

# Abstract

Brain tumors are a serious condition that has resulted in thousands of deaths each year worldwide, characterized by the unnatural and uncontrolled growth of abnormal cells in or around the brain. Transfer learning methods have gained attention for brain tumor detection due to their ability to train on limited datasets. Magnetic Resonance Imaging (MRI) is essential in this detection process due to its superior image quality. Accurate analysis and automatic detection of brain tumors with limited data can significantly impact the global mortality rate. Therefore, the selection of an appropriate transfer learning model is very important. On the other hand, prototyping of brain tumor detection is still rare. To overcome this problem, this final project aims to design and evaluate the performance of three transfer learning models (InceptionResNetV2, Xception, and MobileNetV2) to detect four types of brain tumors: meningioma, glioma, pituitary, and notumor (healthy brain). In addition, this final project also analyzes the performance of the proposed prototype. The methods used in this final project are 1. Literature study Designing a transfer learning model for brain tumor detection, 3. prototyping based on the best-designed model, 4. Performance testing and analysis. The results showed that InceptionResNetV2 achieved the highest performance compared to other models by achieving accuracy 99.64%, precision 99.64%, precision 99.64%, sensitivity 99.62%, specificity 100%, and f1-score 99.63%. Prototype performance testing using the InceptionResNetV2 model achieved accuracy 98.46%, precision 98.46%, sensitivity 98.46%, specificity 98.67%, and f1-score 98.46%. This final project concludes that selecting the right transfer learning model can improve the accuracy of brain tumor detection, and the proposed prototype shows promising performance. Thus, the model and prototype generated from this study have the potential to assist clinical practitioners and radiologists in diagnosing, quantifying, and monitoring brain tumor cases.

**Keywords:** brain tumor, magnetic resonance imaging, transfer learning, InceptionResNetV2, Xception, MobileNetV2, prototype.