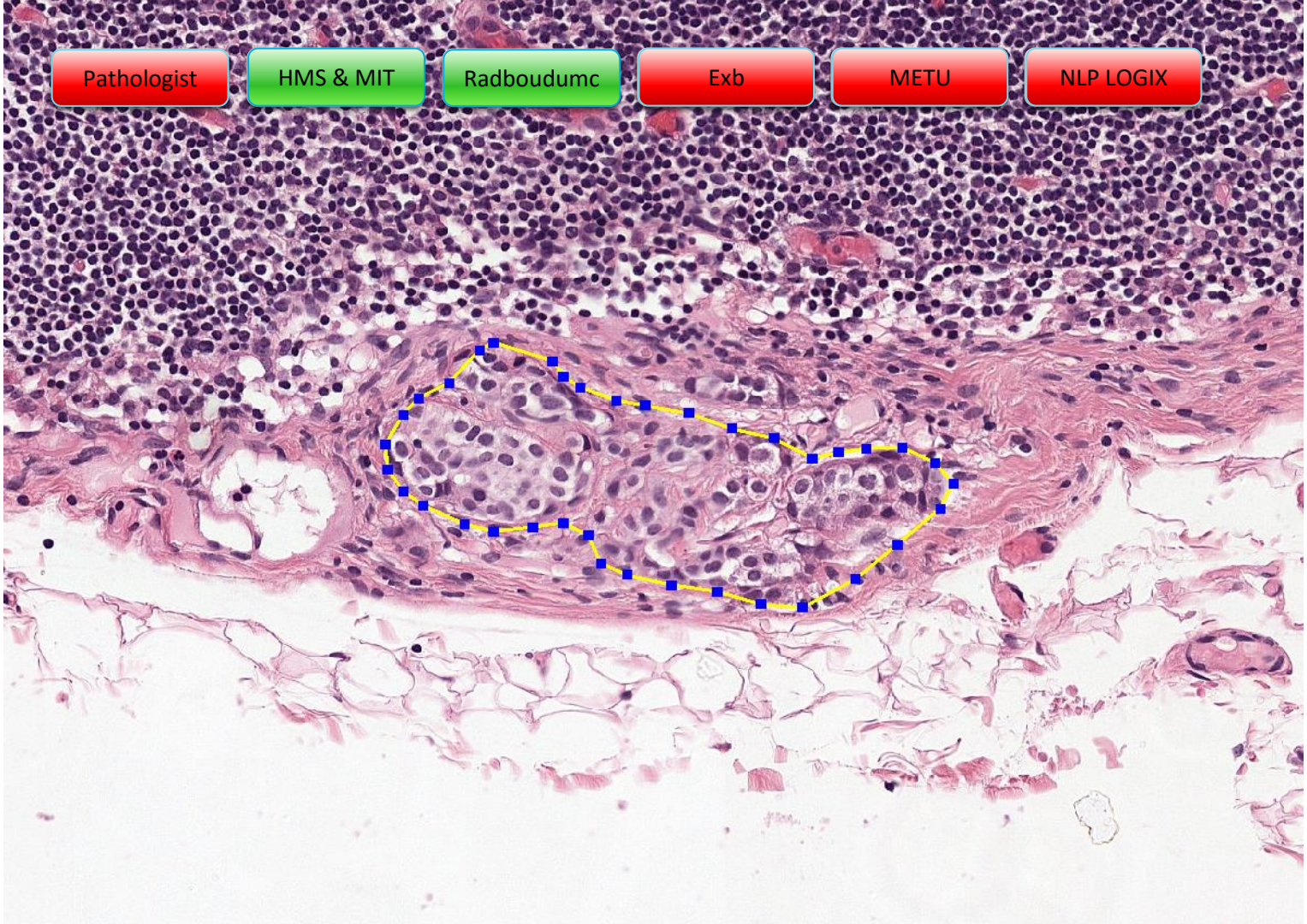

CAMELYON17

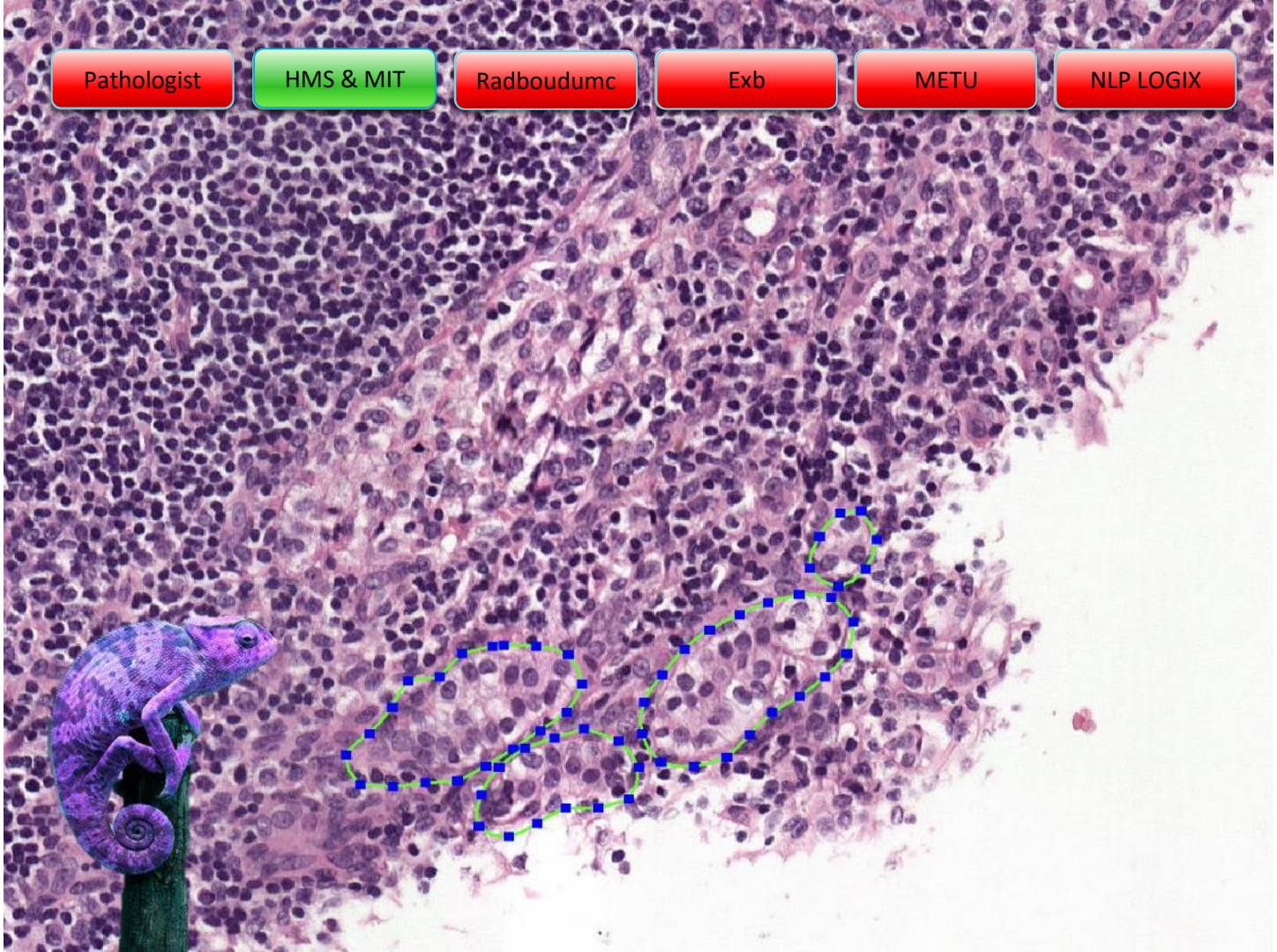
CAMELYON16/17 deelnemers

Meer dan 1000 deelnemers

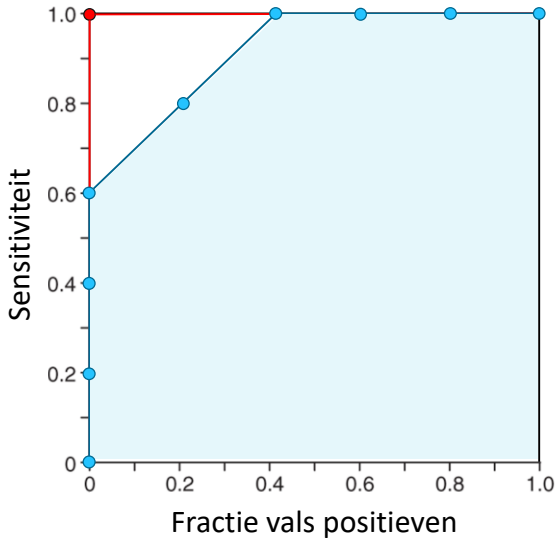


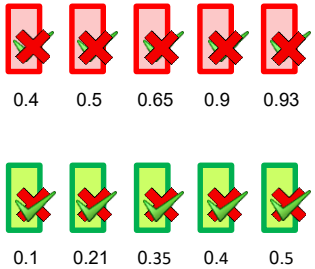
CAMELYON16/17 deelnemers


Pathologist
HMS & MIT
Radboudumc
Exb
METU
NLP LOGIX

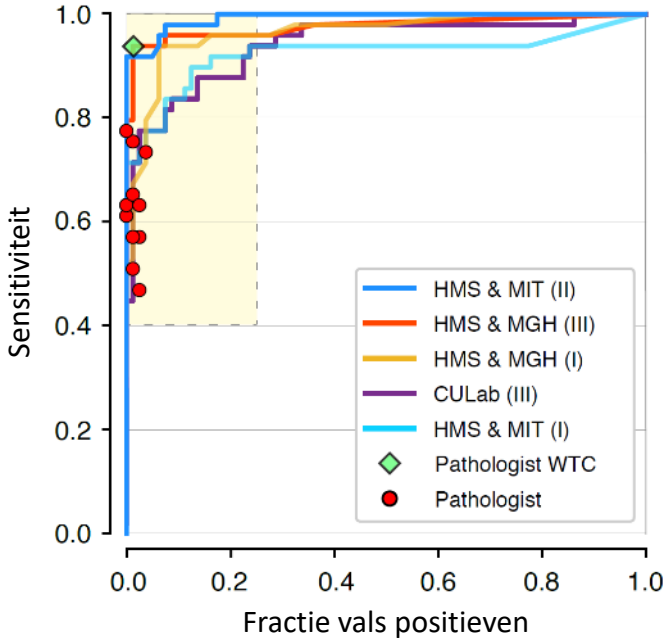

Pathologist
HMS & MIT
Radboudumc
Exb
METU
NLP LOGIX

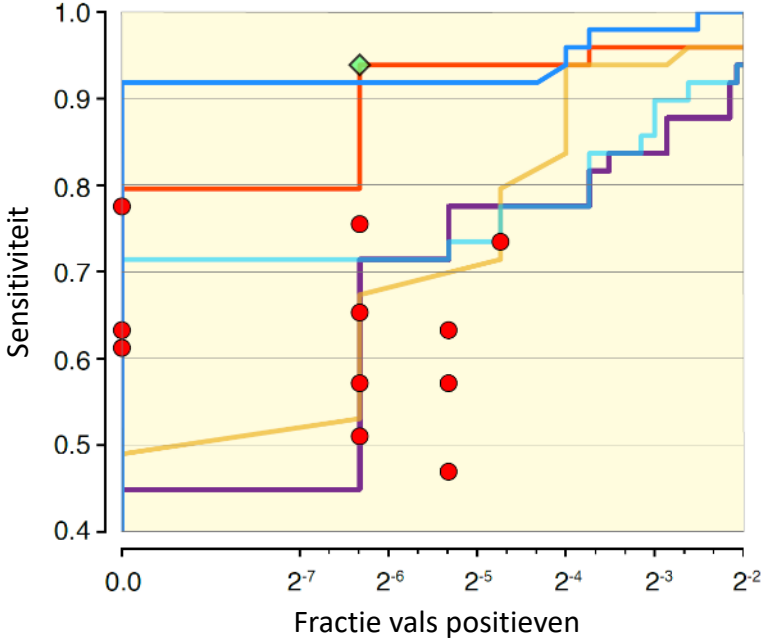
Scoren van een systeem





Vergelijking met de specialist





Ehteshami, Litjens, van de Laak et al. *JAMA. 2017*

Radboudumc

File View Help

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	Potential metastases	Group
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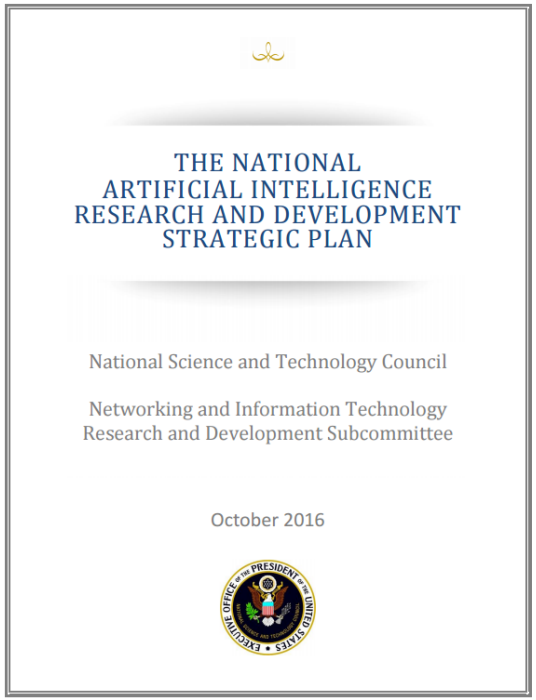
	Area 2	Polygon
	Area 3	Polygon
	Area 4	Polygon

Add new group | Clear | Load | Save

Annotations | Image Filters | Overlays

Zelfs het Witte Huis gehaald…



THE NATIONAL ARTIFICIAL INTELLIGENCE RESEARCH AND DEVELOPMENT STRATEGIC PLAN

National Science and Technology Council

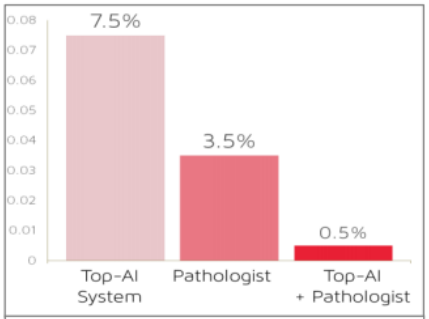
Networking and Information Technology Research and Development Subcommittee

October 2016

National Institutes of Health (NIH) grants-supported research

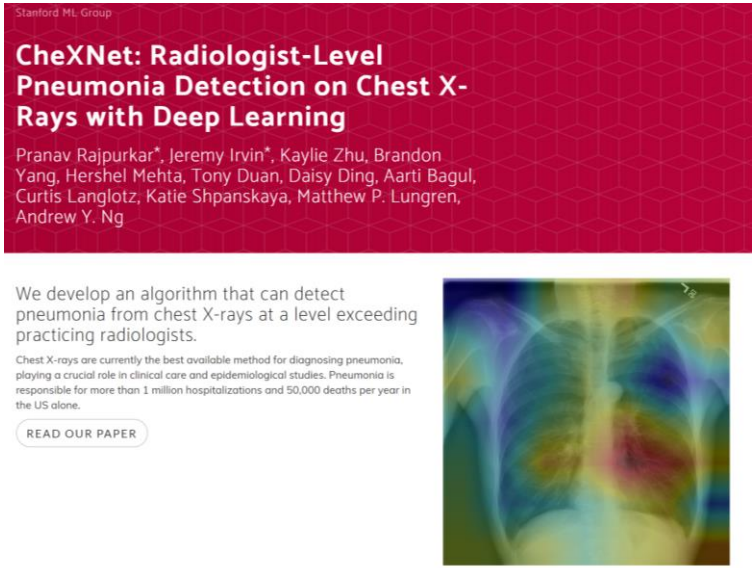
ARTIFICIAL INTELLIGENCE FOR COMPUTATIONAL PATHOLOGY

Image interpretation plays a central role in the pathologic diagnosis of cancer. Since the late 19th century, the primary tool used by pathologists to make definitive cancer diagnoses is the microscope. Pathologists diagnose cancer by manually examining stained sections of cancer tissues to determine the cancer subtype. Pathologic diagnosis using conventional methods is labor-intensive with poor reproducibility and quality concerns. New approaches use fundamental AI research to build tools to make pathologic analysis more efficient, accurate, and predictive. In the 2016 Camelyon Grand Challenge for metastatic cancer detection,[69] the top-performing entry in the competition was an AI-based computational system that achieved an error rate of 7.5%.[70] A pathologist reviewing the same set of evaluation images achieved an error rate of 3.5%. Combining the predictions of the AI system with the pathologist lowered the error rate to down to 0.5%, representing an 85% reduction in error (see image).[71] This example illustrates how fundamental research in AI can drive the development of high performing computational systems that offer great potential for making pathological diagnoses more efficient and more accurate.

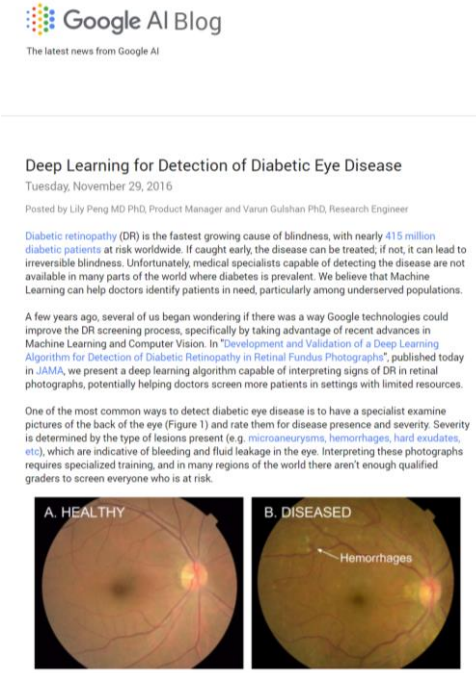


AI significantly reduces pathologist error rate in the identification of metastatic breast cancer from sentinel lymph node biopsies.

Dermatologie



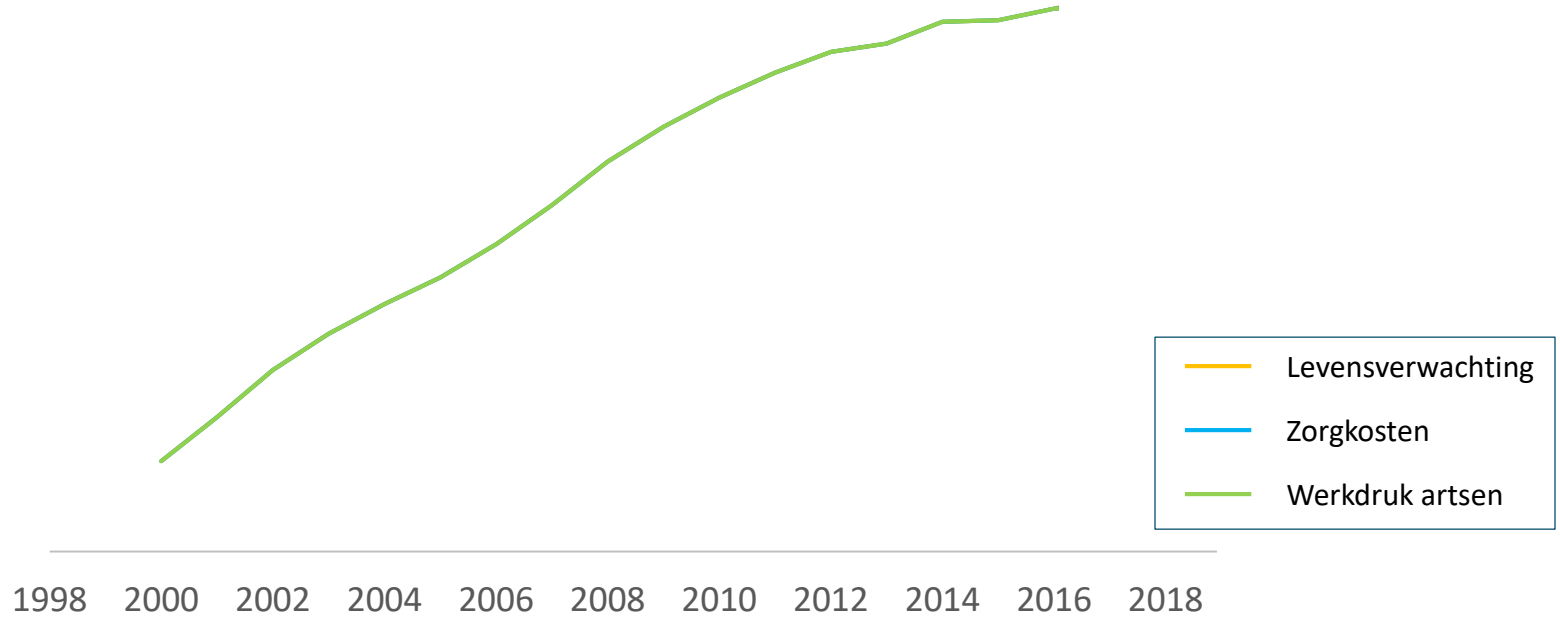
Radiologie



Oogheelkunde

Radboudumc

Moeten artsen nu bang zijn voor hun baan?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