BIRUNI UNIVERSITY
"Future of Science"

Faculty of Engineering
M.Sc Computer Engineering

Course
Applied Artificial Neural Networks

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Title

Brain Tumor Detection Using Convolutional Neural Networks (CNN)

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1. Introduction

Brain tumors are abnormal growths of cells in the brain that can be life-threatening if not detected early. Medical imaging techniques such as MRI (Magnetic Resonance Imaging) are commonly used to diagnose brain tumors.

Artificial Intelligence, especially Deep Learning, has shown great potential in assisting doctors by automatically analyzing medical images and providing fast and accurate predictions.

The objective of this project is to build a deep learning model that can classify MRI images into two categories:

- Tumor
- No Tumor

2. Dataset

The dataset used in this project was collected from Kaggle and contains MRI brain images divided into two classes:

- Yes → Images with brain tumor
- No → Images without brain tumor

The dataset was split into:

- 80% for training
- 20% for validation

All images were resized to 150 × 150 pixels before training.

3. Methodology

A Convolutional Neural Network (CNN) was built using TensorFlow and Keras.

The model architecture consists of:

- Input layer (150×150×3)
- Rescaling layer (normalization)
- Three Conv2D layers with ReLU activation
- MaxPooling layers
- Flatten layer
- Dense layer (128 neurons)
- Dropout layer (to reduce overfitting)
- Output layer with Sigmoid activation

The model was compiled using:

- Optimizer: Adam
- Loss Function: Binary Crossentropy
- Metric: Accuracy

The model was trained for 10 epochs.

4. Results

After training, the model achieved:

- Training Accuracy ≈ 99%
- Validation Accuracy ≈ 98–100%

The loss values decreased steadily, indicating that the model learned effectively and generalized well to unseen data.

5. Application Development

A simple web application was developed using Streamlit.

The application allows the user to:

- Upload an MRI image
- Display the image
- Predict whether a tumor is detected
- Show prediction confidence percentage

This makes the system interactive and practical for real-world use.

Uploaded Image

Prediction Result:

Raw prediction value: `0.5639`

🧠 Tumor Detected

Confidence: 56.39%

6. Conclusion

This project demonstrates how Convolutional Neural Networks can be applied to medical image classification.

The model achieved high accuracy and successfully detected brain tumors from MRI images.

In the future, the system could be improved by:

- Using larger and more diverse datasets
- Applying transfer learning
- Deploying the application online for real clinical usage