

An Automated Breast Cancer Grading Demonstrator - PathScore™

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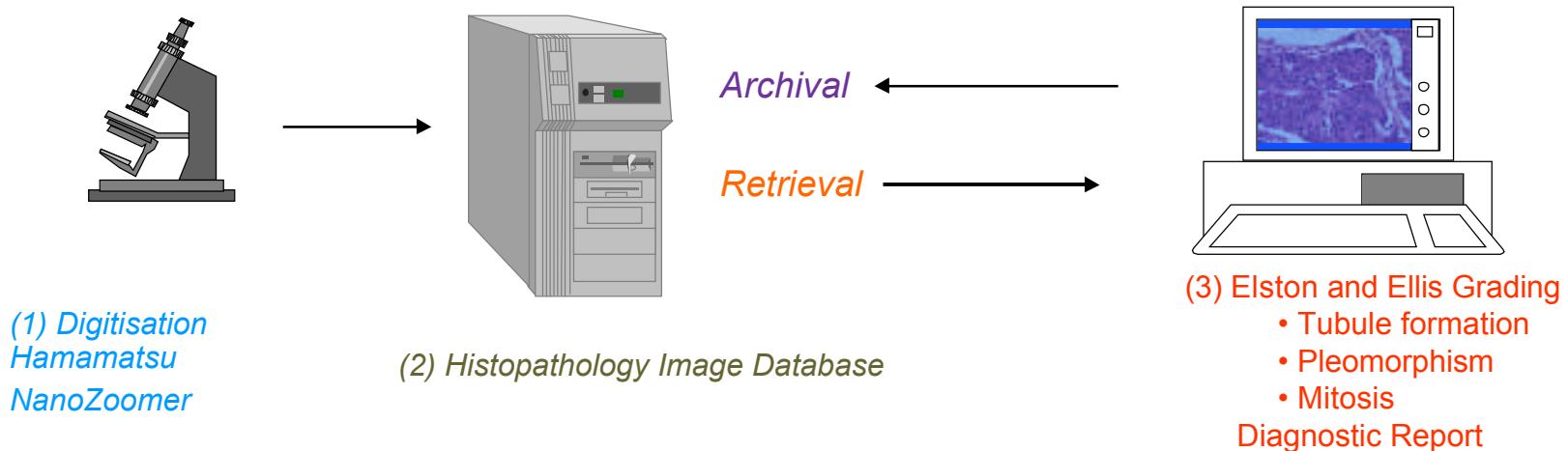
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Introduction

- Pathological analysis of tissue entails visual interpretation of complex microscopic images which is liable to :
 - Inter- and intra- observer variation
- NEQAS work has improved the concordance of grading from 0.3 (low concordance) kappa to 0.6 (medium concordance) however the performance still varies
- There is a need for a new approach

The PathScore™ Project

- Developed an automated computer analysis for grading breast cancer
 - (1) Whole slides are digitised by the Hamamatsu NanoZoomer scanner and stored in the PathScore database system
 - (2) Database system is designed to:
 - Manage multiple slides from same and different patients
 - Allow viewing of slides at different resolutions
 - (3) Automatic grading of the slide based on the Elston and Ellis grading system and generates a patient's diagnostic report



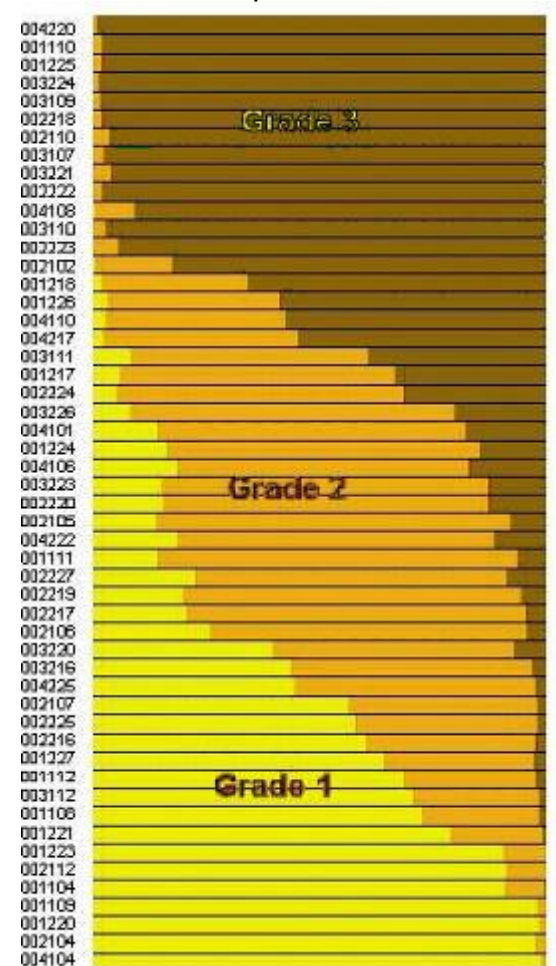
System Evaluation Data

- The evaluation dataset consisted of 47 case samples from the NEQAS assessed by 733 pathologists
- Slides are scanned at:
 - x40 resolution
 - Sub-sampled for x10 processing when required
 - Images are compressed, c.f. Raw

Ground Truth for Evaluation

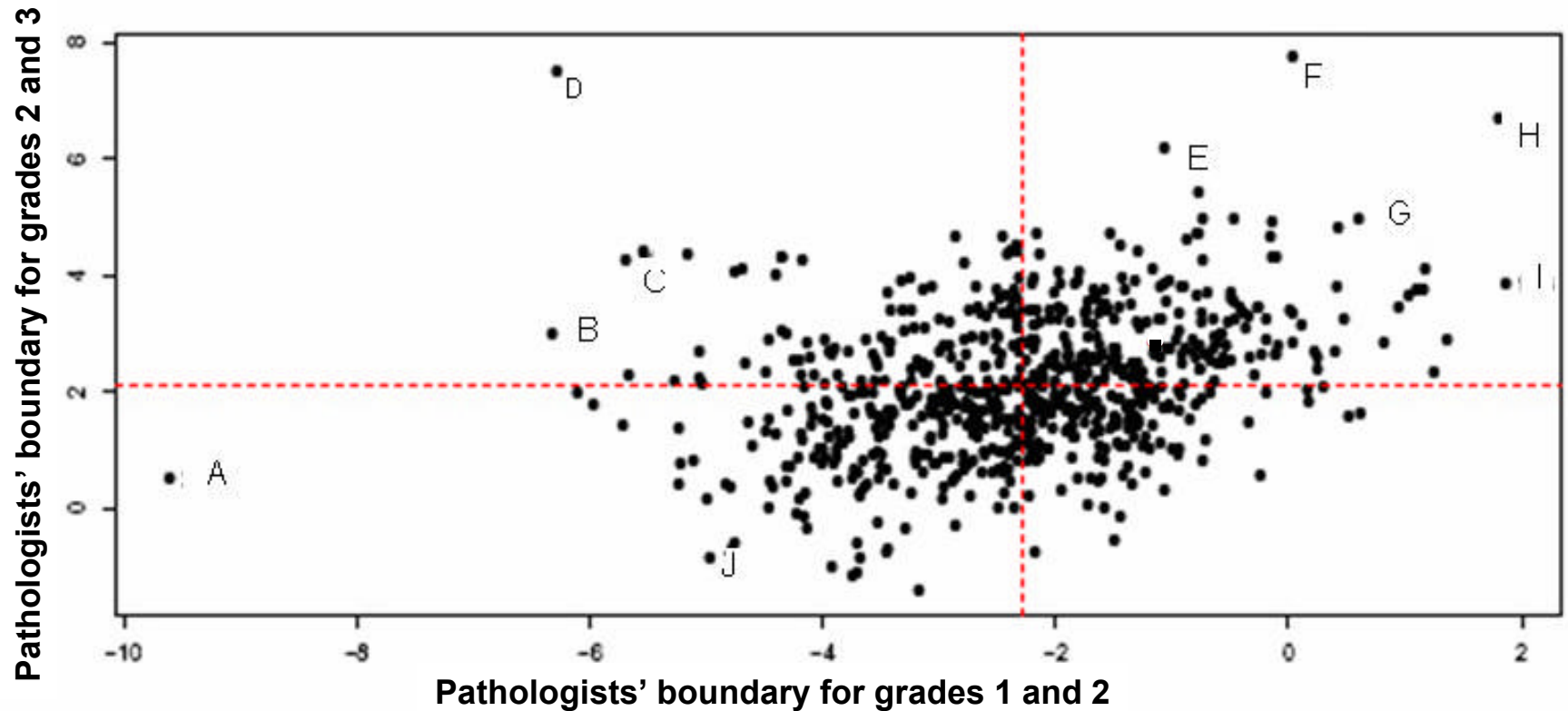
- The ground truth is based on the scores from 733 pathologists
- Evaluation was thus carried out against the majority view of all pathologists
- The grade allocated by pathologists was usually not unanimously agreed, the level of agreement varied

Pathologists' Agreement
Sample Number



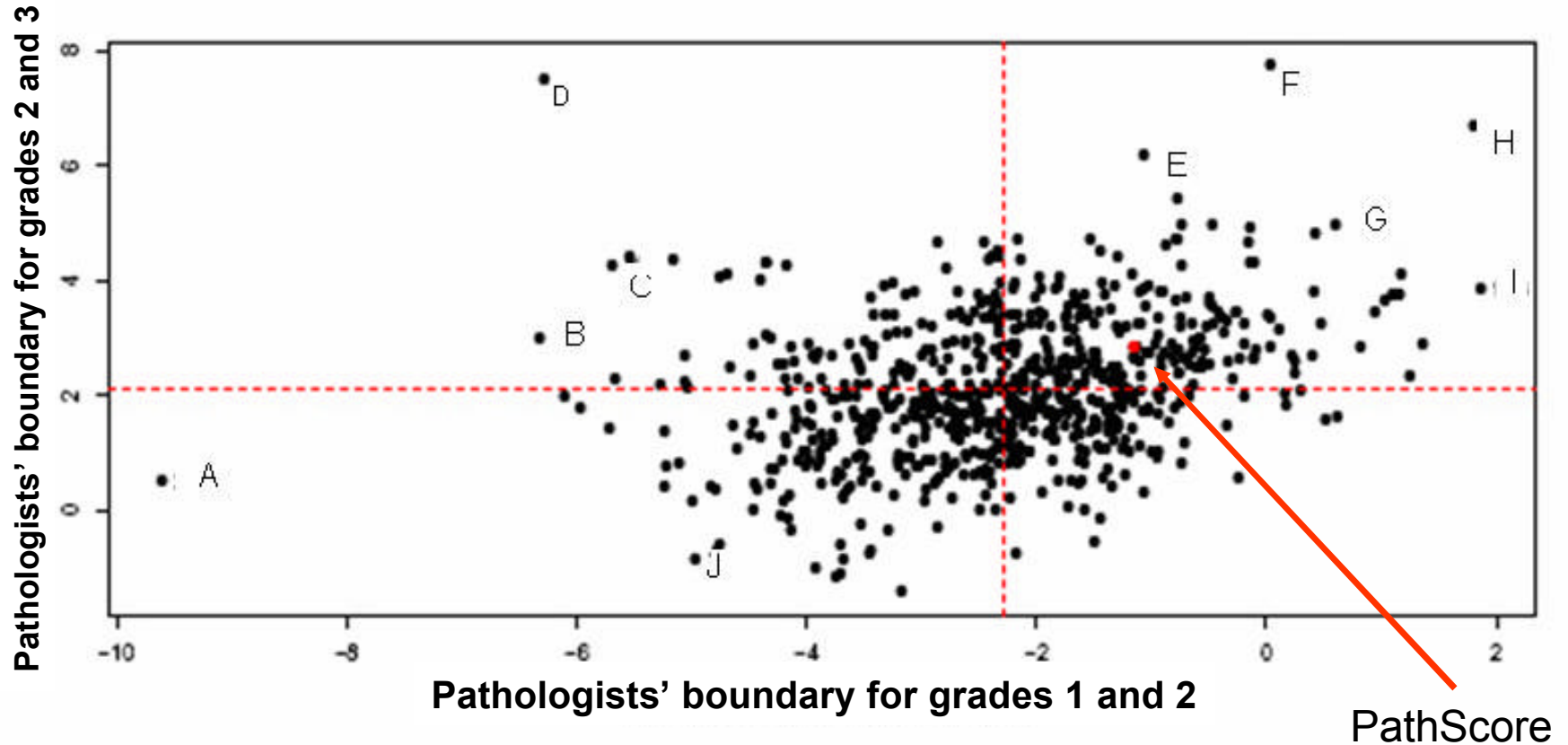
% Agreement

Graphical Representation of Pathologists' Grading



Location of the mean and outliers shown

PathScore and 733 Pathologists



Location of the mean and outliers shown

Conclusions

- PathScore has developed automated computer analysis for grading invasive breast cancer using the Elston and Ellis grading scheme
- PathScore provides the potential for enhanced objectivity and reproducibility offering a standardized reliable method for histological grading of breast cancer on routine clinical samples
- Evaluation showed the PathScore's performance was similar to that of human pathologists
- Overall grade agreement between the pathologists and PathScore was good, although there was some tendency for PathScore to overestimate the severity of Nuclear Pleomorphism
- The observed agreement (68.09%) is twice as high as could have been observed by chance
- The weighted kappa of 0.59 for the concordance of grading between PathScore and the pathologists is statistically very highly significant and there is no evidence of any significant disagreement over any category or its asymmetry
- By coincidence the level of agreement on the final grade amongst the pathologists yielded as identical kappa value (kappa = 0.59)