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AUGMENTED PATHOLOGY

Automated Ki67 hot-spot detection and analysis

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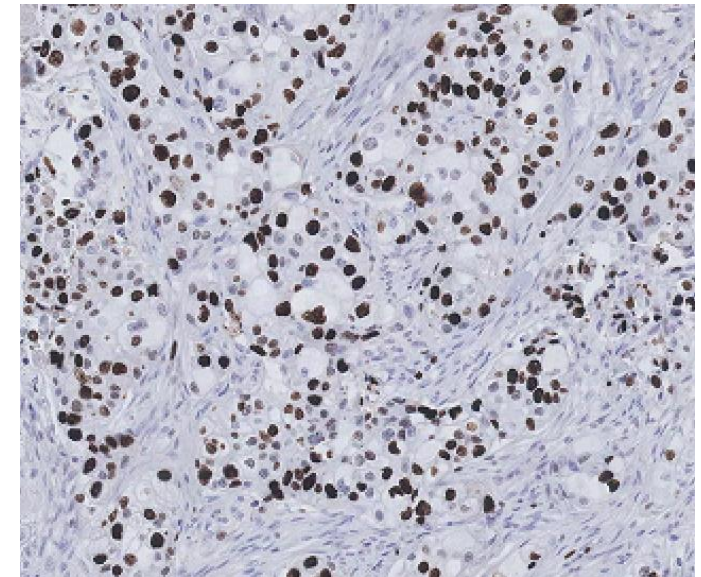
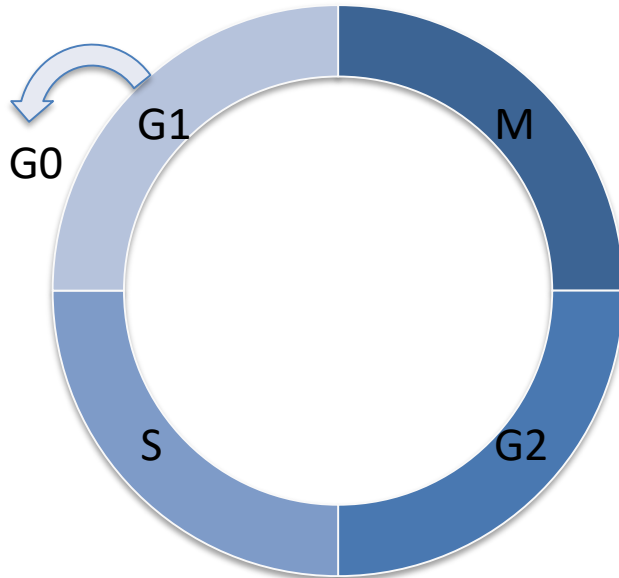
University of Groningen, University Medical Center Groningen

The Netherlands

Background

Ki67

- Nuclear protein
- Expressed during cell cycle
- Prognostic and predictive in breast cancer



Ki67 low

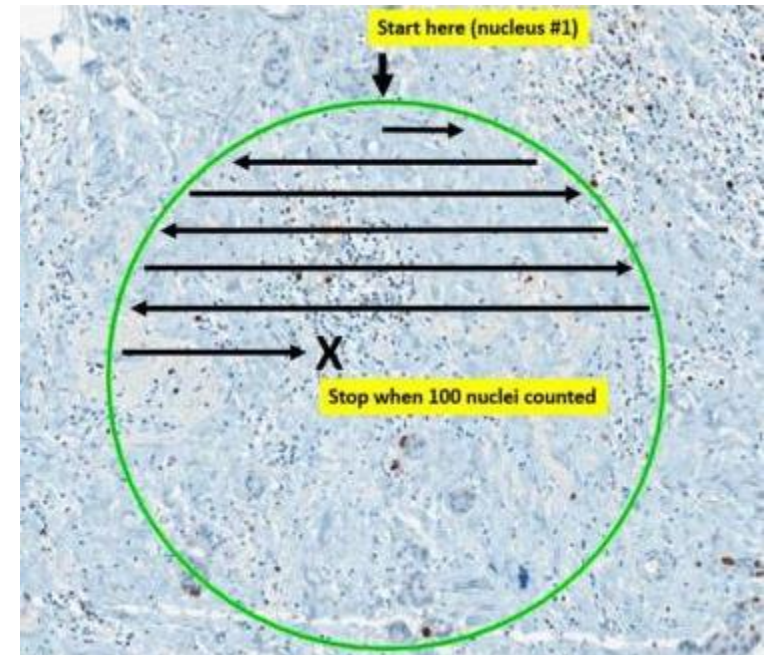


Ki67 high

Background

Standardised manual Ki67 hot-spot scoring

- Select one high-power field with highest staining rate
- Count up to 500 cells
- Type-writer pattern
- Median scoring time: 6 minutes (4-8)



Background

Hot-spot scoring

- Visual identification is difficult
- Labour-intensive
- Inter- and intra-observer variability
 - Inter-observer reproducibility/ICC of 0.8

Background & Objective

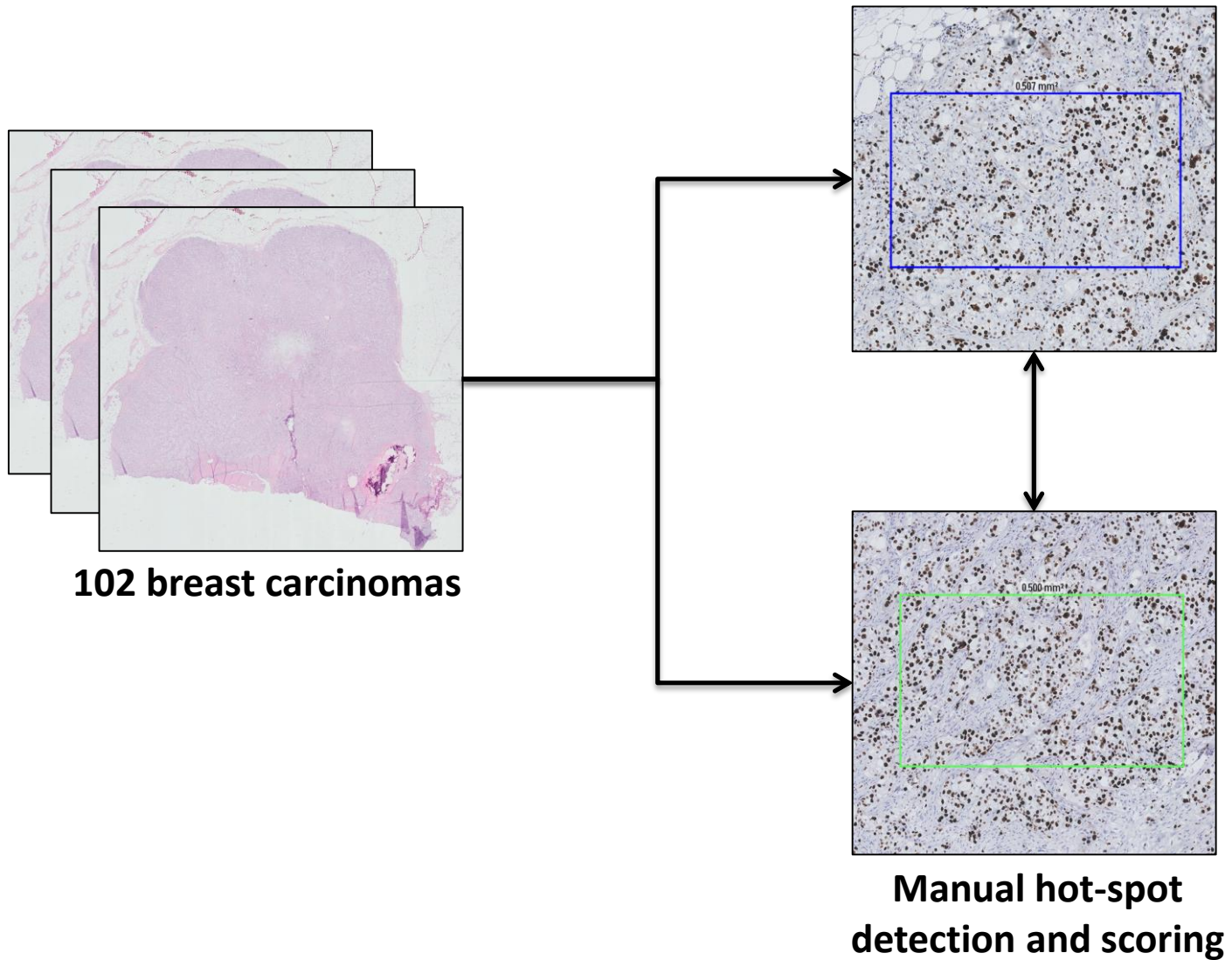
Digital image analysis

- Automated detection and scoring
- Standardised and reproducible

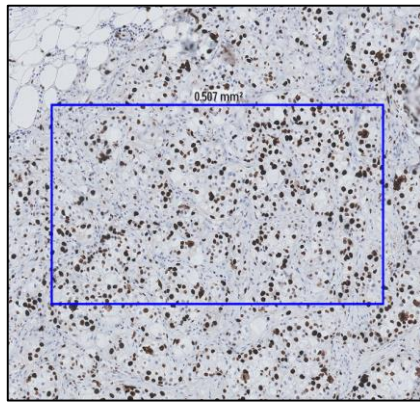
Objective

- Compare manual Ki67 hot-spot scoring and detection with digital image analysis (DIA)

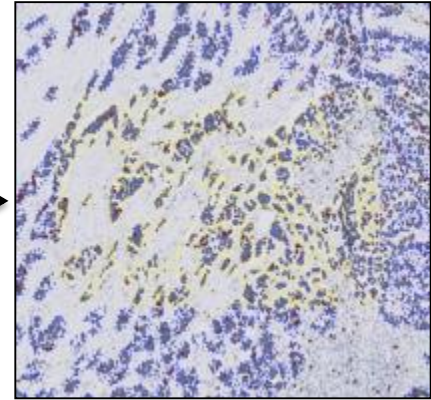
Methods



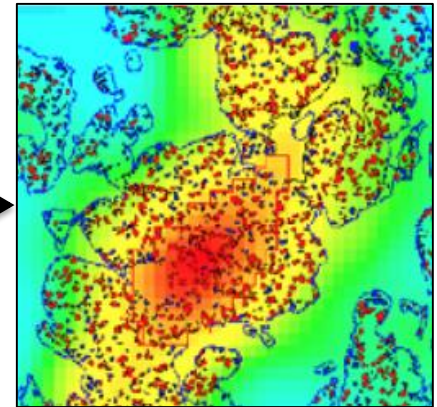
Methods



**Manual hot-spot
detection and scoring**



DIA manual hot-spot



**Automated hot-spot
detection and scoring**

Automated hot-spot selection and analysis

1. Tumor identification

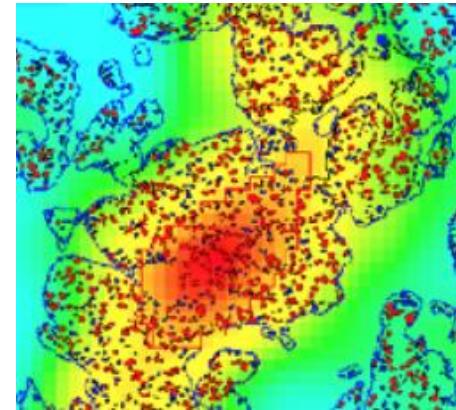
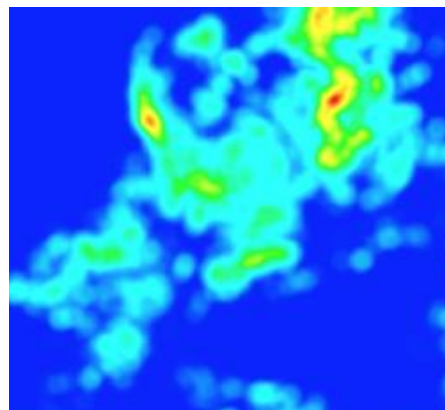
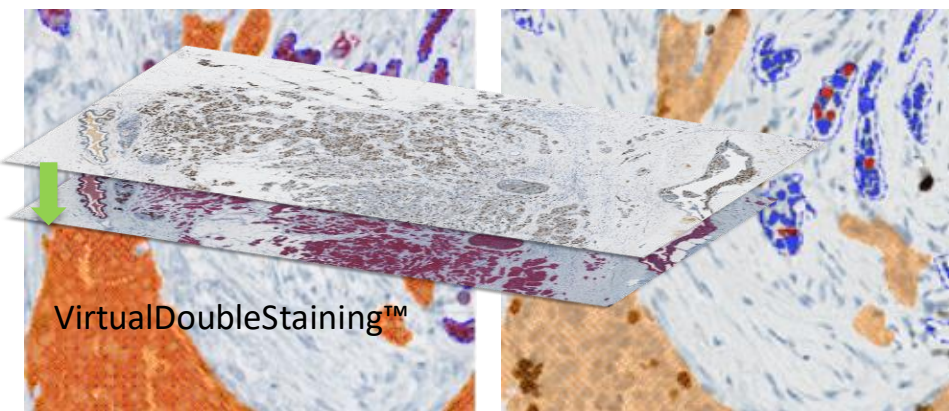
2. DCIS vs. invasive tumor discrimination

3. Ki67 quantification

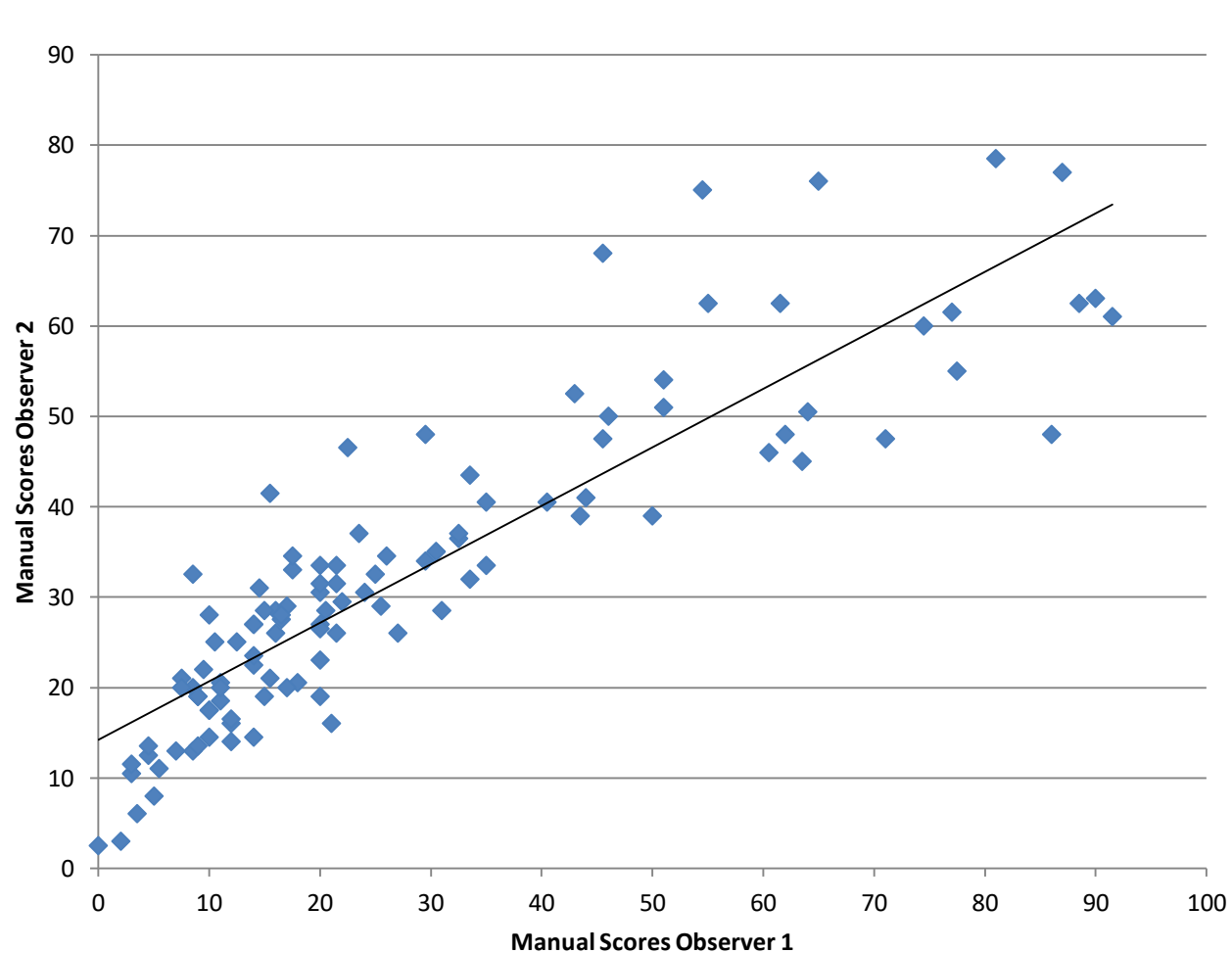
4. Heat map creation

5. Hot spot identification

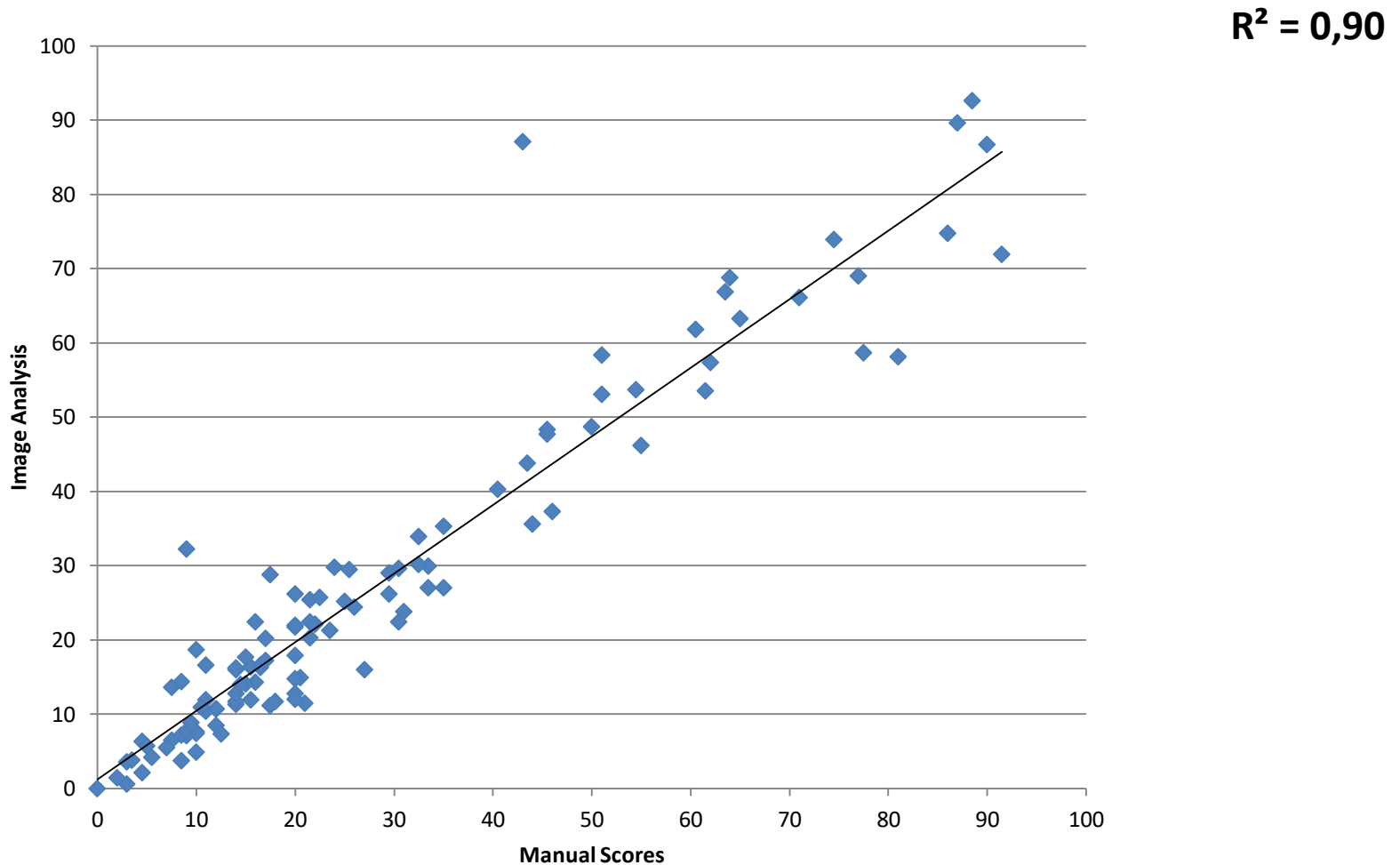
6. Ki67 quantification within hot spot



Manual Ki67 hot-spot correlation is suboptimal

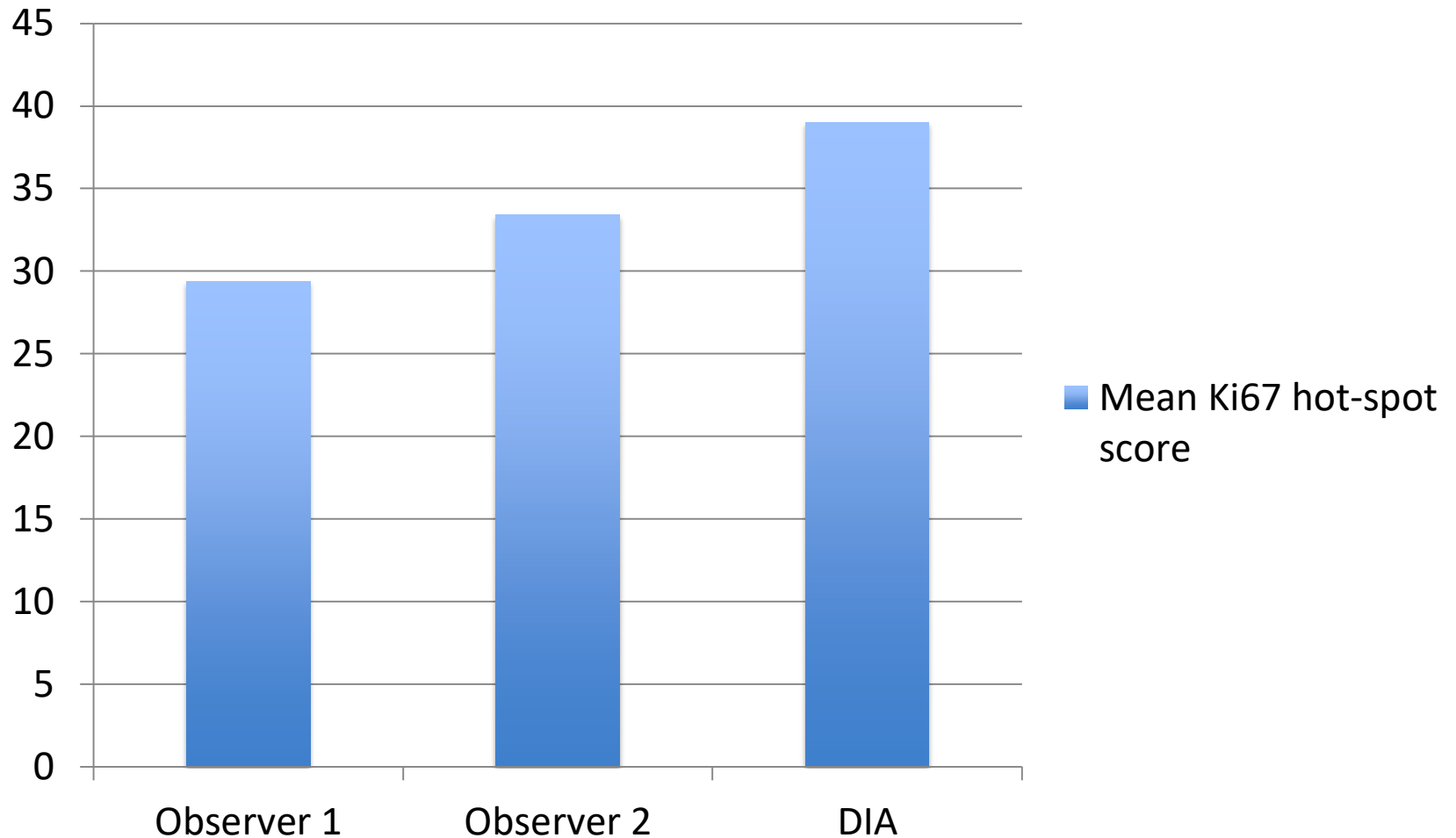


Manual and DIA scores of the manual ROIs strongly correlate



Automated Ki67 hot-spot analysis leads to higher proliferation indices

Mean Ki67 hot-spot score



Conclusion

Automated Ki67 hot-spot detection and analysis is a reliable method that leads to higher hot-spot Ki67 proliferation indices

Acknowledgments

UMCG/UG

- Dr. Bert van der Vegt
- Dr. Timco Koopman
- Henk Buikema



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Visiopharm

- Dr. Henrik Klingberg
- Dzenita Omanovic
- Dr. Andreas Schønau

