LIME-Powered Interpretation of YOLOv8 Tumor Detection

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Abstract. *Early detection of brain tumors in MRI scans is essential for improving clinical outcomes. YOLOv8, a real-time object detection model, provides excellent performance but lacks interpretability. This study integrates Local Interpretable Model-agnostic Explanations (LIME) to explain model predictions and enhance trust in AI-assisted diagnostics. The results demonstrate that YOLOv8, combined with LIME, enables precise detection with meaningful explanations, thereby supporting transparency in healthcare AI. An explainable deep learning approach for brain tumor detection in MRI scans using YOLOv8 and LIME is explored in this study.*

YOLOv8s achieved the best results: precision = 0.947, recall = 0.912, mAP@0.5 = 0.955, mAP@0.5–0.95 = 0.713. To improve interpretability, we applied LIME to visualize superpixels most responsible for predictions. LIME perturbed inputs and used a local linear model to assign importance scores. The most influential regions corresponded to tumor locations.

Interpretation metrics confirmed the explanations were meaningful: Stability = 0.0302, Sparsity = 0.6442, MaxWeight = 0.2840, Entropy = 5.15.

Keywords. brain tumor detection, MRI, YOLOv8, LIME, explainable AI, deep learning, medical imaging, interpretability, object detection, XAI

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