

ICE 2025

INTERNATIONAL CONFERENCE OF INNOVATIVE COMPUTER ENGINEERING

International Conference of Innovative Computer Engineering (ICE 2025)

PROCEEDINGS E-BOOK

6 November 2025 Ankara

ATTENTION-ENHANCED CNN WITH GRAD-CAM FOR EXPLAINABLE BRAIN TUMOR CLASSIFICATION

Maral A. Mustafa
Northern Technical University
maralanwer@ntu.edu.iq

O. Ayhan Erdem
Gazi University
ayerdem@gazi.edu.tr

Esra Söğüt
Gazi University
esrasogut@gazi.edu.tr

Abstract
Aim: To analyze the clinical interpretability of deep learning models for classifying brain tumors on MRI.

Methods: We compared a baseline Convolutional Neural Network (CNN), an attention-enhanced CNN, and transfer-learning back-bones (MobileNetV2, InceptionV3, Xception) on a four-class MRI dataset (glioma, meningioma, pituitary, no tumor). Models were trained with Adam and evaluated using Grad-CAM visualizations, F1-score, accuracy, precision, recall, and confusion matrices.

Results: MobileNetV2 achieved the highest accuracy (95.7%), with closely aligned precision, recall, and F1-score. The attention-augmented CNN performed competitively, and Grad-CAM highlighted tumor-relevant regions, supporting model reliability.

Conclusion: Transfer learning, especially MobileNetV2, offers strong performance for MRI tumor classification, while attention mechanisms and Grad-CAM improve focus and interpretability, facilitating clinical adoption.

Keywords: brain tumor, MRI, deep learning, transfer learning, explainable AI