

PURPOSE

MSxplain web application facilitates access to **AI-driven neuroimaging** tools for researchers and clinicians. The platform provides automatic segmentation and quantification of white matter lesions (WMLs) in MRI for multiple sclerosis (MS).

MATERIALS & METHODS

Input: T1 (MPRAGE) and FLAIR MRI sequences.

Processing: Integrates dcm2niix, FSL, ANTs, HD-BET for robust preprocessing.

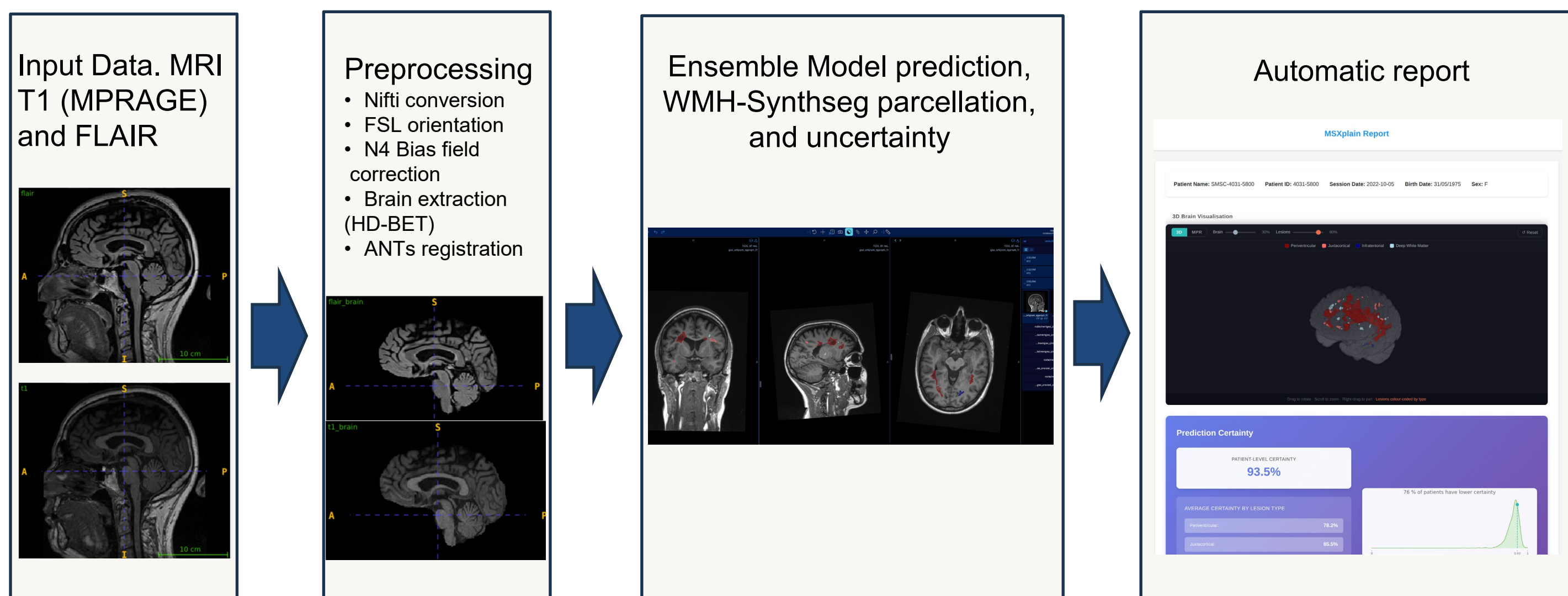


Fig.1: The MSxplain pipeline: from input MRI scans to automated MS segmentations and reporting, including preprocessing, AI analysis, and parcellation.

AI Core: The MSxplain AI model (Swin-UNETR ensemble) automatically detects and segments WMLs [1] performs anatomical localization using WMH-SynthSeg according to the **McDonald criteria** and computes uncertainty at both lesion and patient level [2].

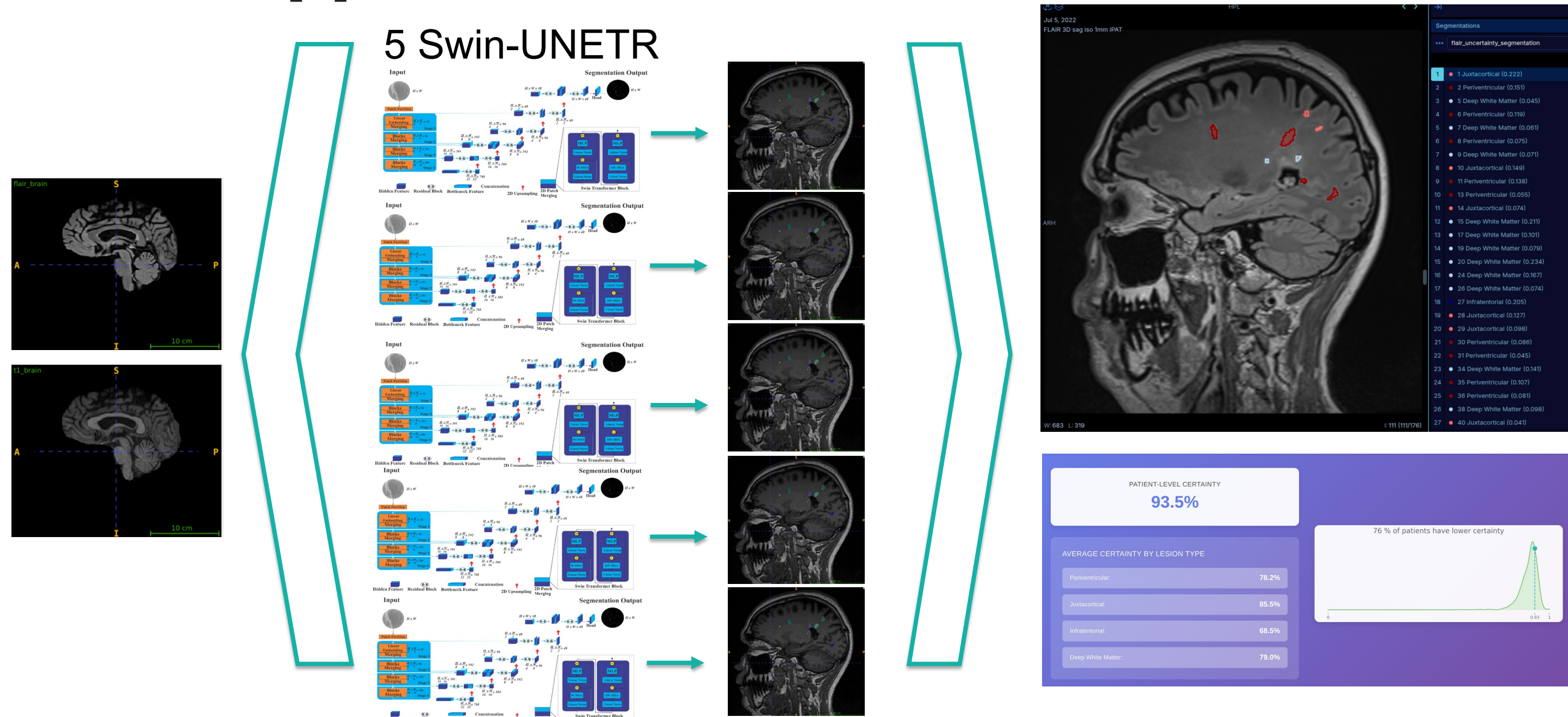


Fig.2: An ensemble of models utilizing a Swin-UNETR backbone to predict the average segmentation and compute lesion detection uncertainty.

DATASET (SMSC)

Trained and validated on the Swiss MS Cohort (SMSC):

	Training set	Validation set	Test set
N° patients (n° visits)	969 (3375)	138 (522)	278 (1015)
Median lesion load per patient (mm3)	4440 (Q1: 1518.5, Q3: 12665)	3810 (Q1: 1454.25, Q3: 12111.5)	4574 (Q1: 1551, Q3: 13178.5)
Interquartile Range (IQR)	11166.5	10657.25	11627.5
Dice score test set: 0.799 ± 0.115 validation set: 0.7835 ± 0.112			

Tab.1: Dataset training, validation, and test sets, including the average lesion load per patient and the Dice score obtained on the test set.

THE PLATFORM

Secure and easy deployment using **Docker**.

- **Frontend:** React.js + OHIF Medical Viewer
- **Backend:** Python inference + FastAPI
- **DICOM PACS Server:** Orthanc integration

MSxplain Report

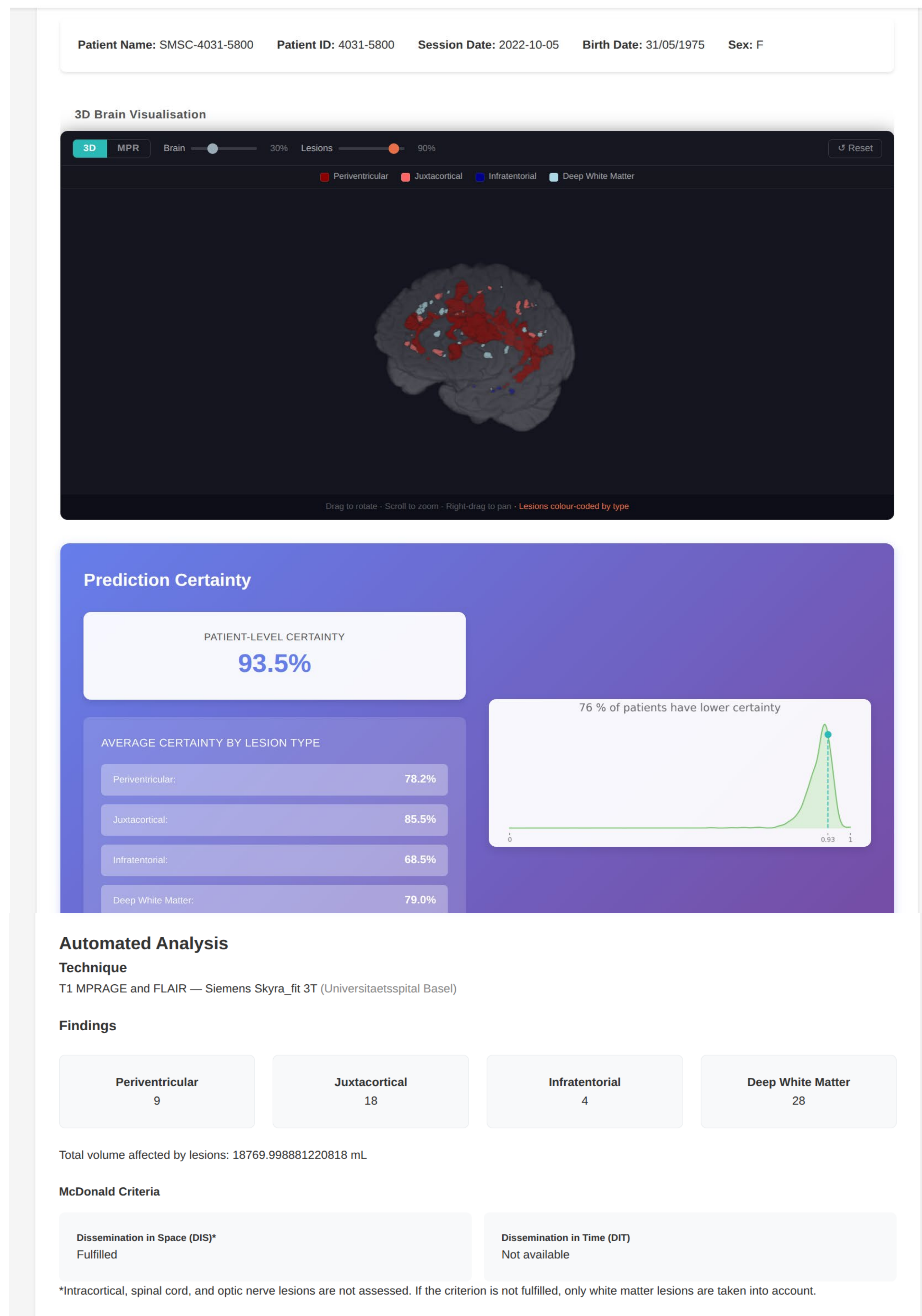


Fig.3: Main view of MSxplain Web displaying the automatic report including automatic WMLs detection and segmentation with AI model uncertainty assessment.

KEY RESULTS

Automated Reporting: Detects, counts, and localizes MS lesions and their volumes in juxtacortical, periventricular, and infratentorial regions.

CONCLUSION

MSxplain Web provides a **no-code framework** for MS WML detection, bridging the gap between advanced AI and radiological workflows. It also computes model uncertainty to support clinical confidence.

[1] Spagnolo, F., Molchanova, N., Cuadra, M. B., Ocampo-Pineda, M., Melie-Garcia, L., Granziera, C., ... & Depeursinge, A. (2026). Instance-level quantitative saliency in multiple sclerosis lesion segmentation: F. Spagnolo et al. Scientific Reports.

[2] Molchanova, N., Raina, V., Malinin, A., La Rosa, F., Depeursinge, A., Gales, M., ... & Cuadra, M. B. (2025). Structural-based uncertainty in deep learning across anatomical scales: Analysis in white matter lesion segmentation. *Computers in biology and medicine*, 184, 109336.

