Artificial Intelligence for Digital Breast Tomosynthesis: A tool to enhance radiologist's performance and efficiency

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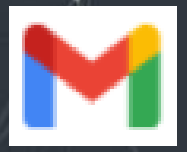
Disclosures

- S.Pacilè and P.Fillard are employees at Therapixel
- Contact Information:



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Introduction and Research Question

- Breast cancer screening programs **reduce mortality**[1]
- DBT **improves cancer detection** and **reduces false positive** calls[2]
- Artificial Intelligence (AI) **showed improvements**[3] in breast cancer detection with digital mammography (DM)

➢ **Can an AI show the same benefits with DBT images?**

[1] *Lauby-Secretan B. et al. Breast-Cancer Screening — Viewpoint of the IARC Working Group. New England Journal of Medicine. 2015.*
[2] *Sharpe RE et al. Increased Cancer Detection Rate and Variations in the Recall Rate Resulting from Implementation of 3D Digital Breast Tomosynthesis into a Population-based Screening Program. Radiology. 2016.*
[3] *Pacilè S. et al. Improving Breast Cancer Detection Accuracy of Mammography with the concurrent Use of an Artificial Intelligence Tool. Radiology: Artificial Intelligence. 2020.*

Materials and Methods 1/2

Study population

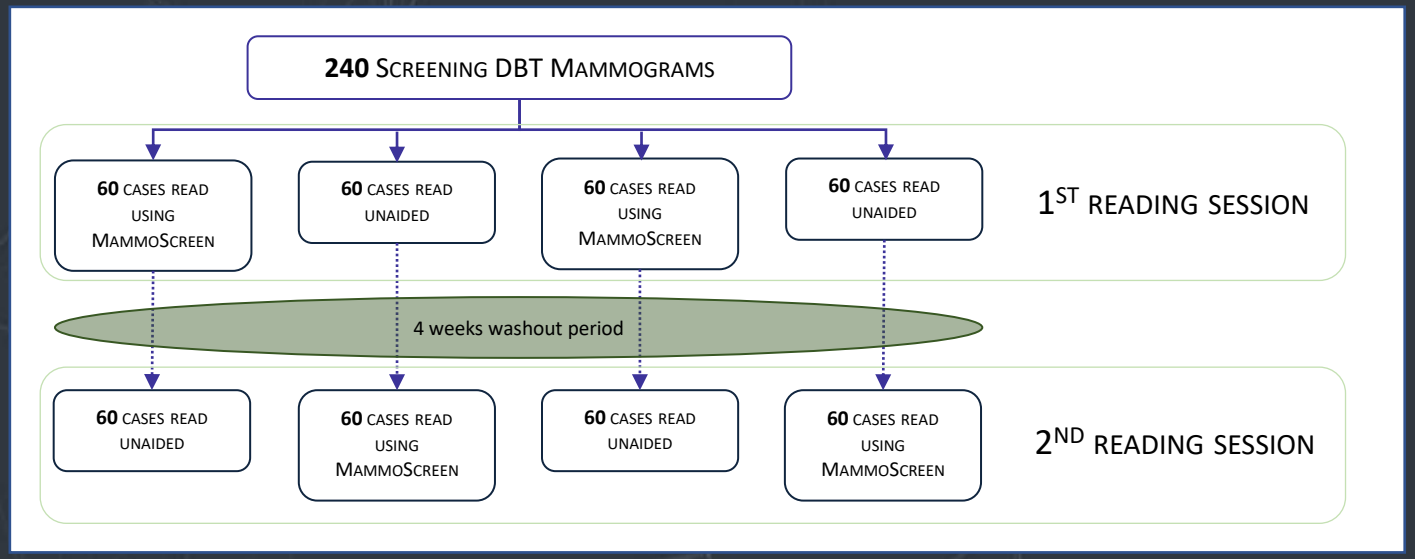
- Cohort: 240 women
- Dataset: **DBT only**
- Readers: **20 radiologists**

80 True Positive cases	**34** False Negative cases
80 True Negative cases	**46** False Positive cases

*Cases distribution – definitions refer to the **original interpretation** of the mammogram (i.e., the **initial reader assessment** at the time of the acquisition),*

Reader test

- Forced BI-RADS (1 – 5)
- Level of suspicion (1 – 100)
- Position of the most suspicious lesion (if any)

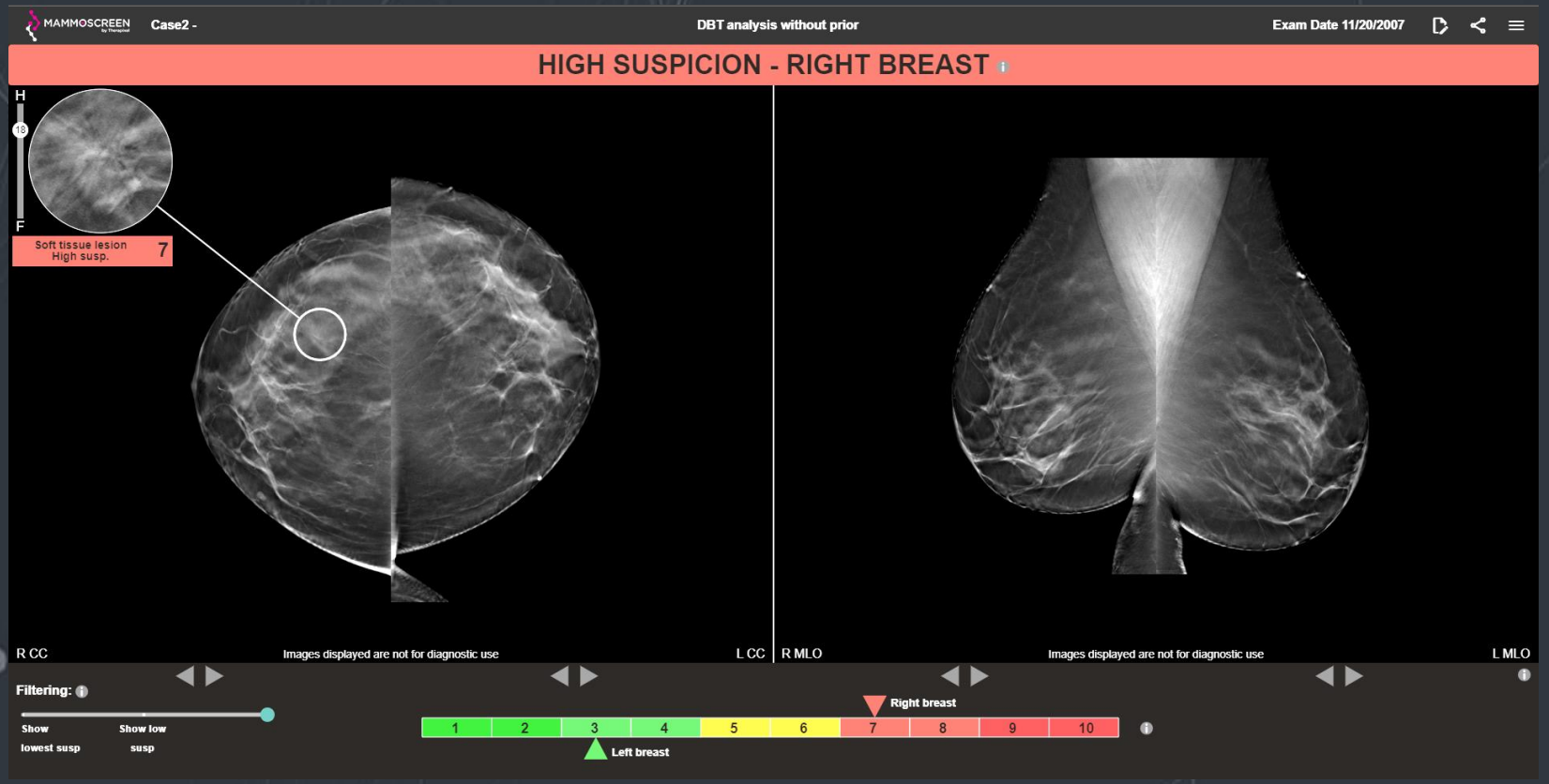


Materials and Methods 2/2

AI system: MammoScreen v2.0.0 (Therapixel)

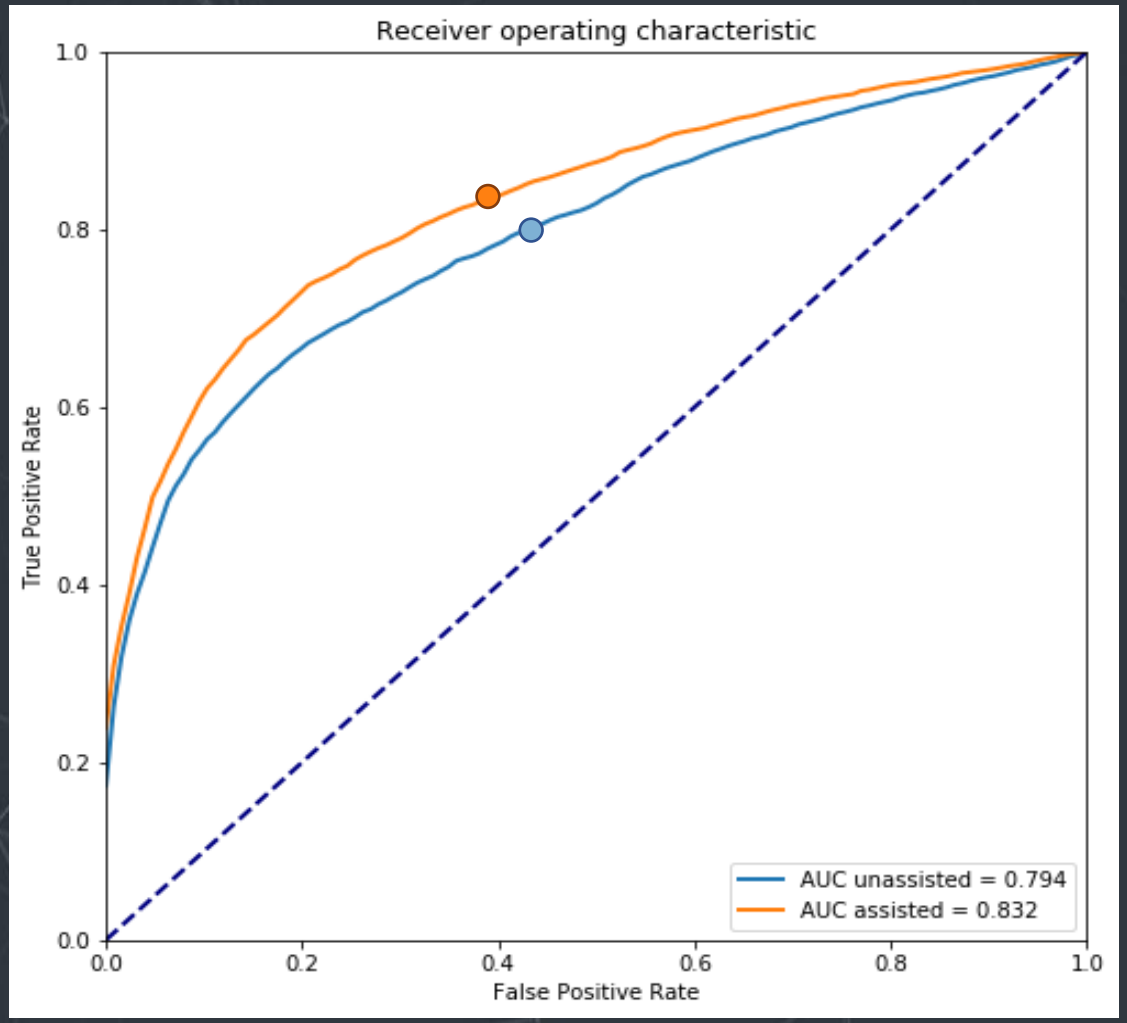
- Inputs:
  - 4 **DBT views**

- Outputs:
  - **Findings**
    (in-plane position + DBT slice)
  - **Level of suspicion:**
    From **1** (benign)
    to **10** (highly suspicious)



Results 1/2

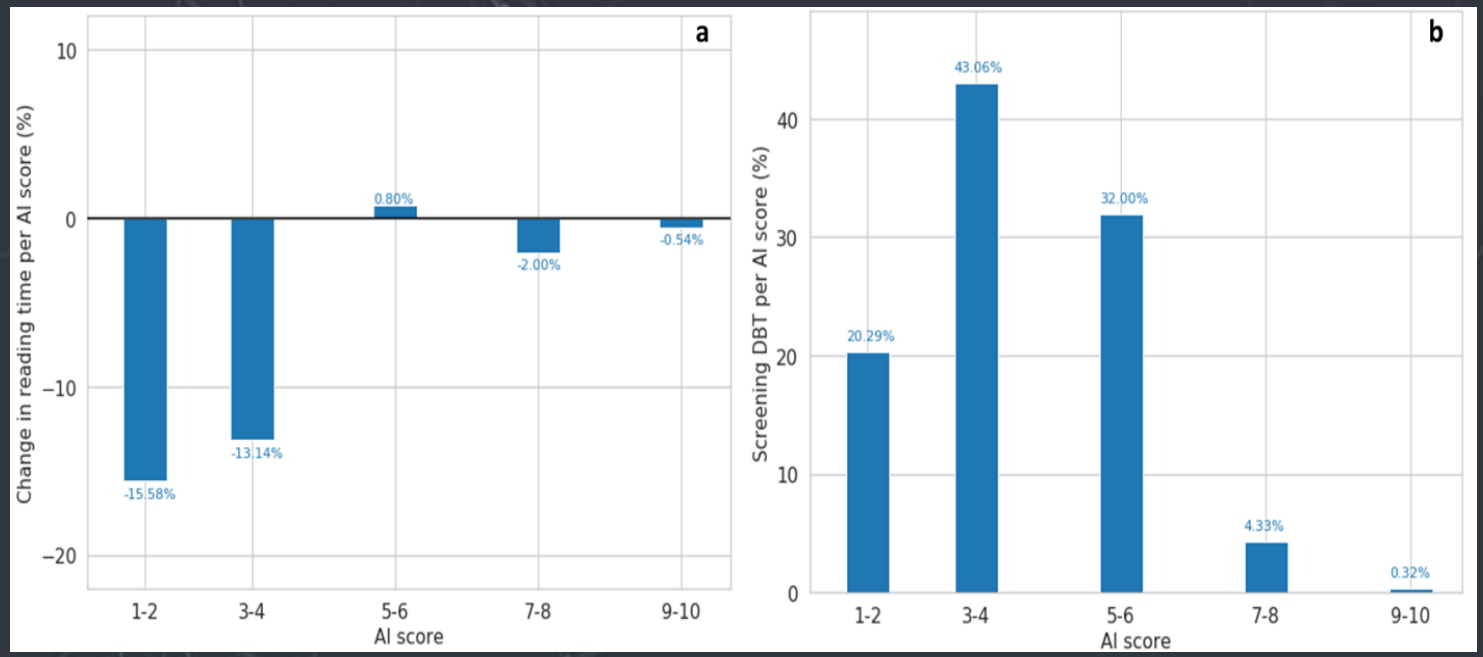
- **Average AUC**: **+4%** (CI: 1.9% to 5.7%, p < 0.001)
  - w/o AI = 0.79 (CI: 0.75 - 0.84)
  - with AI = 0.83 (CI: 0.79 - 0.87)
- **Sensitivity**: **+2%** (CI: -0.4% to 4.2%, p = 0.012)
  - w/o AI = 0.80
  - with AI = 0.82
- **Specificity**: **+5%** (CI: 1.5% to 8.7%, p = 0.007)
  - w/o AI = 0.56
  - with AI = 0.61



Results 2/2

- **Average reading time reduced**:
  - w/o AI = 74.7 s
  - with AI = 70.9 s

- On a simulated **screening distribution**:
  - **-8%** (CI: -13% to 3.1%)



a) Percentage change in reading time per AI score category.

b) Distribution of DBT examinations per AI score on a simulated screening population.

Conclusions

- Improved performance in breast cancer screening with DBT:
  - +2% sensitivity → Up to **6600 more cancers** found per year*
  - +5% specificity → **-3% recall rate****
- Reduced reading time per case on a screening population:
  → Up to **13% additional cases per batch**
- Future work: Evaluate the benefits of AI with DB **prospectively**

**based on data available from "American Cancer Society. Breast Cancer Facts & Figures 2019-2020. Atlanta: American Cancer Society, Inc. 2019."*
***based on prevalence used during MRMC study*