

# AI decision support for increasing prostate biopsy efficiency: a retrospective multicentre, multi-scanner study

## ELECTRONIC SUPPLEMENTARY MATERIAL

### Supplementary Methods

In this study, a total of 815 cases (with a 35% prevalence of csPCa) were used for development of the Pi v3.0 MRI-AI model. The development dataset consisted of 612 cases from five NHS hospitals in the PAIR-1 study and 203 cases from the public dataset PROSTATEx. The MRI-AI model and its development have been described previously [1]. In [1], the performance of the model for clinically significant prostate cancer detection was found to be statistically non-inferior to radiologists, with a 10% performance margin considered acceptable. The model attained an AUC of 0.91, compared to 0.95 for radiologists. At the predefined risk threshold of 3.5, the model achieved a sensitivity of 95% and a specificity of 67%. In comparison, radiologists using PI-RADS/Likert  $\geq 3$  identified Grade Group  $\geq 2$  cancers with a sensitivity of 99% and specificity of 73%.

### Supplementary references:

1. Giganti F, Moreira da Silva N, Yeung M, et al (2025) AI-powered prostate cancer detection: a multi-centre, multi-scanner validation study. Eur Radiol 1–10. <https://doi.org/10.1007/S00330-024-11323-0/FIGURES/3>

**Supplementary Table 1** - Number of patients and MR data for each centre.

Legend – MR: Magnetic Resonance; GEHC: GE HealthCare; T: Tesla. All cases used a PI-RADS compliant multiparametric MR protocol comprising at least axial T2 weighted imaging, diffusion-weighted imaging, and dynamic contrast enhanced imaging.

|               | Number of patients<br>(Validation set) | Number of patients<br>(AI-DSS Development set) | Prevalence of GG>2<br>(Validation set) | MR scanner vendor               | Field strength           |
|---------------|----------------------------------------|------------------------------------------------|----------------------------------------|---------------------------------|--------------------------|
| PAIR-1 Site 1 | 42                                     | 90                                             | 45%                                    | Siemens                         | 1.5                      |
| PAIR-1 Site 2 | 42                                     | 111                                            | 24%                                    | Siemens                         | 3T                       |
| PAIR-1 Site 3 | 42                                     | 86                                             | 26%                                    | Siemens                         | 3T                       |
| PAIR-1 Site 4 | 42                                     | 0                                              | 33%                                    | Siemens                         | 1.5T                     |
| PAIR-1 Site 5 | 42                                     | 128                                            | 33%                                    | GEHC                            | 3T                       |
| PAIR-1 Site 6 | 42                                     | 112                                            | 26%                                    | Siemens                         | 1.5T (n=30)<br>3T (n=12) |
| PRIME Site A  | N/A                                    | 14                                             | N/A                                    | Siemens                         | 3T                       |
| PRIME Site B  | N/A                                    | 28                                             | N/A                                    | Siemens                         | 3T                       |
| PRIME Site C  | N/A                                    | 22                                             | N/A                                    | Siemens                         | 3T                       |
| PRIME Site D  | N/A                                    | 5                                              | N/A                                    | Siemens                         | 3T                       |
| PRIME Site E  | N/A                                    | 26                                             | N/A                                    | GEHC                            | 3T                       |
| PRIME Site F  | N/A                                    | 9                                              | N/A                                    | Siemens                         | 3T                       |
| PRIME Site G  | N/A                                    | 11                                             | N/A                                    | Siemens                         | 3T                       |
| PRIME Site H  | N/A                                    | 8                                              | N/A                                    | Philips                         | 3T                       |
| PRIME Site I  | N/A                                    | 13                                             | N/A                                    | Siemens                         | 1.5T                     |
| PRIME Site J  | N/A                                    | 8                                              | N/A                                    | Siemens                         | 3T                       |
| PRIME Site K  | N/A                                    | 40                                             | N/A                                    | Siemens (n=7)<br>Philips (n=33) | 1.5T (n=7)<br>3T (n=33)  |
| PRIME Site L  | N/A                                    | 25                                             | N/A                                    | Siemens                         | 3T                       |
| PRIME Site M  | N/A                                    | 29                                             | N/A                                    | Siemens                         | 3T                       |
| PRIME Site N  | N/A                                    | 1                                              | N/A                                    | Siemens                         | 3T                       |
| PRIME Site O  | N/A                                    | 4                                              | N/A                                    | Philips                         | 3T                       |

**Supplementary Table 2** – Demographic characteristics for the validation set (N = 252).

| Validation set                               | csPCa                  | non-csPCa          |
|----------------------------------------------|------------------------|--------------------|
| Total (N)                                    | 79                     | 173                |
| Age mean $\pm$ std                           | 69.4 $\pm$ 7.8         | 65.8 $\pm$ 8.6     |
| PSA (ng/mL) median (IQR)                     | 10.2 (IQR: 6.3 - 14.5) | 5.9 (IQR: 4.1-8.8) |
| BPH (N)                                      | 1 <sup>*1</sup>        | 16 <sup>*2</sup>   |
| Prostatitis (N)                              | 0 <sup>*3</sup>        | 3 <sup>*4</sup>    |
| UTI (N)                                      | 2 <sup>*5</sup>        | 10 <sup>*6</sup>   |
| Family history<br>Genetic predisposition (N) | 11 <sup>*7</sup>       | 24 <sup>*8</sup>   |
| LUTS (N)                                     | 44 <sup>*9</sup>       | 91 <sup>*10</sup>  |
| Prostate Volume (mL) mean $\pm$ std          | 50.2 $\pm$ 26.9        | 71.5 $\pm$ 39.0    |
| PI-RADS (N)                                  |                        |                    |
| 1                                            | 0                      | 4                  |
| 2                                            | 1                      | 123                |
| 3                                            | 4                      | 23                 |
| 4                                            | 22                     | 17                 |
| 5                                            | 52                     | 6                  |
| Gleason Grade Group (N)                      |                        |                    |
| Benign                                       | 0                      | 41                 |
| No biopsy                                    | 0                      | 115                |
| 1                                            | 0                      | 17                 |
| 2                                            | 41                     | 0                  |
| 3                                            | 18                     | 0                  |
| 4                                            | 5                      | 0                  |
| 5                                            | 15                     | 0                  |

Missing data: <sup>\*1</sup> - 26 patients without BPH information, <sup>\*2</sup> - 57 patients without BPH information, <sup>\*3</sup> - 26 patients without Prostatitis information, <sup>\*4</sup> - 62 patients without Prostatitis information, <sup>\*5</sup> - 26 patients without UTI information, <sup>\*6</sup> - 62 patients without UTI information, <sup>\*7</sup> - 21 patients without FH/GP information, <sup>\*8</sup> - 55 patients without FH/GP information, <sup>\*9</sup> - 15 patients without LUTS information, <sup>\*10</sup> - 50 patients without LUTS information

**Supplementary Table 3** – Demographic characteristics per site for the validation set (N = 252).

| Demographics                    |           | Validation            |                      |                      |                       |                      |                       |
|---------------------------------|-----------|-----------------------|----------------------|----------------------|-----------------------|----------------------|-----------------------|
|                                 |           | Site 1                | Site 2               | Site 3               | Site 4                | Site 5               | Site 6                |
| Age mean ± std                  |           | 70.6±7.1              | 66.2±9.3             | 63.0±5.9             | 70.3±7.3              | 65.8±9.7             | 65.8±9.2              |
| Prostate Volume (mL) mean ± std |           | 72.0±36.7             | 59.1±40.6            | 59.2±20.6            | 73.9±42.3             | 65.4±38.4            | 59.3±38.5             |
| PSA level (ng/mL) median (IQR)  |           | 9.0 (IQR: 5.7 – 13.5) | 6.0 (IQR: 2.9 – 8.4) | 5.5 (IQR: 4.1 – 7.1) | 9.4 (IQR: 6.4 – 15.1) | 6.3 (IQR: 4.6 – 9.4) | 6.6 (IQR: 4.4 – 10.0) |
| PI-RADS (N)                     | 1         | 0                     | 0                    | 0                    | 0                     | 0                    | 4                     |
|                                 | 2         | 21                    | 22                   | 21                   | 21                    | 20                   | 19                    |
|                                 | 3         | 2                     | 5                    | 11                   | 1                     | 3                    | 5                     |
|                                 | 4         | 4                     | 3                    | 6                    | 11                    | 7                    | 8                     |
|                                 | 5         | 15                    | 12                   | 4                    | 9                     | 12                   | 6                     |
| Gleason Grade Group (N)         | Benign    | 1                     | 7                    | 13                   | 4                     | 9                    | 7                     |
|                                 | No biopsy | 21                    | 18                   | 17                   | 19                    | 18                   | 22                    |
|                                 | 1         | 1                     | 7                    | 1                    | 5                     | 1                    | 2                     |
|                                 | 2         | 8                     | 2                    | 7                    | 8                     | 9                    | 7                     |
|                                 | 3         | 6                     | 3                    | 2                    | 3                     | 3                    | 1                     |
|                                 | 4         | 1                     | 0                    | 2                    | 1                     | 0                    | 1                     |
|                                 | 5         | 4                     | 5                    | 0                    | 2                     | 2                    | 2                     |

**Supplementary references:**

1. Giganti F, Moreira da Silva N, Yeung M, et al (2025) AI-powered prostate cancer detection: a multi-centre, multi-scanner validation study. *Eur Radiol* 1–10. <https://doi.org/10.1007/S00330-024-11323-0/FIGURES/3>