**Supplementary Table S1.** Detailed Preprocessing and Model Parameters

| Section | Parameter | Details |
|---|---|---|
| Preprocessing | N4 Bias Correction | Threshold: 0.001, Spline Distance: 150 mm |
| | Laplacian of Gaussian (LoG) Filter | Sigma: 0.5-5.0, Step: 0.5 |
| | Wavelet Decomposition | 8-level, Haar wavelet |
| | Motion Correction | FSL (v6.0) |
| | Intensity Normalisation | Nyul's method, Python (v3.9) |
| | Resampling | Isotropic 1 $mm^3$, Spline interpolation, 3D Slicer (v5.6.2) |
| | Voxel Intensity Discretisation | Fixed bin width: 25 |
| | Z-score Standardisation | Applied to normalise data distribution |
| | DWI Eddy Correction | FSL eddy tool |
| | SWI Phase Filtering | Philips proprietary algorithm |
| XGBoost Grid Search | Learning Rate | Searched: 0.01, 0.05, 0.1, 0.3; Optimal: 0.1 |
| | Max Depth | Searched: 3, 5, 7, 10; Optimal: 5 |
| | N_estimators | Searched: 100, 200, 300, 500; Optimal: 300 |
| CLAIM Checklist | Availability | Available upon request |

**Supplementary Table S2.** Lasso Feature Reduction Results

| Feature Set | Number of Features | AUC-ROC (95% CI) | Notes |
|---|---|---|---|
| Original Features | 127 | 0.87 (0.82-0.92) | Selected via RFECV |
| Reduced Features | 52 | 0.86 (0.81-0.91) | Via L1 regularisation, λ=0.01 |


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