White matter hyperintensities (WMHs) are foci of abnormal signal intensity in white matter regions seen with magnetic resonance imaging (MRI). WMHs are associated with normal aging and have shown prognostic value in neurological conditions such as traumatic brain injury (TBI). The impracticality of manually quantifying these lesions limits their clinical utility and motivates the utilization of machine learning techniques for automated segmentation workflows. Herein, we develop a concatenated random forest framework with tailored features for segmenting WMHs in a TBI cohort. The framework is provided publicly through the Advanced Normalization Tools (ANTs)[[1]](#footnote-1) and ANTsR toolkits. MR (3D FLAIR, T2-, and T1-weighted) images from 24 service members and veterans scanned in the Chronic Effects of Neurotrauma Consortium’s (CENC) observational study were acquired. Manual annotations were employed for both training and evaluation using a leave-one-out strategy. Lesion load and overlap evaluative comparisons are complimented by feature rankings which showcase the utility of the concatenated approach. Our findings suggest supervised learning methods may be applied to quantify WMHs on routine brain imaging. Paired with correlative outcome data, supervised learning methods may allow for identification of imaging features predictive of diagnosis and prognosis in individual TBI patients.

1. <https://github.com/stnava/ANTs> [↑](#footnote-ref-1)