Slide 1

AI for Breast Imaging
The larger leap forward

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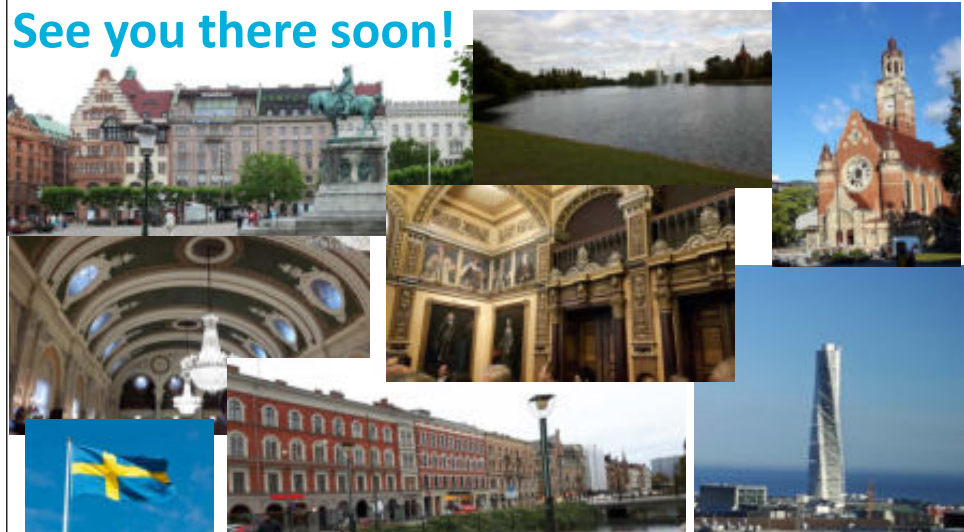ioannis.sechopoulos
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Slide 2

See you there soon!

Slide 3

Disclosures

Research Agreements:
- Siemens Healthcare
- Canon Medical Systems
- ScreenPoint Medical
- Volpara Solutions
- Sectra Benelux

Speaking Agreements:
- Siemens Healthcare
- ScreenPoint Medical

ScreenPoint Medical is a spin-off company from my Department, but I have no personal stake in the company.

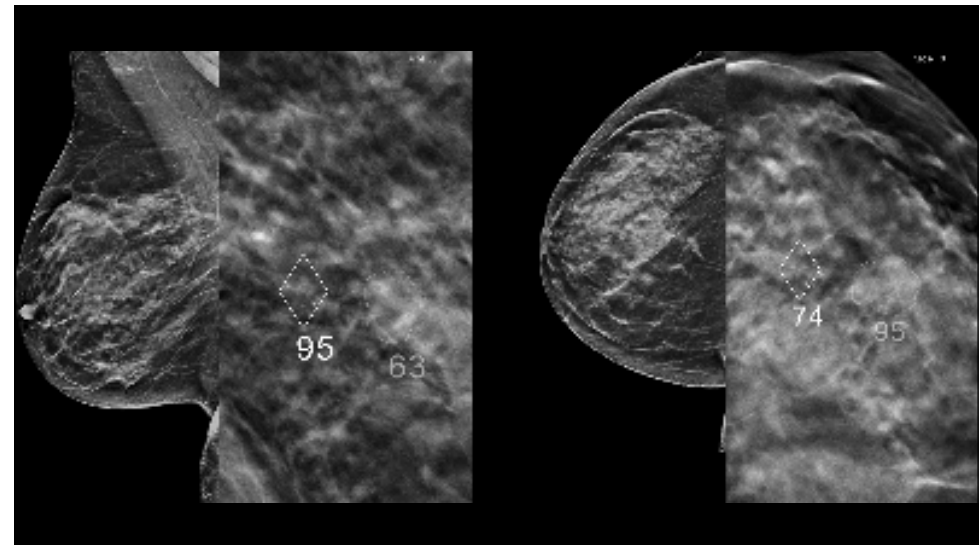**Radboud**umc
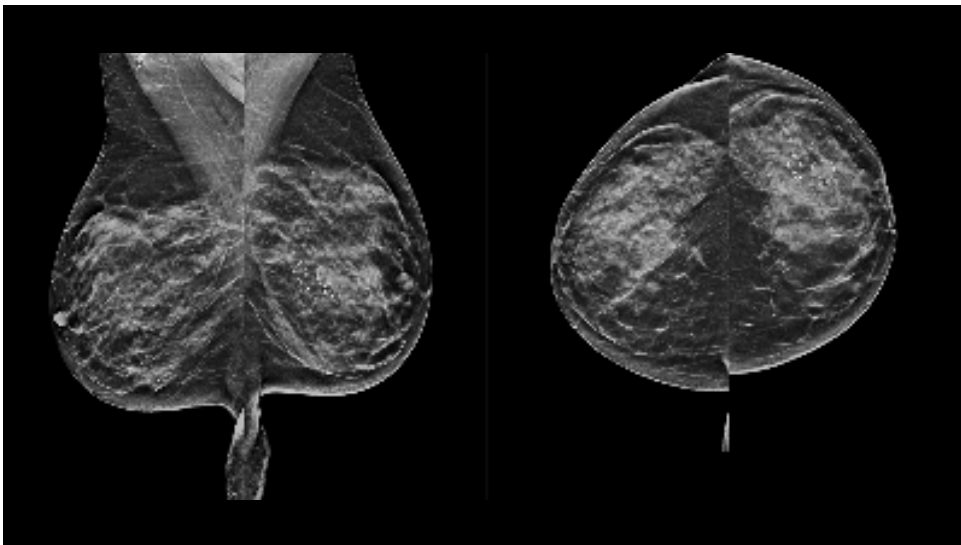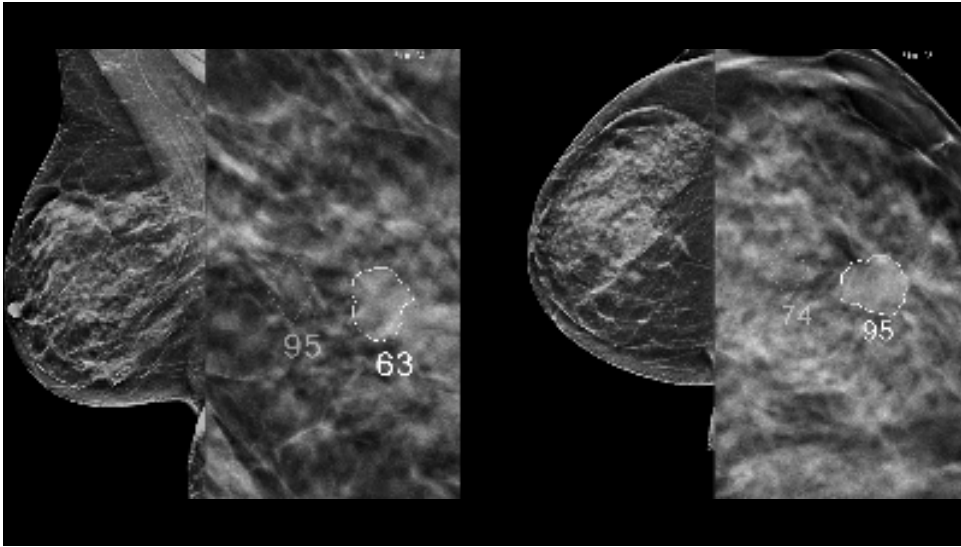
Slide 4

We're on our way...

...to where?

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Faster!
Better!
Less!

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AI-Assisted Reading

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Faster!

Assisted **DBT** reading:
41 s [39 s, 42 s]
➔ 36 s [35 s, 37 s]

-11%
[-8%, -13%]
P < 0.001

P<0.05

Seconds / exam

Unaided   Aided

Van Winkel et al, under review.
Radboudumc

Van Winkel et al, under review.
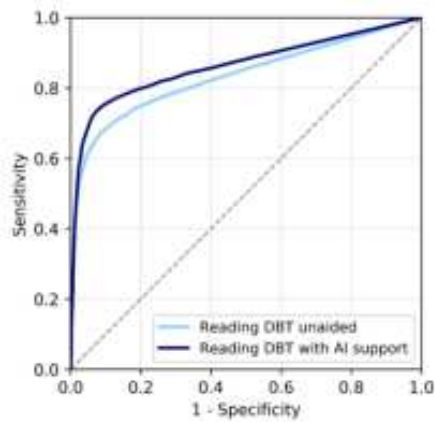Radboudumc

Slide 1

Better!

Slide 2

Assisted **DM** reading:
0.866 [0.83,0.90]
➜ 0.886 [0.85,0.92]

+0.020
[0.007, 0.032]
P = 0.002

Rodriguez-Ruiz et al, Radiology, 2019.

Slide 3

Assisted **DBT** reading:
0.833 [0.80,0.87]
➜ 0.863 [0.83,0.90]

+0.030
[0.011, 0.049]
P = 0.0025

van Winkel et al, under review.

Slide 4
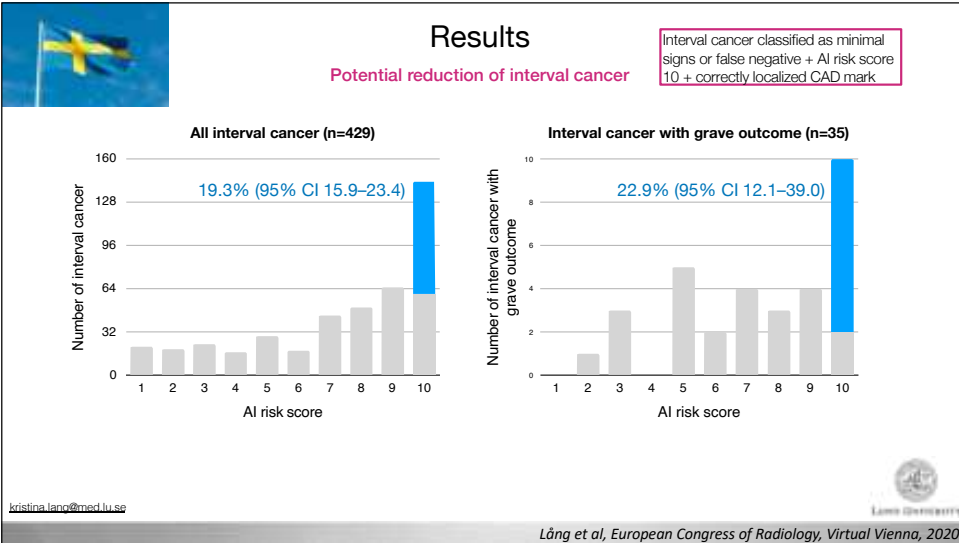
Sensitivity **+6.2%** (P<0.016)
at equal specificity

➜ **-19% fewer false negatives**

van Winkel et al, under review.

Results

Potential reduction of interval cancer

Interval cancer classified as minimal signs or false negative + AI risk score 10 + correctly localized CAD mark

All interval cancer (n=429)

19.3% (95% CI 15.9–23.4)

Interval cancer with grave outcome (n=35)

22.9% (95% CI 12.1–39.0)

AI risk score

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Lång et al, European Congress of Radiology, Virtual Vienna, 2020.

Less!

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Standalone AI

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Radiologists | AUC = 0.87
Transpara 1.3.0 | AUC = 0.89
Transpara 1.6.0 | AUC = 0.91
beta Transpara 1.7.0 | AUC = 0.96
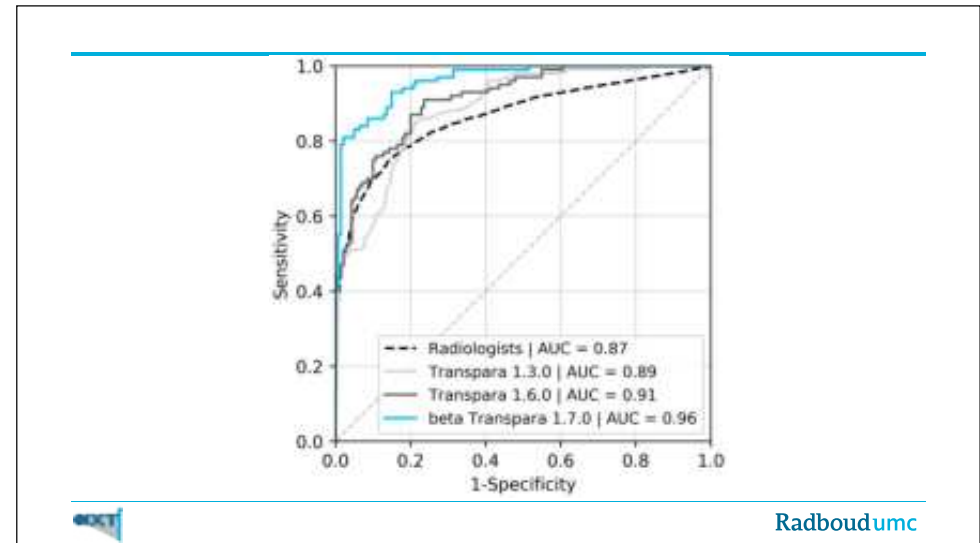
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Pre-selection for **NO** human reading

Rodriguez Ruiz et al, Eur Radiol, 2019.
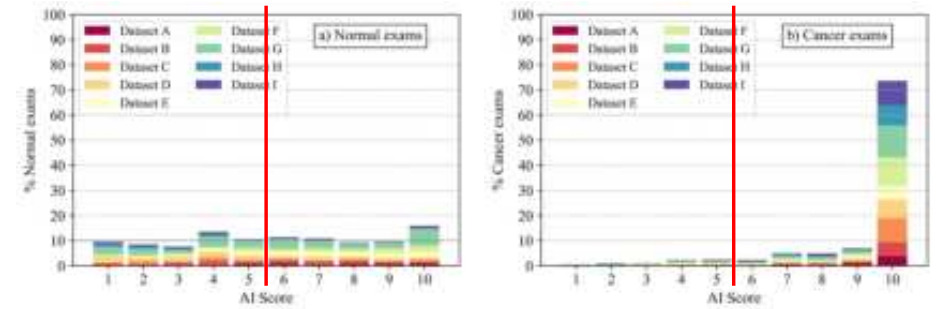
Enriched case set

2,652 DM exams

653 malignant

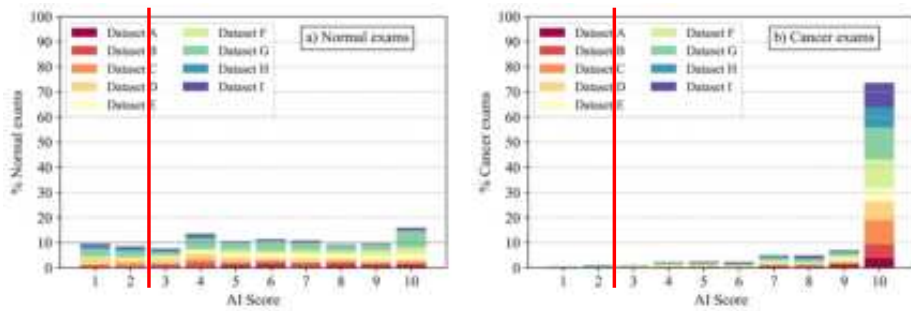50% screening/50% diagnostic

Rodriguez Ruiz et al, JNCI, 2019.

47% decrease in cases
➔ -7% cancers
-27% false positives

Rodriguez Ruiz et al, Eur Radiol, 2019.

Rodriguez Ruiz et al, Eur Radiol, 2019.

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20% decrease in cases

➜   -1% cancers

-5% false positives

Rodriguez Ruiz et al, Eur Radiol, 2019.

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Real screening cohort

53,948 **DM exams**

418 screen-detected cancers

150 interval cancers (< 2 yrs)

Rodriguez Ruiz et al, JNCI, 2019.

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59% decrease in cases
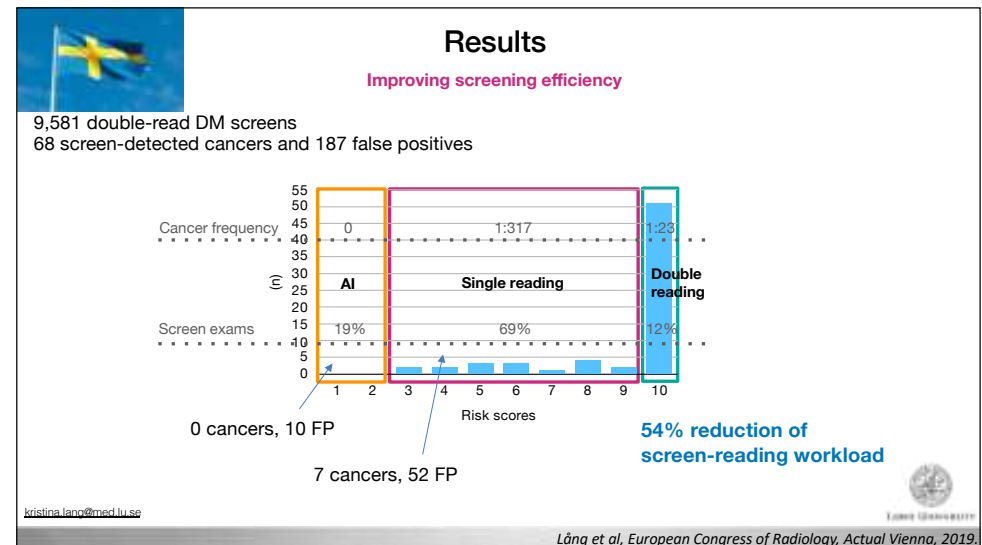
➜   -3.8% cancers

-22% recall rate

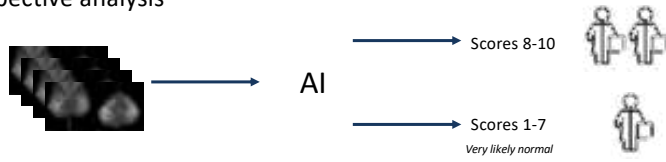*Lauritzen et al, Virtual ECR 2020.*

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Double Reading

Pre-selection for **SINGLE** human reading

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Results

Improving screening efficiency

9,581 double-read DM screens
68 screen-detected cancers and 187 false positives

0 cancers, 10 FP

7 cancers, 52 FP

54% reduction of screen-reading workload

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Lång et al, European Congress of Radiology, Actual Vienna, 2019.

Consecutive real screening cohort
18 015 DM exams
Retrospective analysis

Scores 8-10

Scores 1-7
Very likely normal

	Original double human reading	AI selective double reading	Difference
CDR/1000	6.90	6.90	**Same CDR**
Recall rate (%)	5.69	5.07	**-11% recall rate**
Human Workload (%)	35,914 readings	24,258 readings	**-32% readings**

Balta et al, International Workshop on Breast Imaging, Virtual Leuven, 2020.
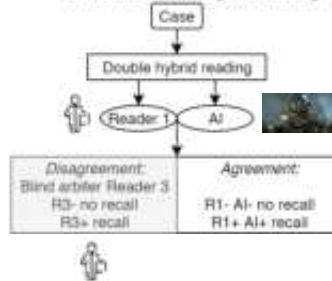

Stand-alone AI as the **second** reader

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Rodriguez Ruiz et al, IWBI, 2020

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	Double **Human** Reading	Double **Hybrid** Reading	Difference
Workload (%)	100	56 (55, 57)	-44 (-42, -45) P<0.001

Rodriguez Ruiz et al, IWBI, 2020

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	Double **Human** Reading	Double **Hybrid** Reading	Difference
Sensitivity (%)	81.5 (75.8, 87.3)	81.4 (75.3, 87.2)	-0.1 (-4.1, 3.9) P = 0.88
Specificity (%)	69.9 (68.4, 71.5)	75.2 (73.8, 76.7)	+5.3 (4.0, 6.7) P<0.001

Rodriguez Ruiz et al, IWBI, 2020

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Which recalls?

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Which cancers?

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Will you behave the same way?

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AI for breast image interpretation

Faster?

DBT: yes!

Better?

reduction in missed cancers

Less?

some cases: NOT or SINGLE read
all cases: AI as the second reader

(very) promising results, more needed

Thank you for your attention!

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