

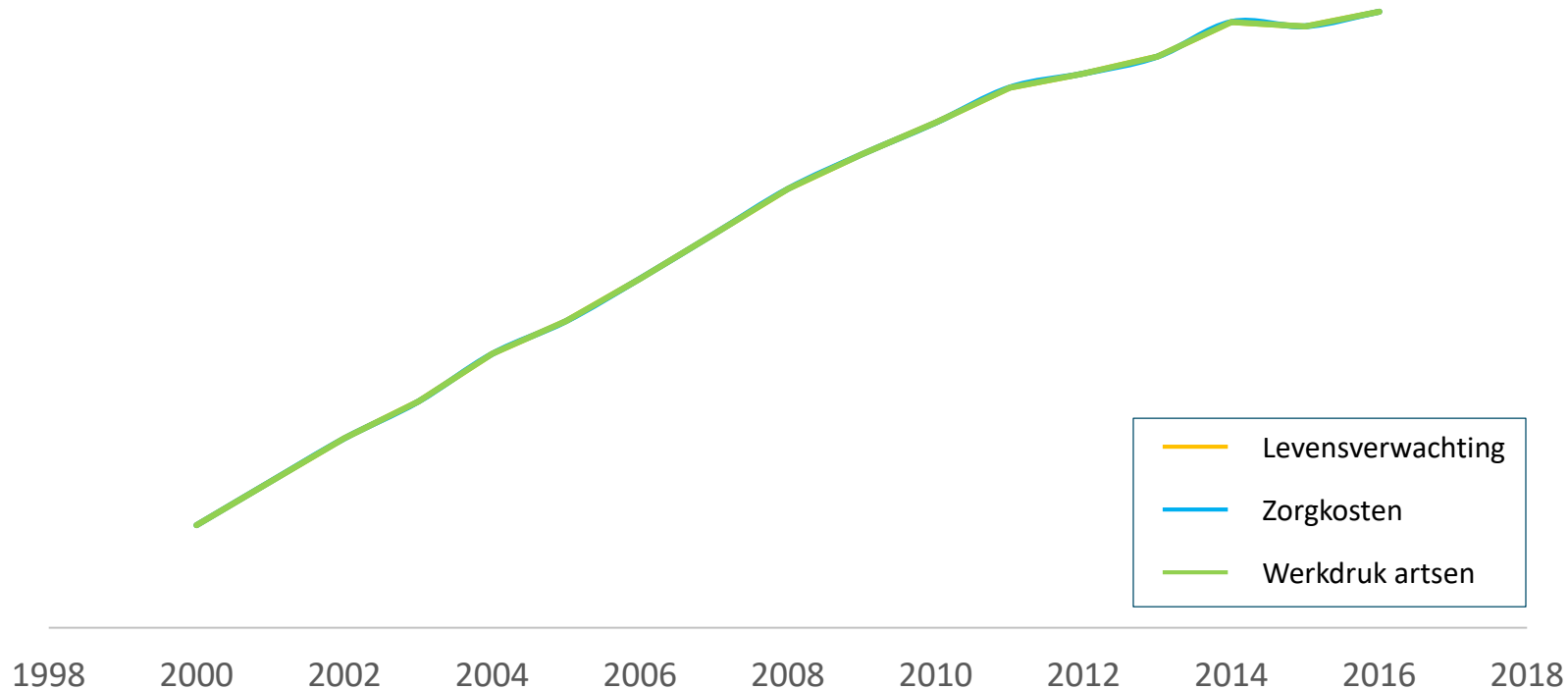
De opmars van zelflerende computers in de zorg

Moeten artsen al vrezen voor hun baan?

Geert Litjens

Afdeling Pathologie en Radiologie, Radboudumc

Radboudumc



NOS

Zorgkosten in tien jaar tijd flink gestegen

nrc.nl

Noodrem op stijging van zorgkosten



Huisartsen vrezen fouten door overbelasting

Opinie Hans Wiegel

Stijging zorgkosten moet stoppen

De Telegraaf

Zorgkosten stegen vorig jaar met 2 miljard

de Volkskrant

COLUMN JOOST ZAAT

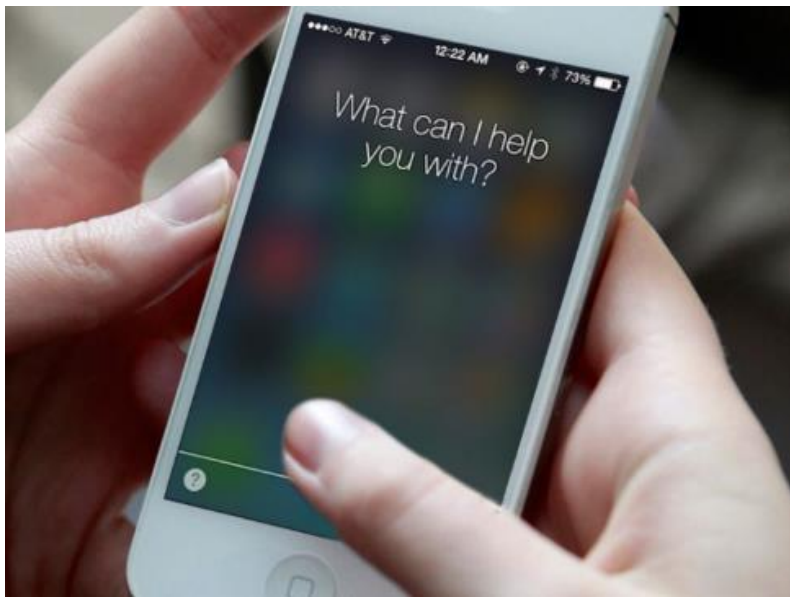
Zeg maar wat een leven mag kosten

Joost Zaat 6 mei 2018, 17:56

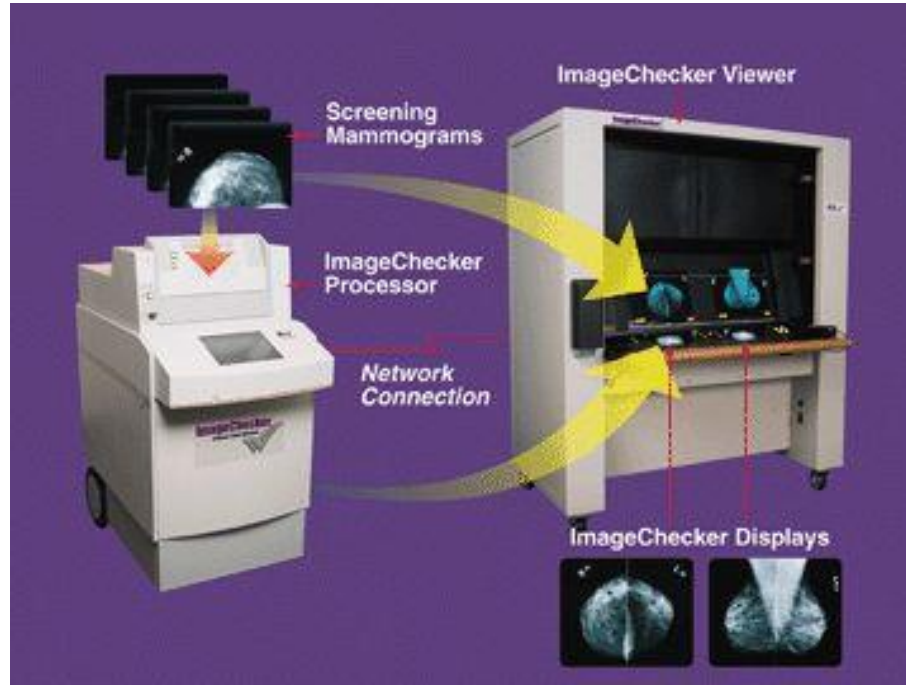
Hoera, de robots komen eraan!



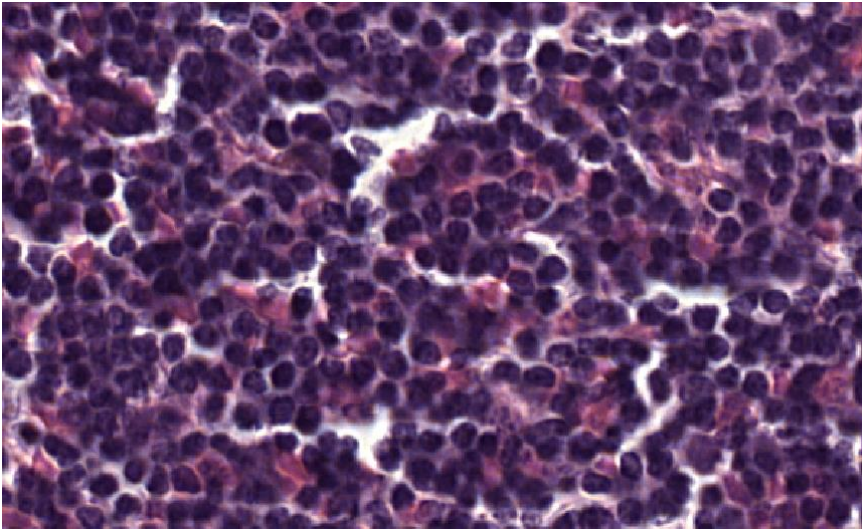
Kunstmatige intelligentie



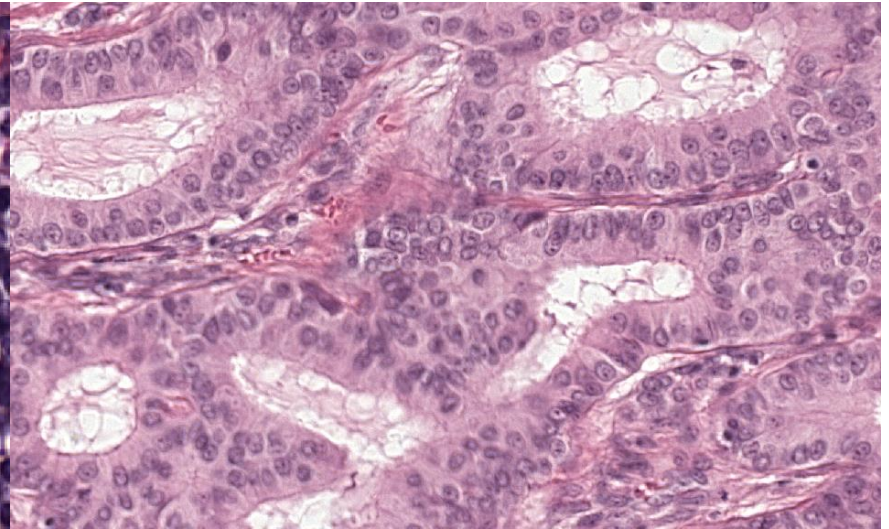
Computer-ondersteunde diagnose



Hoe maakte je zo'n systeem?



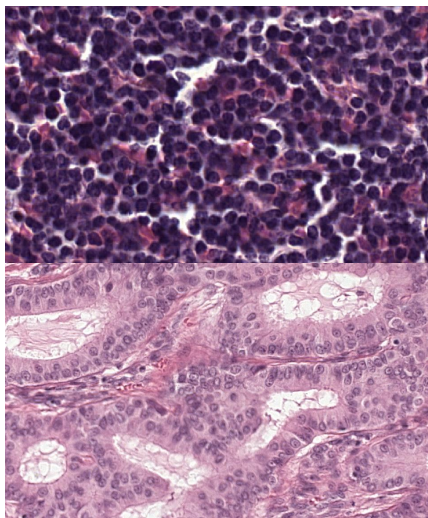
Normale cellen



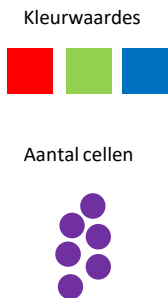
Borstkanker

Hoe maakte je zo'n systeem?

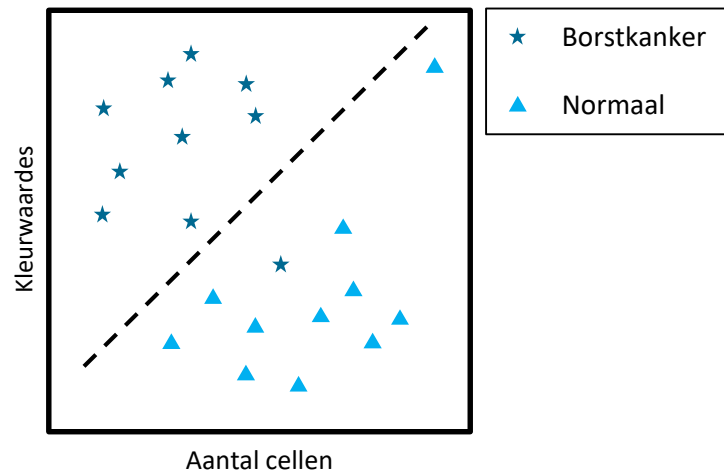
Voorbeelden



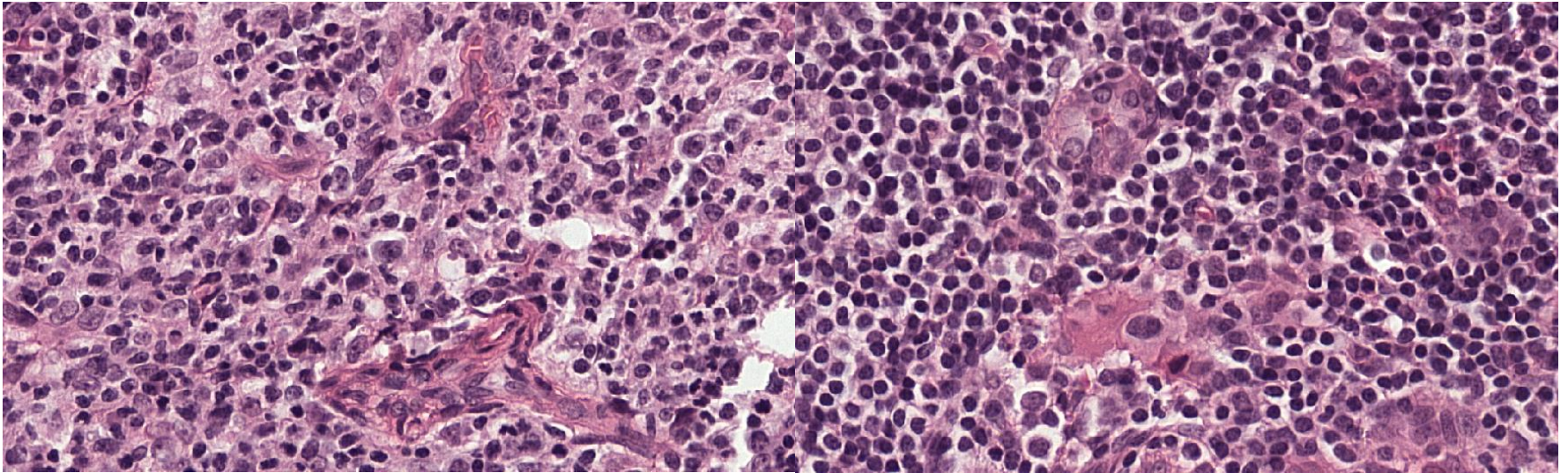
Kenmerken



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'

*Darwin's's calling
card forty years on*

PAGE 462

NATURE.COM/NATURE

26 January 2015 £10

Vol. 529, No. 7581





Google AI algorithm masters ancient game of Go

Deep-learning software defeats human professional for the first time

Elizabeth Gibney

27 January 2016



PDF

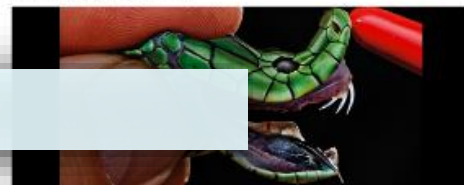


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The computer that mastered Go



Antivenom anxiety



Vipers, mambas and taipans: the escalating health crisis over snakebites

Snakes kill tens of thousands of people each year. But experts can't agree on how best to overcome a desperate shortage of antivenom.



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De Samsonite Paradiver Light Duffel
Wheels Backpack 55 white is onderd...
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Bestellen

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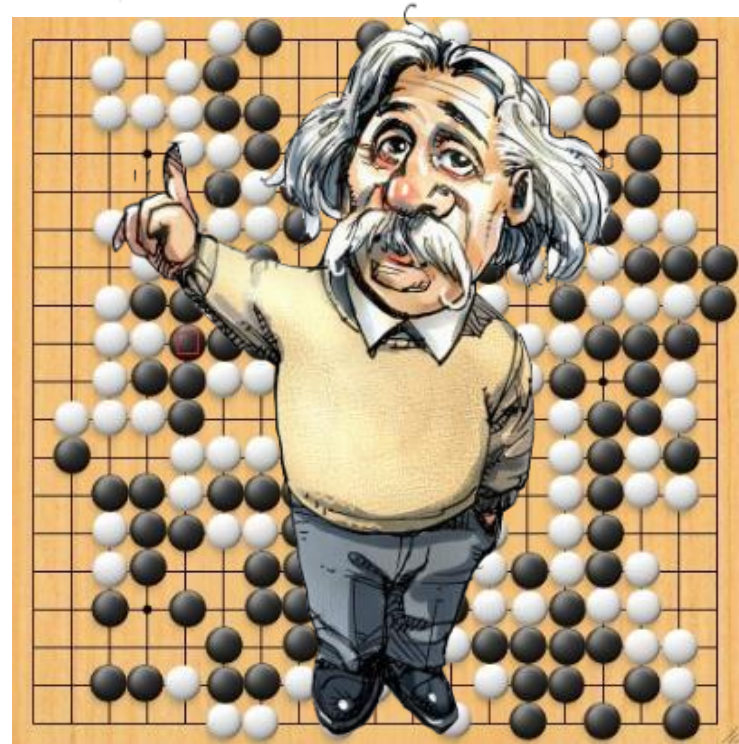
Recent

Read

Commented



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?



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



EDWARD C. MONAGHAN

SHARE



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TWEET

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

MOST POPULAR

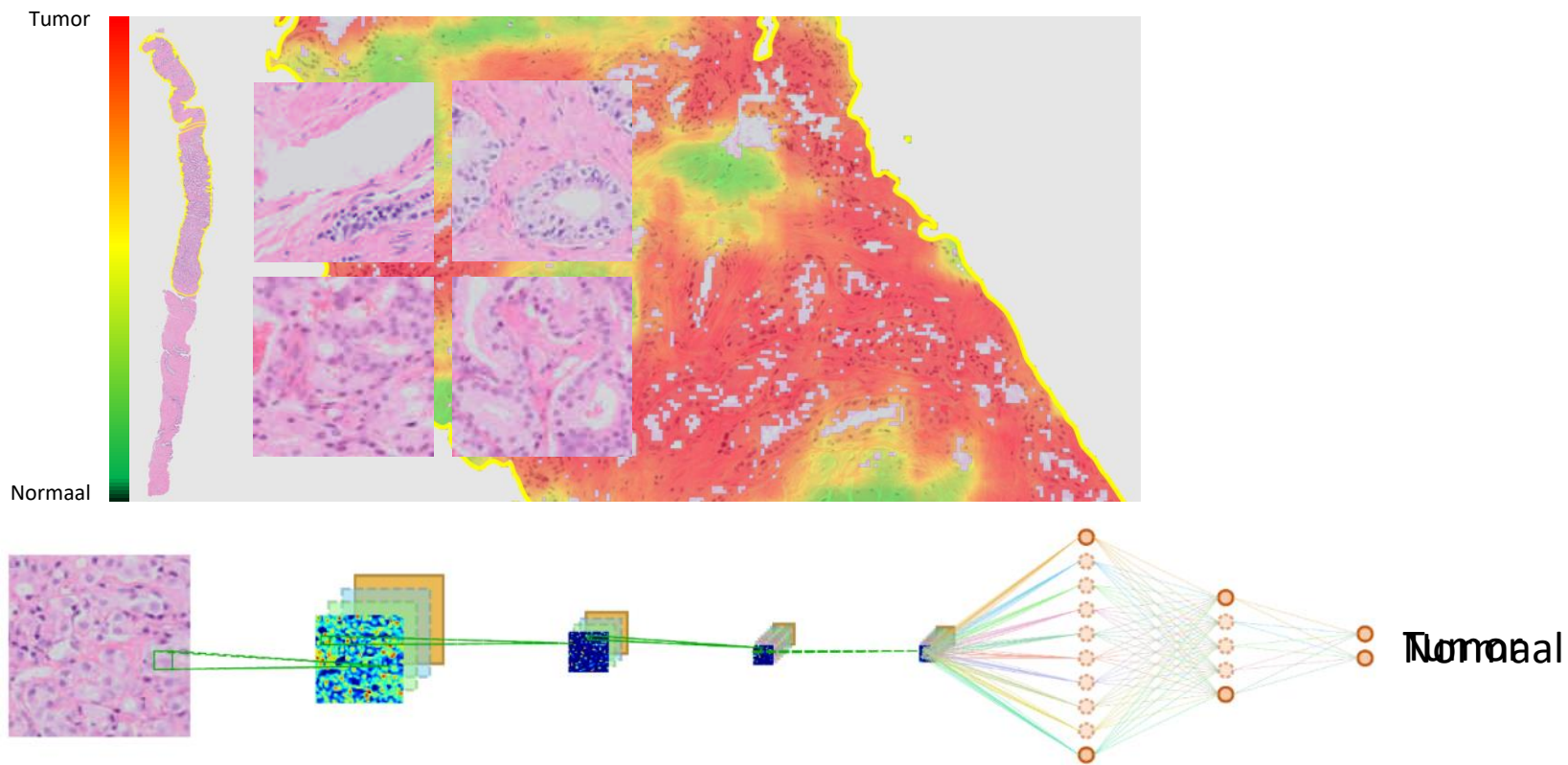


BUSINESS
SpaceX's President is Thinking Even Bigger Than Elon Musk
ERIN GRIFFITH

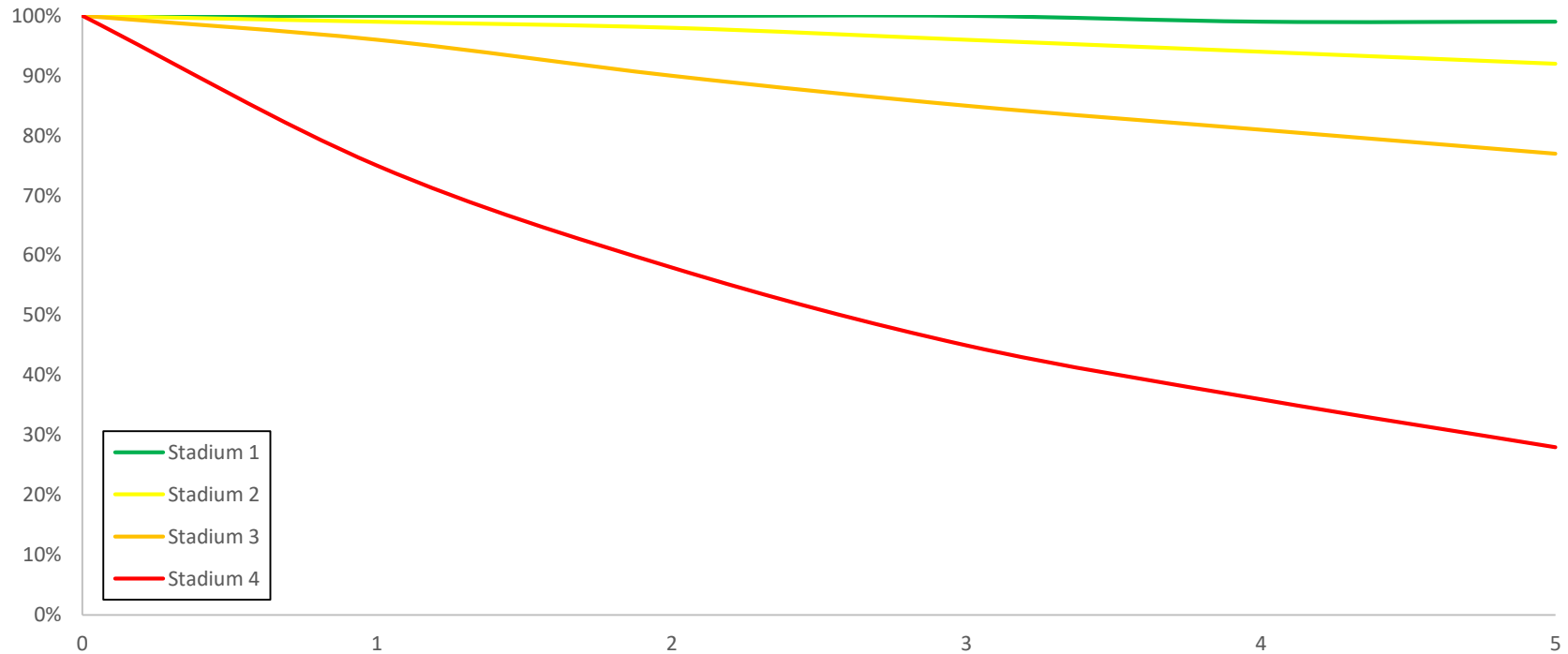
TRANSPORTATION

JASON TANZ IDEAS 05.17.16 06:50 AM

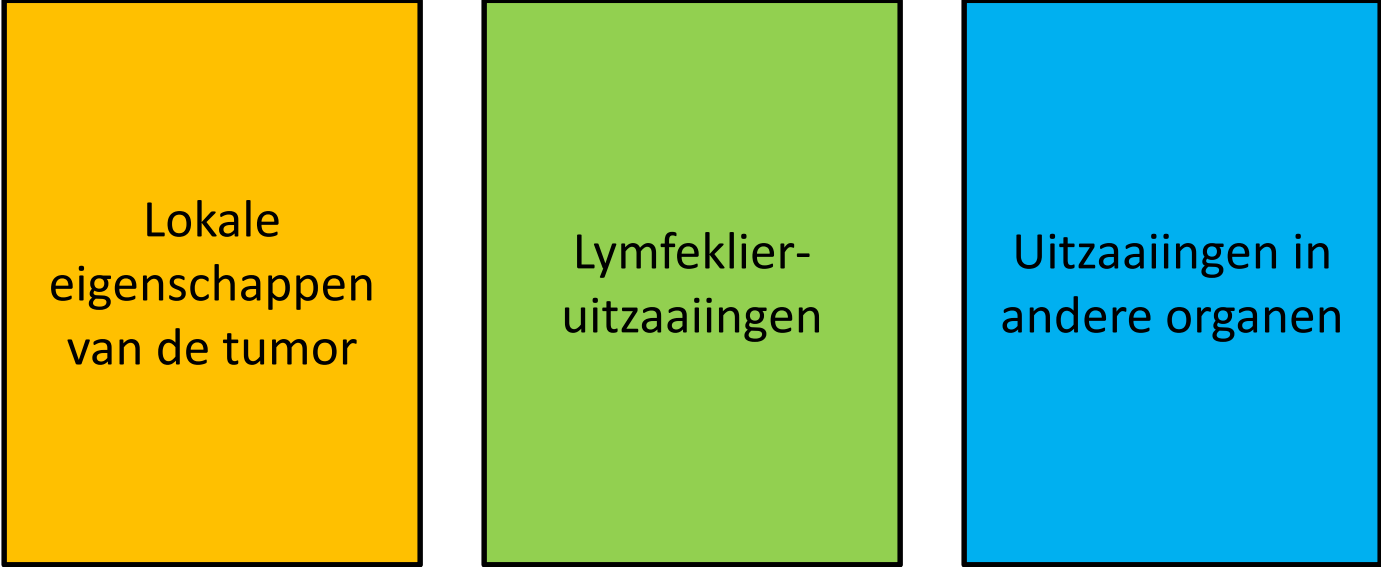
**SOON WE WON'T PROGRAM COMPUTERS. WE'LL
TRAIN THEM LIKE DOGS**



Overleving borstkanker



Stadiëring van borstkanker



Lokale
eigenschappen
van de tumor

Lymfeklier-
uitzaaiingen

Uitzaaiingen in
andere organen

Detectie van uitzaaiingen in lymfeklieren



File View Help

Color Name Type

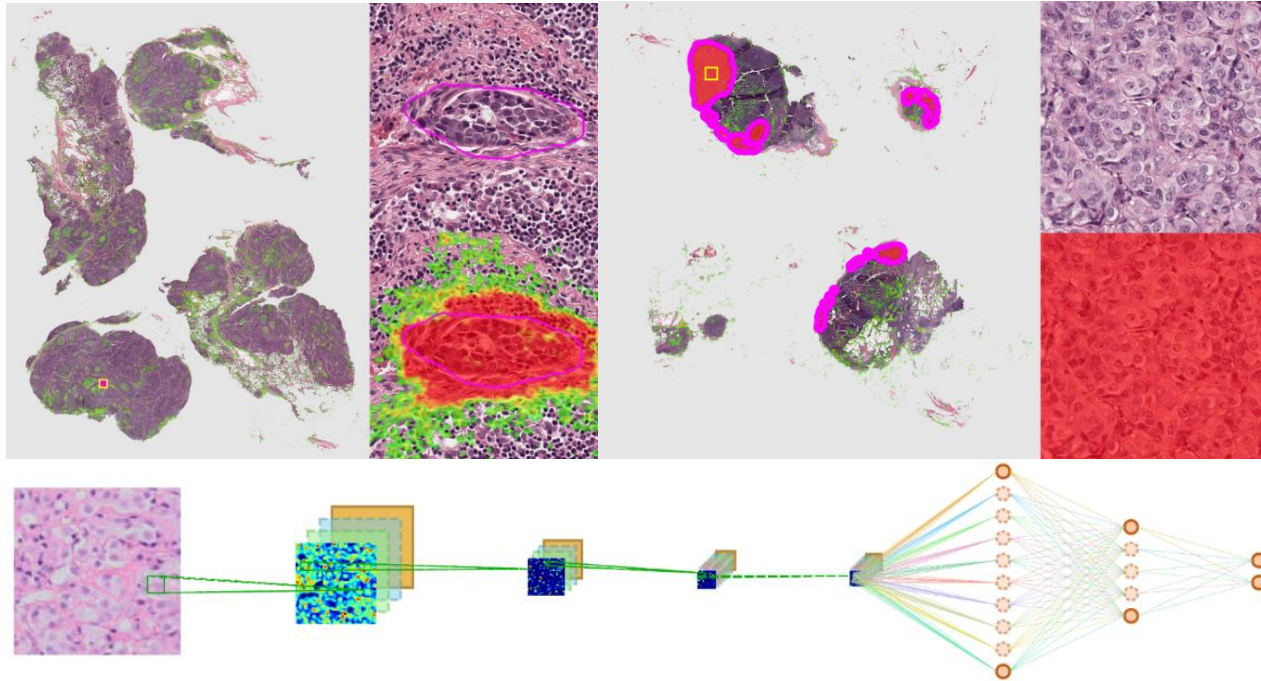
Add new group Clear Load Save

Annotations Image Files Overview

4 mm



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



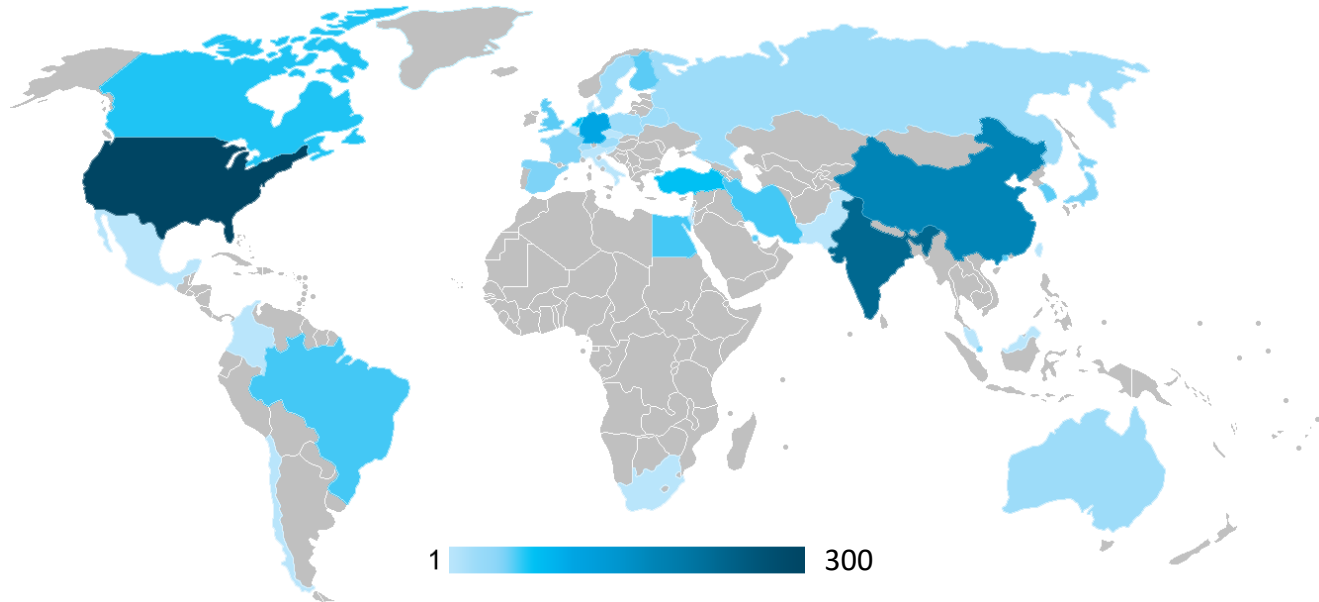
CAMELYON16



CAMELYON17

CAMELYON16/17 deelnemers

Meer dan 1000 deelnemers



CAMELYON16/17 deelnemers



Pathologist

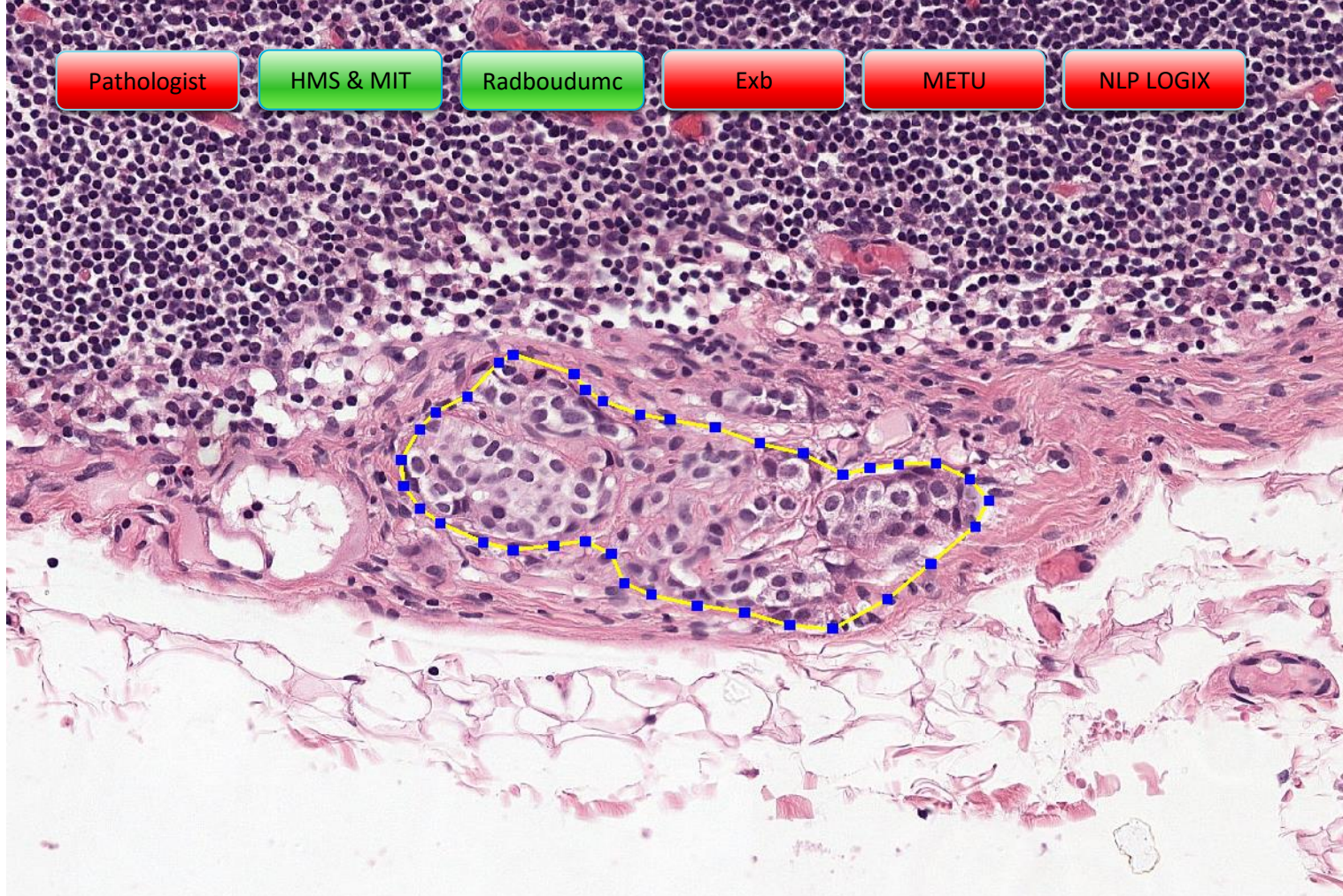
HMS & MIT

Radboudumc

Exb

METU

NLP LOGIX



Pathologist

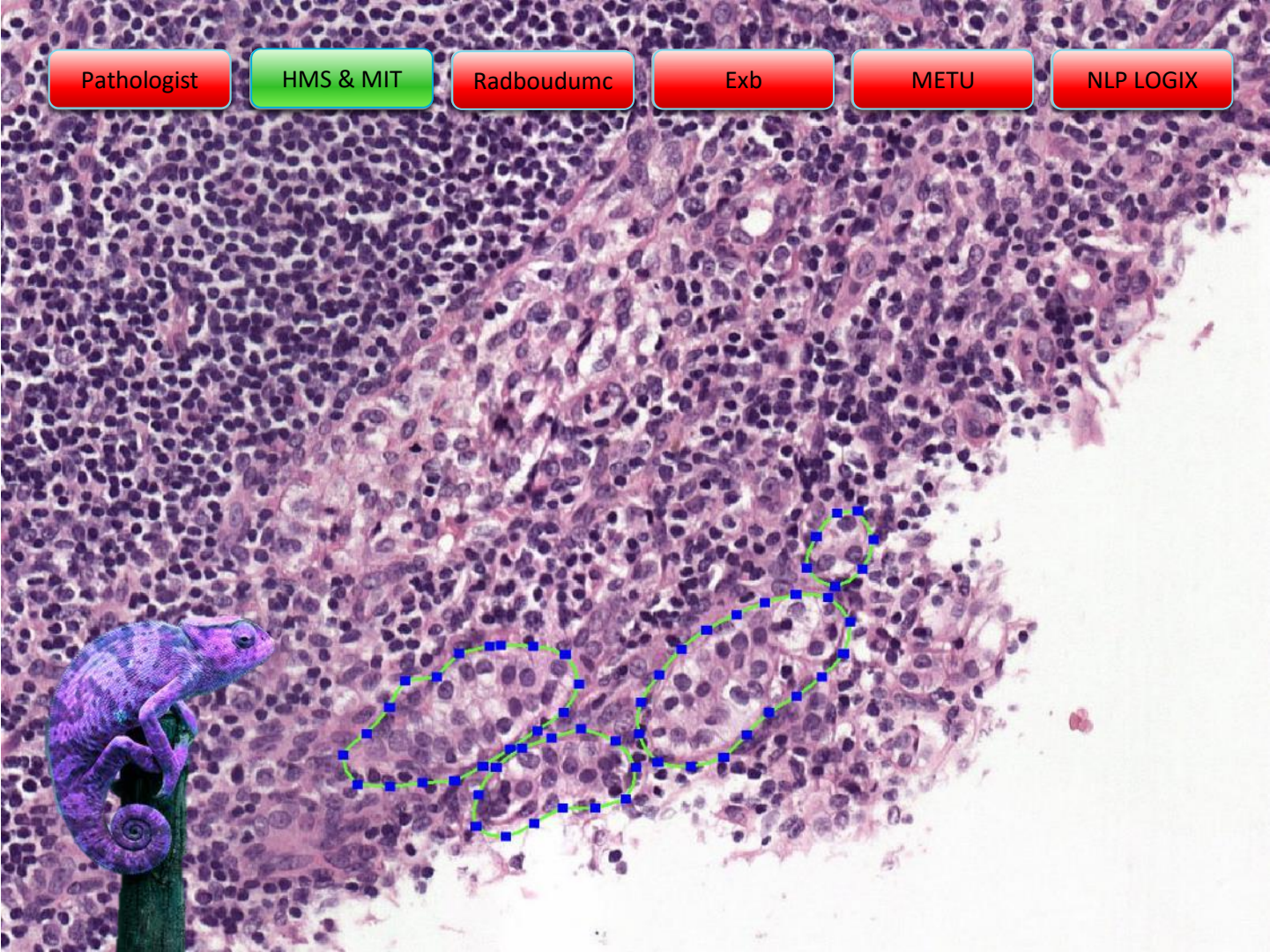
HMS & MIT

Radboudumc

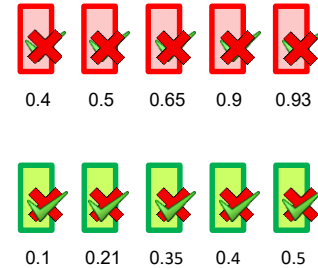
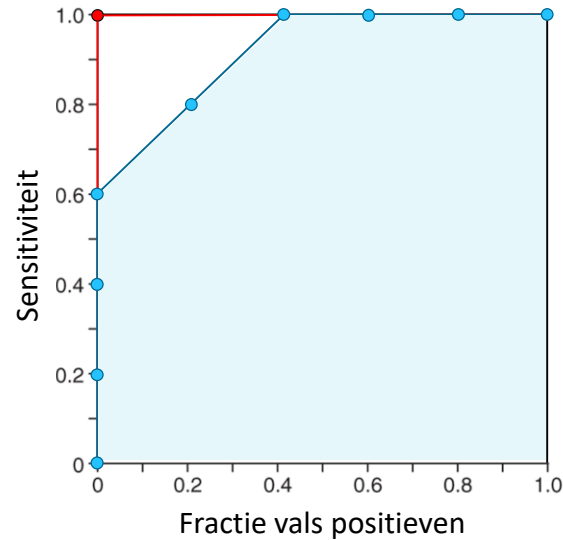
Exb

METU

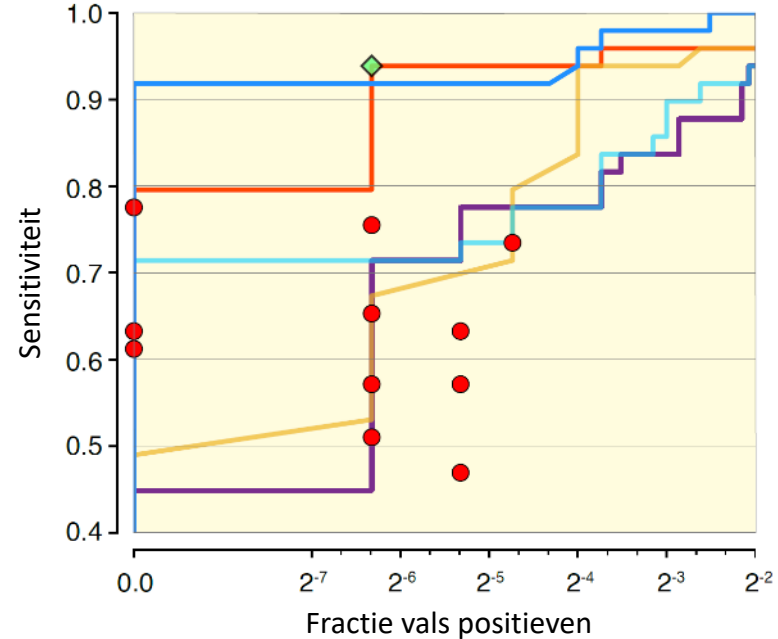
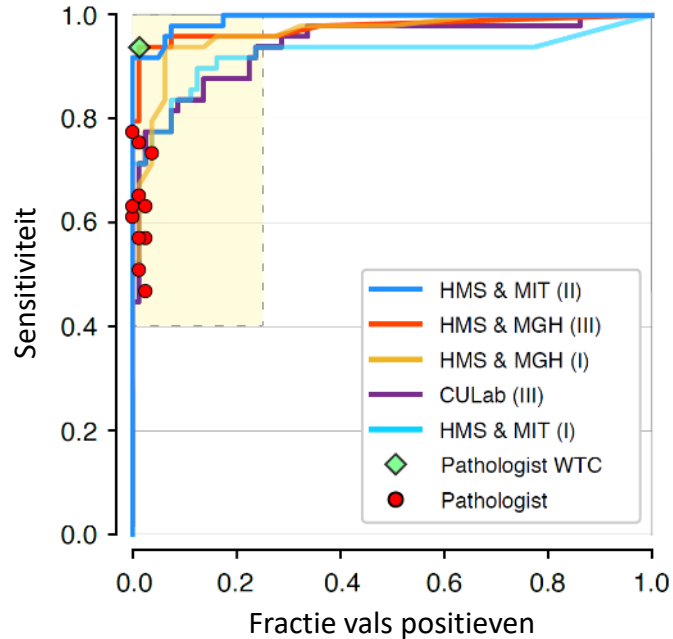
NLP LOGIX



Scoren van een systeem



Vergelijking met de specialist

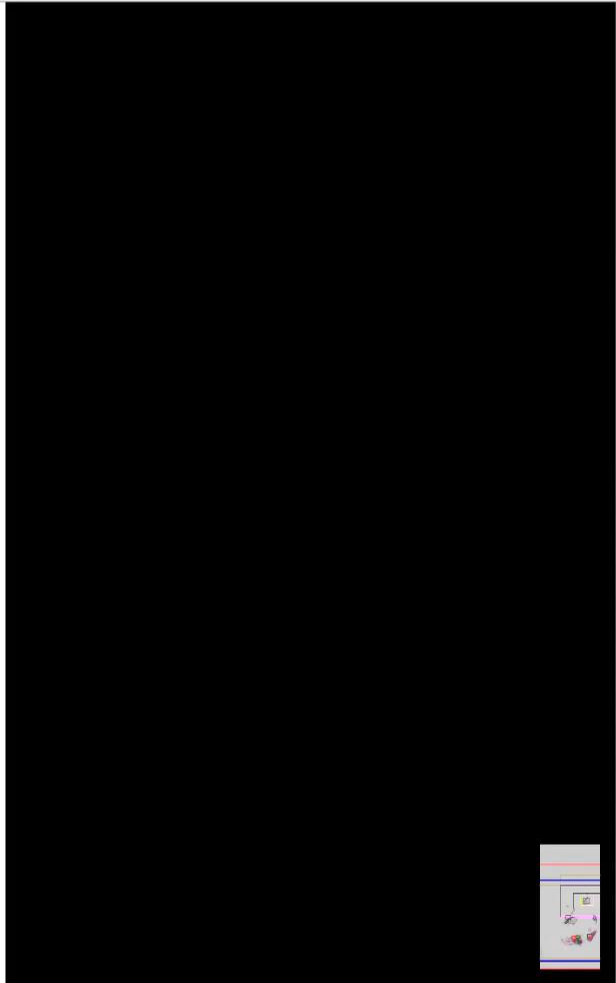
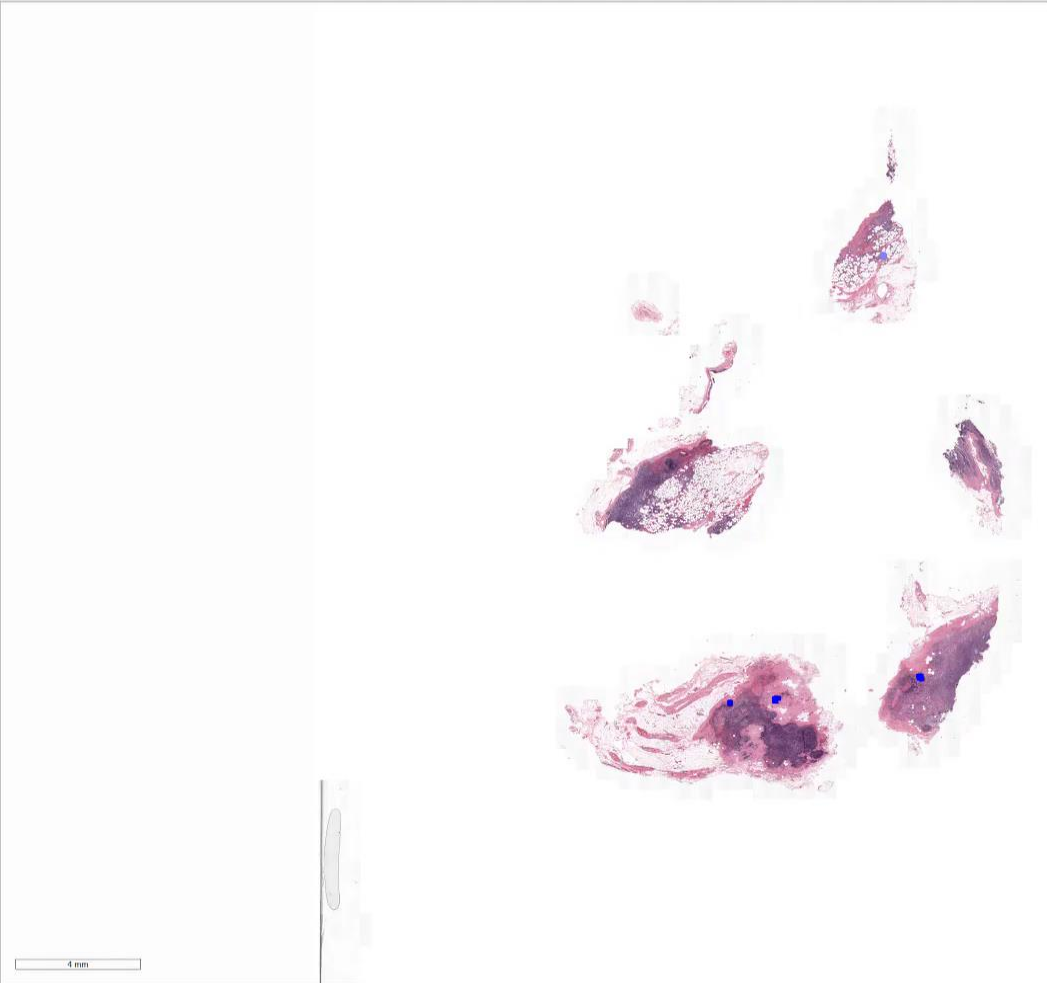


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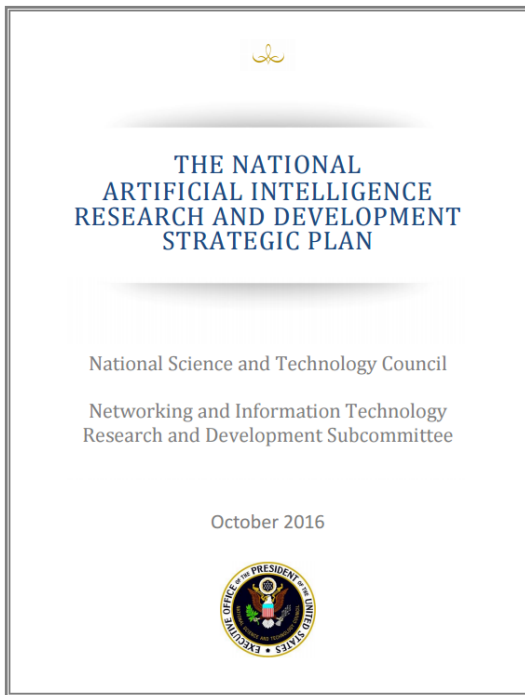
✓	Potential metastases	Group
■	Area 1	Polygon
■	Area 2	Polygon
■	Area 3	Polygon
■	Area 4	Polygon

Add new group Clear Load Save

Annotations Image Fit Zoom Overlay



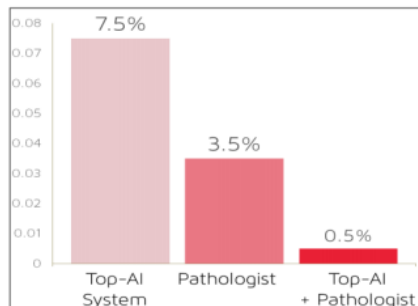
Zelfs het Witte Huis gehaald...



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-



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

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.



Dermatologie

Stanford ML Group

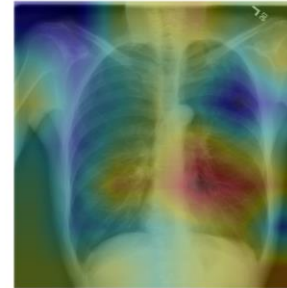
CheXNet: Radiologist-Level Pneumonia Detection on Chest X-Rays with Deep Learning

Pranav Rajpurkar*, Jeremy Irvin*, Kaylie Zhu, Brandon Yang, Hershel Mehta, Tony Duan, Daisy Ding, Aarti Bagul, Curtis Langlotz, Katie Shpanskaya, Matthew P. Lungren, Andrew Y. Ng

We develop an algorithm that can detect pneumonia from chest X-rays at a level exceeding practicing radiologists.

Chest X-rays are currently the best available method for diagnosing pneumonia, playing a crucial role in clinical care and epidemiological studies. Pneumonia is responsible for more than 1 million hospitalizations and 50,000 deaths per year in the US alone.

[READ OUR PAPER](#)



Radiologie

Google AI Blog
The latest news from Google AI

Deep Learning for Detection of Diabetic Eye Disease
Tuesday, November 29, 2016

Posted by Lily Peng MD PhD, Product Manager and Varun Gulshan PhD, Research Engineer

Diabetic retinopathy (DR) is the fastest growing cause of blindness, with nearly 415 million diabetic patients at risk worldwide. If caught early, the disease can be treated; if not, it can lead to irreversible blindness. Unfortunately, medical specialists capable of detecting the disease are not available in many parts of the world where diabetes is prevalent. We believe that Machine Learning can help doctors identify patients in need, particularly among underserved populations.

A few years ago, several of us began wondering if there was a way Google technologies could improve the DR screening process, specifically by taking advantage of recent advances in Machine Learning and Computer Vision. In "Development and Validation of a Deep Learning Algorithm for Detection of Diabetic Retinopathy in Retinal Fundus Photographs", published today in JAMA, we present a deep learning algorithm capable of interpreting signs of DR in retinal photographs, potentially helping doctors screen more patients in settings with limited resources.

One of the most common ways to detect diabetic eye disease is to have a specialist examine pictures of the back of the eye (Figure 1) and rate them for disease presence and severity. Severity is determined by the type of lesions present (e.g. microaneurysms, hemorrhages, hard exudates, etc), which are indicative of bleeding and fluid leakage in the eye. Interpreting these photographs requires specialized training, and in many regions of the world there aren't enough qualified graders to screen everyone who is at risk.



Oogheekunde

Moeten artsen nu bang zijn voor hun baan?



