

AI bij de pathologie

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UMC Utrecht

De patholoog



- Verdenking borstkanker

- Weefselbiopt of operatie

- Kanker of niet
- Stadium
- Prognose
- Behandeladvies
- Erfelijk of niet
- Compleet verwijderd of niet



Diagnostiek



Scanners

Kunstmatige intelligentie?



- Wereldwijd tekort aan pathologen
- Forse toename aantal kanker diagnoses

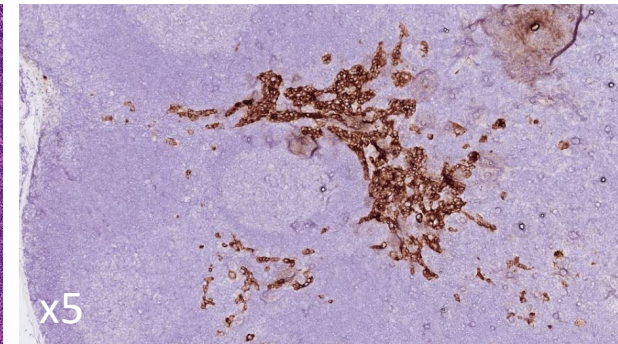
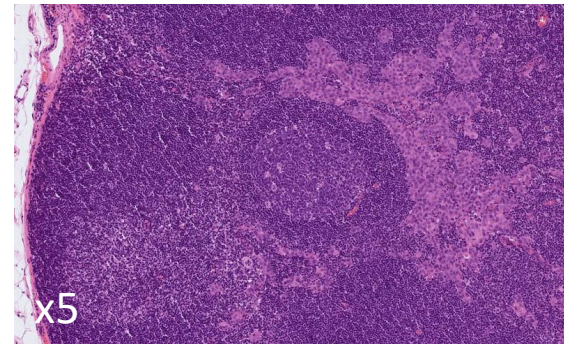
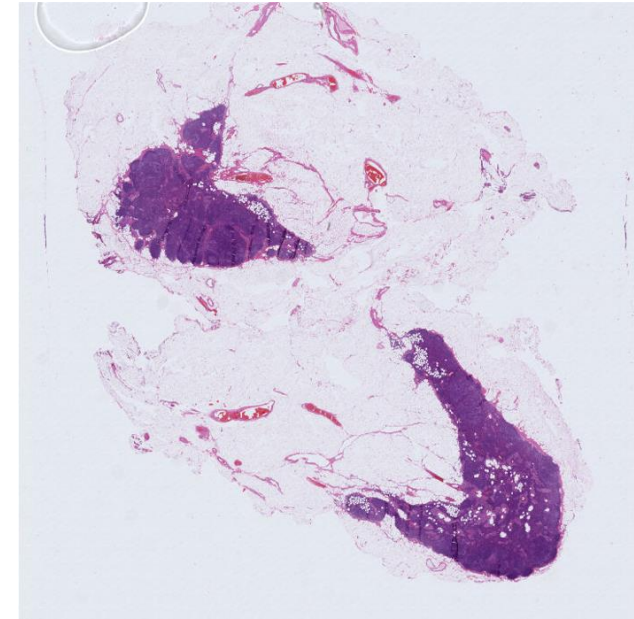


Digitale diagnostiek

- 50% van de Nederlandse labs
- Veel voordelen, lastige 'business' case

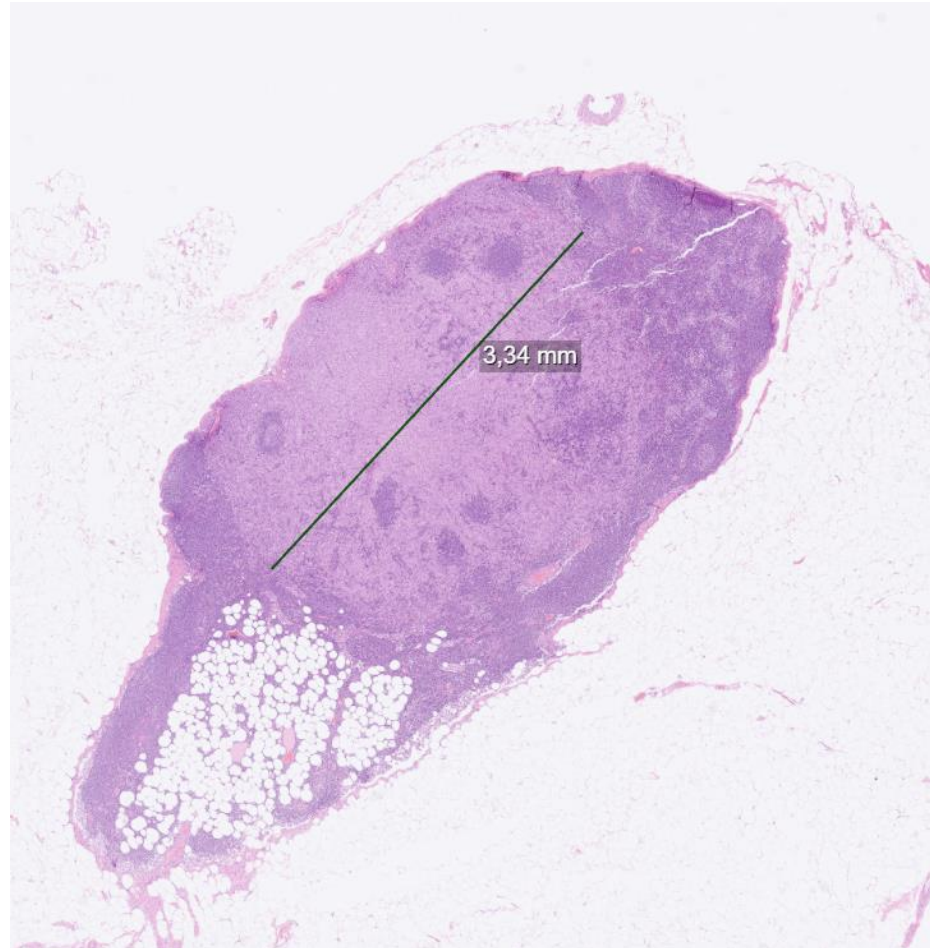
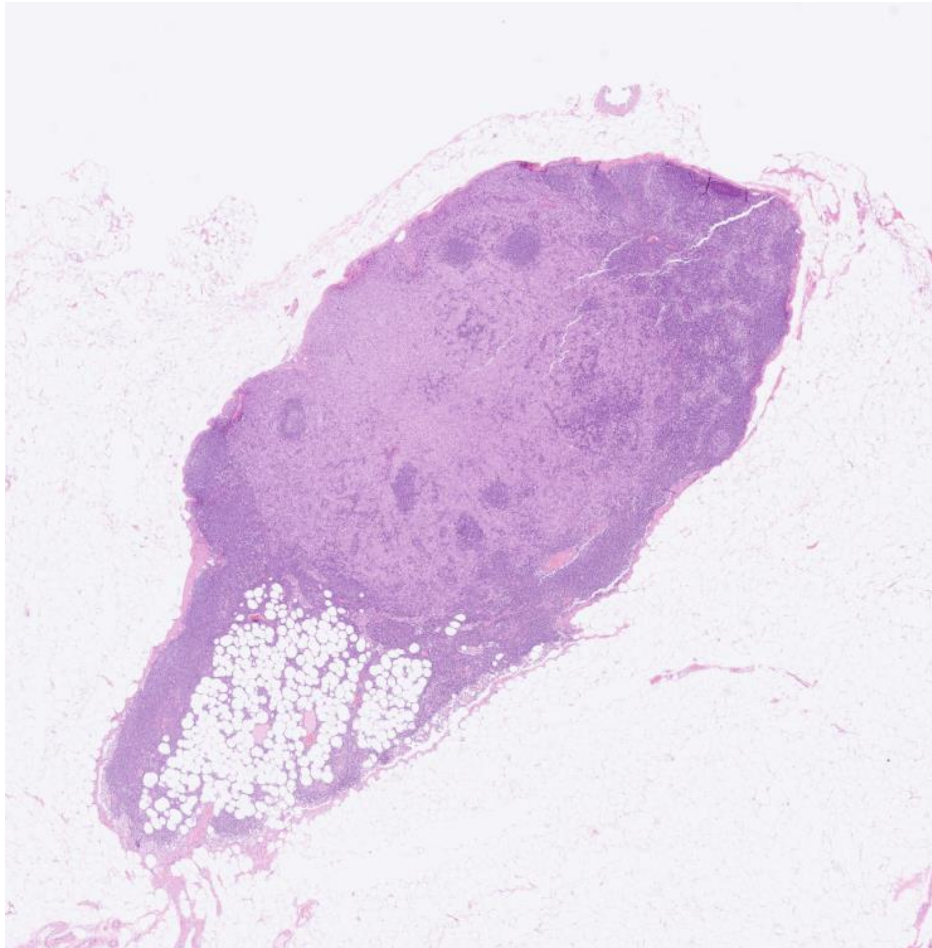
Schildwachtlier (poortwachter)

- **Patholoog: uitzaaiingen of niet** → Hormoontherapie?
Chemotherapie?
Radiotherapie?
- **Beoordeling weefsel**
 - 3-5 plakjes (slides) per *weefselblokje* →
 - **Goed zoeken!**
 - Meestal geen uitzaaiingen (2/3^e)
 - Concentratie
 - Tijdrovend
 - 'Saai' werk
 - **Niets gevonden? Kleuringen!**
 - Immunohistochemie: tumorcellen worden bruin



€25 x 5

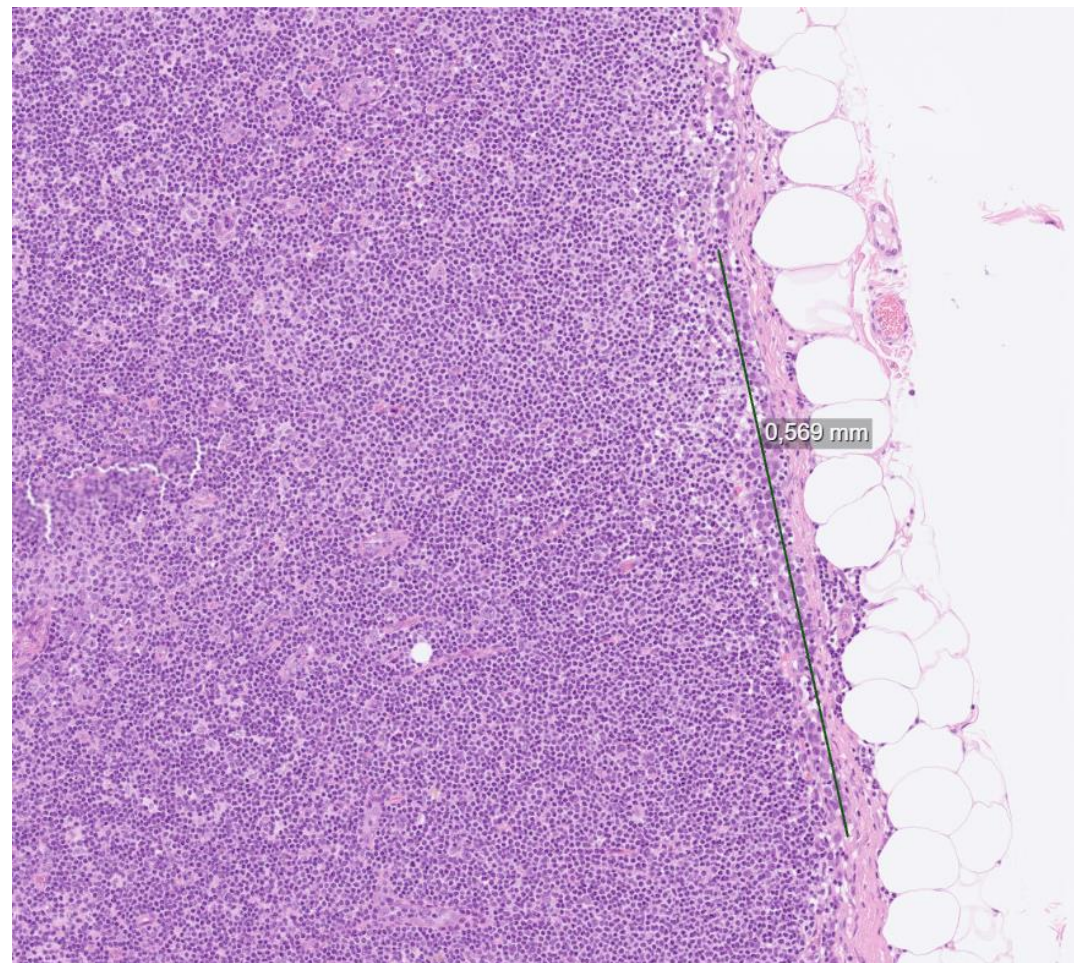
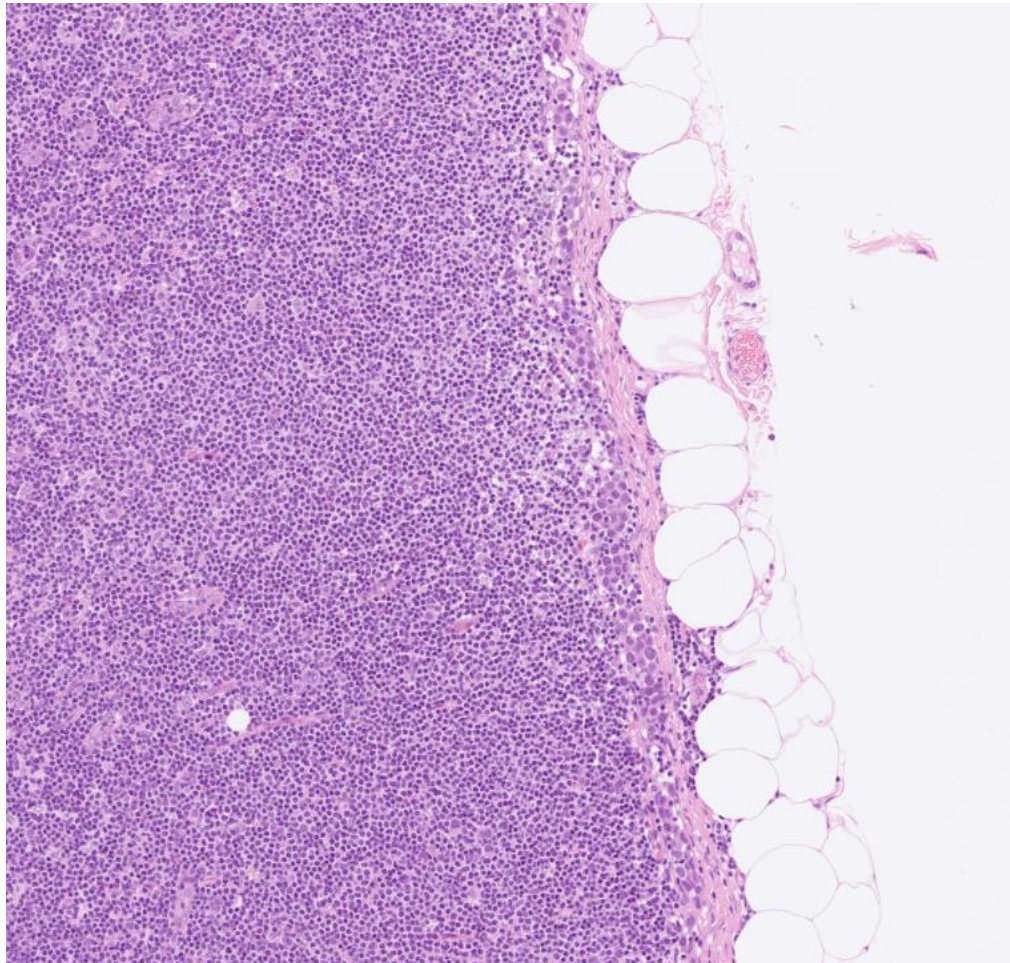
SWK in de praktijk: macro-metastase



Type	Afmeting
ITC	$\leq 0.2\text{mm}$
Micro	$>0.2\text{mm}-<2\text{mm}$
Macro	$\geq 2\text{mm}$

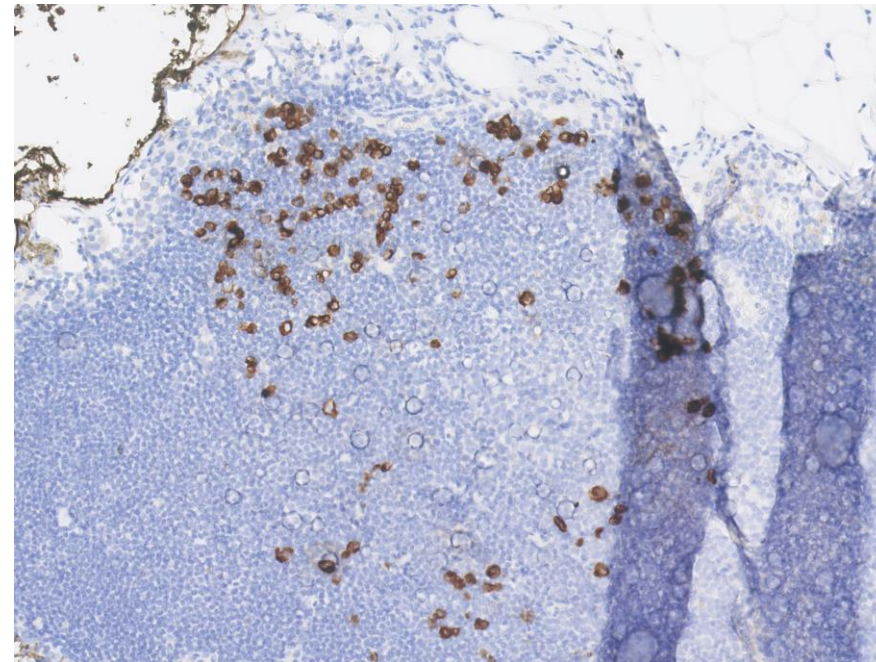
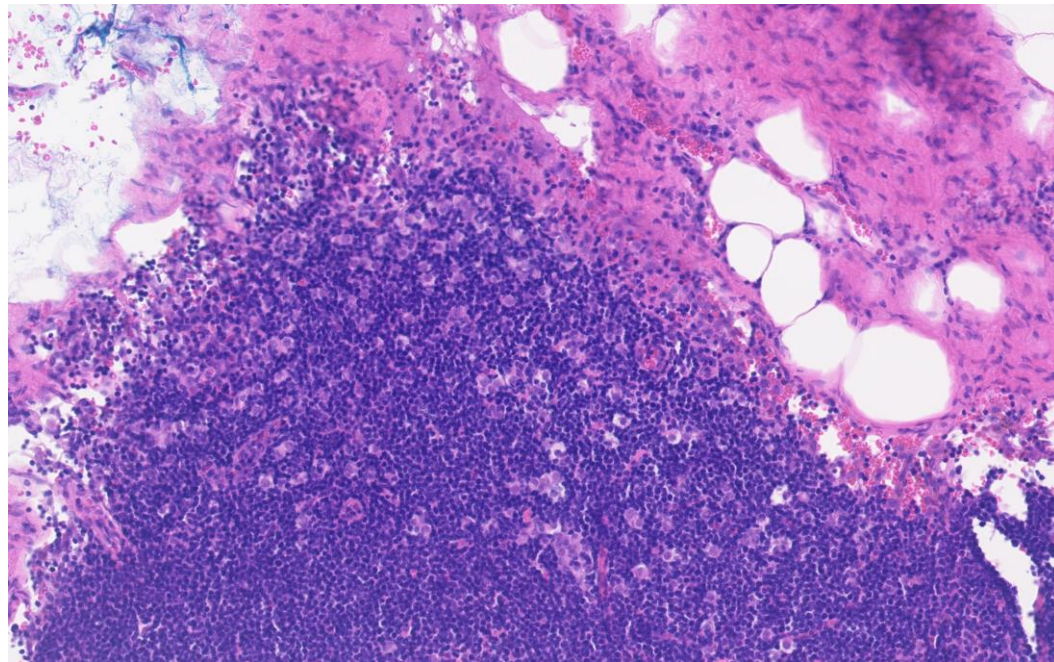
SWK in de praktijk: micro-metastase (2)

Type	Afmeting
ITC	$\leq 0.2\text{mm}$
Micro	$>0.2\text{mm}-<2\text{mm}$
Macro	$\geq 2\text{mm}$



SWK in de praktijk: micro-metastase (3)

Type	Afmeting
ITC	$\leq 0.2\text{mm}$
Micro	$>0.2\text{mm}-<2\text{mm}$
Macro	$\geq 2\text{mm}$



Ideale 'taak' voor AI-assistentie

- Mens blijft belangrijk!
- Augmented intelligence: $1 + 1 = 3$
- Het bestaat al lang: 2017 (!)
- **Implementatie in de praktijk?**
 - Geen vergoeding
 - IT-personeel
 - Digitaal werken (NL: 50%, VS: 5-6%)
 - Integratie in digitaal systeem (PACS)
 - Goedkeuring (IVD- en/of FDA)

NOS Nieuws • Vrijdag 3 maart 2017, 17:07 • Aangepast vrijdag 3 maart 2017, 17:23

Computer kan kanker beter herkennen dan patholoog

Nikolas Stathonikos Paul Pham



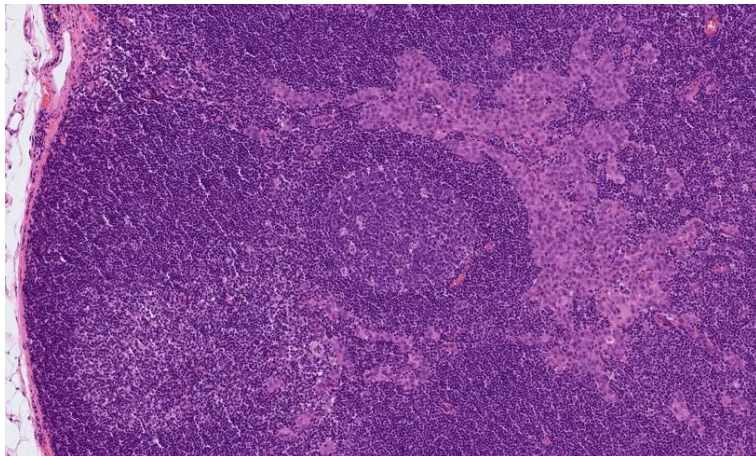
➔ **Kostenbesparingen elders in de workflow**

➔ **Implementatie studies: toegevoegde waarde in dagelijkse praktijk**

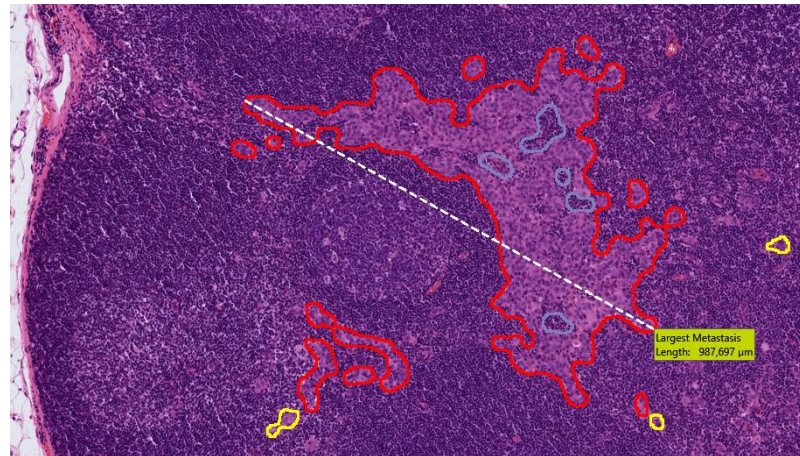
Wat doet AI dan?

- **Metastasis Detection App**  VISIOPHARM®
 - “Het is gewoon een digitale kleuring”
 - Goedkeuring (IVD) voor borst- en darmkanker
 - Outlines: **geel**, **oranje**, **rood**

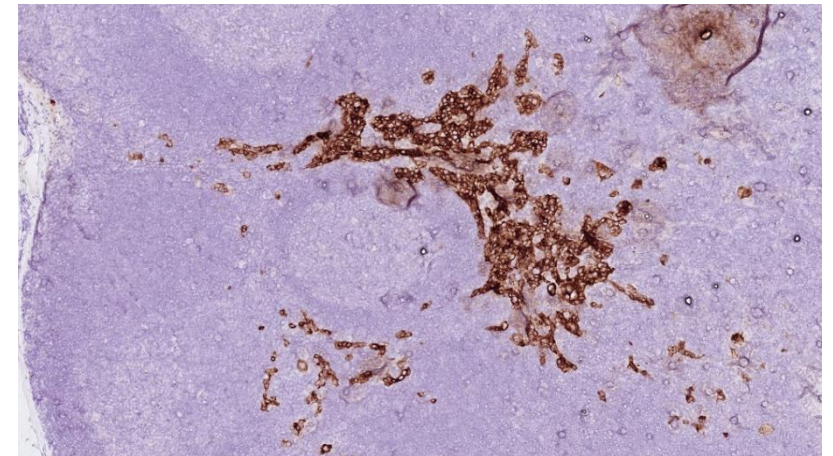
‘Gewone’ (HE)-slide



AI-output



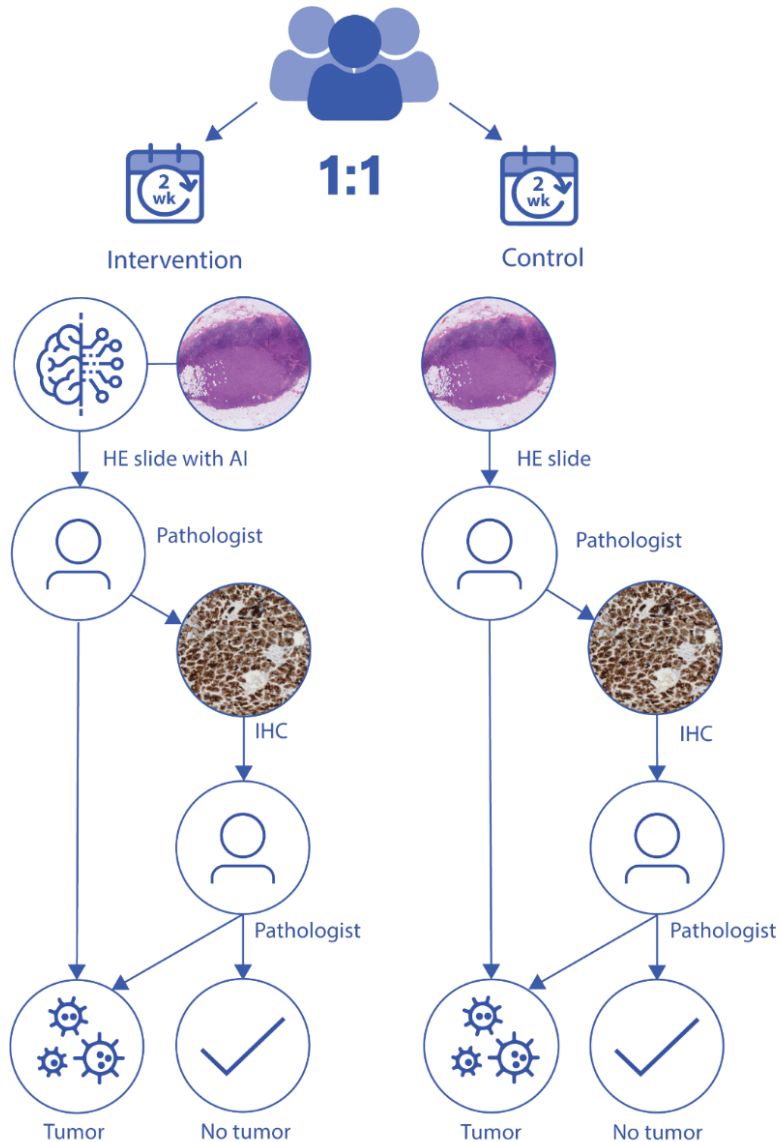
Immuunhistochemische kleuring



Voorbeeld (casus 1)

[View 01 - Slide Score \(umcutrecht.nl\)](#)

Implementatie: doen?



nature cancer



Article

<https://doi.org/10.1038/s43018-024-00788-z>

Clinical implementation of artificial-intelligence-assisted detection of breast cancer metastases in sentinel lymph nodes: the CONFIDENT-B single-center, non-randomized clinical trial

Received: 15 January 2024

Accepted: 29 May 2024

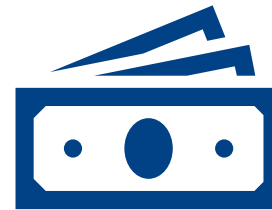
Published online: 27 June 2024

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- Pathologen als 'deelnemer' 
- 190 schildwachtklier-samples (9 maanden)
- Beoordeling zoals 'normaal' of met AI

Implementatie: doen!

- **Significant minder vaak kleuringen nodig om uitzaaiingen aan te tonen: -32%**
 - Beter in aantonen van geïsoleerde tumorcellen (+27%)
 - Beter in aantonen van micro-uitzaaiingen (+30%)
- **Flinke kostenbesparing:**
 - €3.000 in studie zelf
 - S1: €1.500-€3.000 per 100 SN's
 - S2: €7.500-€12.500 per 100 SN's
- **Workflow-verbeteringen**
 - Significante tijdsbesparing: 3min45 versus 6min04
 - Pathologen vinden het werk plezieriger !



Wat zeggen pathologen zelf?

- Makkelijke, repetitieve taken
- Mens in de 'loop'

“Veel winst te behalen bij ‘makkelijke’ bulktaken.”

CP 13: With artificial intelligence, I mainly think about easy tasks. For instance, part of my work is very complex, and part is very easy. All the tasks which are very easy, those moments in which I am diagnosing basal cell carcinomas, for instance, I think 'did I really study this long to be able to perform this task?'. It would be very nice if such tasks could be completely automated. You would only have to push a button as pathologist, at least in the beginning. Perhaps it could become completely automated at a certain moment. That would be ideal. (...) Basal cell carcinomas are, for me, the greatest bulk task. We have calculated that it takes up one-fifth, or around twenty to twenty-five percent, of our total time. (...) AI could give us more time.

“Hulp bij weinig intellectueel uitdagend monnikenwerk.”

CP 14: We do a fair amount of looking at the same kind of patterns, and this is a bit like working in a monastery. It costs me little intellectually – it mainly costs time and requires concentration. But it is not a great mental achievement. A computer could do it as well. AI could do it. For example, an AI-algorithm could just indicate on certain slides, 'look at this one, I suspect there are tumor cells', and then I could look at that area and say 'yes, indeed, I also think it's a tumor'. AI screens it so you don't have to look at the rest of the sample. (...) This could free up some spare time for us to perform other useful tasks.

“AI als automatische piloot, patholoog blijft eindverantwoordelijk”

CP 14: I always compare the possibility of AI in pathology to aviation. AI is like the autopilot. The pathologist is responsible for the final diagnosis, but he or she uses tools to arrive at this diagnosis. Such a tool can save time by performing certain work, certain tasks within pathology. And yes, this is a kind of autopilot-phenomenon. So, you as pathologist hold final responsibility for the diagnosis, but you are supported, in part, by a computer.

“Zwarte doos? Ik weet ook niet hoe mijn telefoon werkt, maar ik weet hoe het te gebruiken en ik kan er op vertrouwen.”

CP 19: One of the concerns people raise, is how pathologists can take responsibility for the application of a black box technique, something that uses deep learning. How can I take responsibility for the results from such a tool? (...) My first response is, look, I have a telephone and I have no idea how it works, but I do know how to use it, and that is sufficient grounds for me to trust it as a reliable technology, something I can depend upon it, with reproducible results. So, you do not necessarily have to understand how something works to trust it.



“AI zal pathologen niet vervangen, maar AI zal wel pathologen vervangen die geen AI willen gebruiken.”

Waar kan AI ons nog meer bij helpen?

- **Tellen van celdelingen! (mitosen)**
 - Noodzakelijk voor gradering borstkanker
 - Kiezen gebied met meeste celdelingen
 - Tellen van de celdelingen

Nikolas Stathonikos Paul Pham

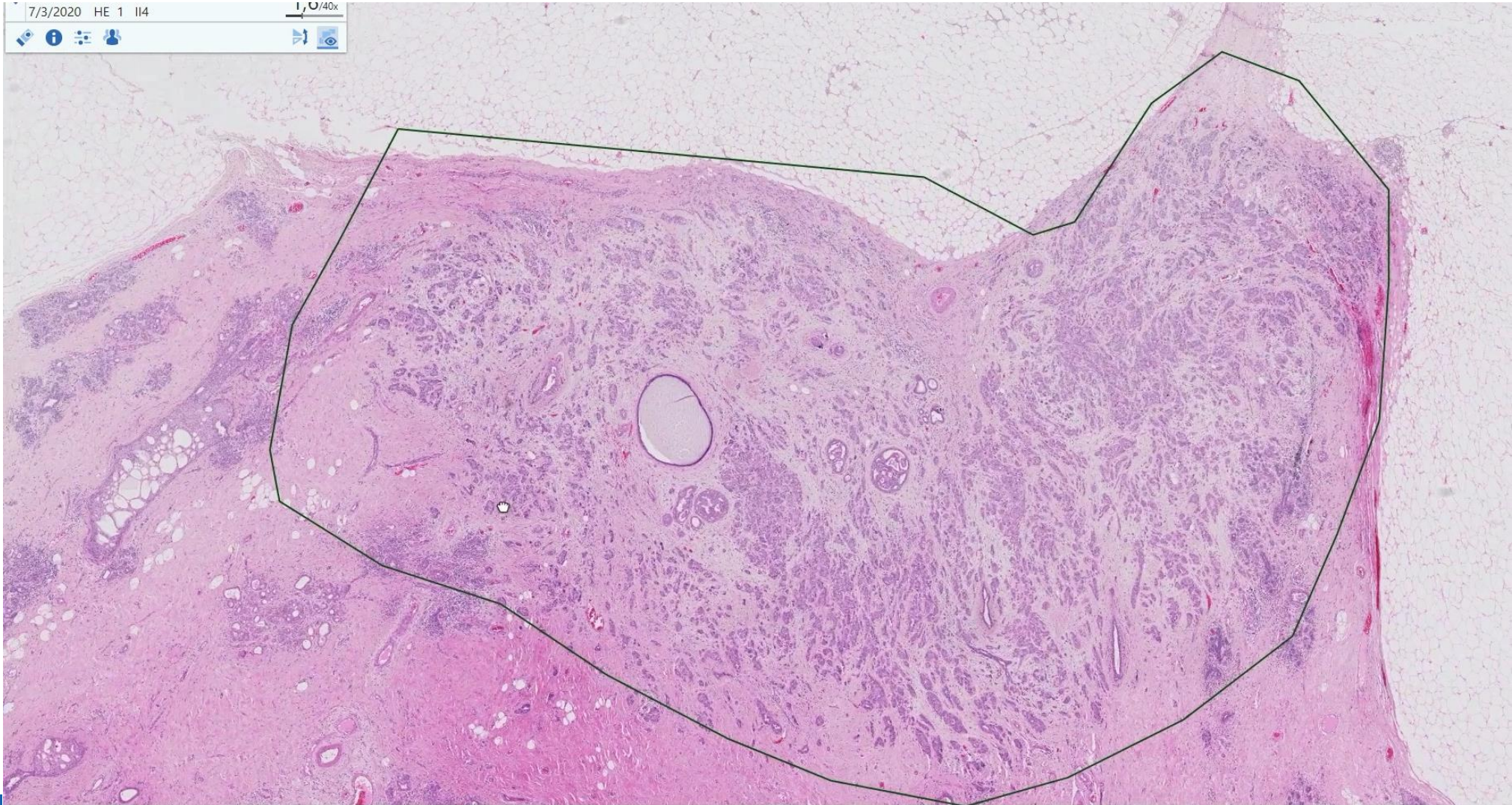


Paul van Diest Natalie ter Hoeve

De histologische graad is I bij de scores 3-5, II bij 6-7, en III bij 8-9.

Mate van buisvorming:	1 = > 75%
	2 = 10-75%
	3 = < 10%
Kernpolymorfie:	1 = weinig anders dan normaal epitheel
	2 = vergroot, vesiculair, kleine nucleoli
	3 = polymorf, vesiculair, grote nucleoli
Delingsactiviteit:	1 = 0 t/m 7 mitoses per 2 mm ²
	2 = 8 t/m 12 mitoses per 2 mm ²
	3 = 13 of meer mitoses per 2 mm ²

Detector in action



Dank voor uw aandacht!

UMC Utrecht AI-pathologie team



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HANARTH
FONDS



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SHARED CHALLENGES, SMART SOLUTIONS