

MSXplain Web – A Platform for AI-based Multiple Sclerosis Lesion Segmentation, Localization, and Reporting in MRI

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Purpose

In the project MSXplain funded by the Hasler Foundation, we developed a web platform to facilitate the use of AI in neuroimaging by providing researchers and clinicians access to automatic segmentation and quantification of multiple sclerosis (MS) white matter lesions (WMLs). It includes a fully automated AI pipeline for processing MRI data from MS patients, offering WML segmentation and anatomical localization, automated reporting, as well as a DICOM viewer, all containerized using Docker for local secure deployment.

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Materials and Methods

MSXplain integrates established preprocessing neuroimaging tools (FSL, ANTs, HD-BET models, Elastix) to automatically detect and segment WMLs. The input consists of MPRAGE and FLAIR MRI sequences. The model was trained on data from 479 patients (3001 studies), validated on 120 patients (695 studies), and tested on 200 patients (1208 studies). WMLs are automatically localized based on the overlap between the dilated anatomical regions obtained with SAMSEG and the U-Net lesion mask. The model’s outputs are exported to an ORTHANC DICOM server and visualized in the OHIF viewer.

Results

The U-Net for WMLs segmentation achieves a Dice score of 0.665 ± 0.156 and a normalized Dice score of 0.790 ± 0.099 in the test set. The automated report informs on the load of WMLs and their anatomical distribution as juxtacortical, periventricular, infratentorial, and deep white matter. MSXplain Web allows users to run the entire pipeline without coding or installing advanced AI tools.

Conclusion

MSXplain Web provides a fully automated framework for MS lesion detection, anatomical mapping, and DICOM-based visualization, facilitating clinical interpretation and integration of AI-generated results into radiological workflows. Future versions will incorporate explainability methods tailored to MS, which are often lacking in AI-based solutions for MS lesion management.