**README for Brain Tumor Classification Project**

***Project Overview***

This project, implemented in Python with TensorFlow, is a comprehensive demonstration of building a Convolutional Neural Network (CNN) for classifying MRI images of brain tumors into four categories:

* Glioma
* Meningioma
* No Tumor
* Pituitary Tumor

The dataset used for this project is publicly available on Kaggle, a leading platform for data science competitions and projects. The CNN model has been designed and trained from scratch to handle the complexity of medical imaging tasks. Through data augmentation, regularization, and evaluation metrics, this project showcases a robust pipeline for tackling real-world deep learning challenges.

***Key Features***

Integration with Kaggle: The dataset was sourced from Kaggle, making this project easily reproducible for other Kaggle users.

Custom CNN Architecture: A deep learning model specifically tailored for multi-class classification using TensorFlow.

Comprehensive Evaluation: Metrics such as precision, recall, F1-score, and confusion matrix provide detailed insights into model performance.

Data Augmentation: Applied techniques such as flipping, zooming, and rotation to increase dataset variability and improve generalization.

***TensorFlow Integration***

TensorFlow was the primary framework used for building, training, and evaluating the model. Its capabilities, including GPU acceleration and robust APIs, made it the ideal choice for this project.

Performance: TensorFlow’s support for parallelism (especially on GPUs) accelerates deep learning workloads.

Flexibility: Provides both high-level APIs like Keras and low-level control over neural network layers.

Ecosystem: TensorFlow includes tools for data processing, visualization (TensorBoard), and deployment.

GPU Utilization:

TensorFlow detects and uses GPUs automatically if available. For local execution:

Kaggle provides a community-driven platform with rich datasets and powerful resources like GPUs, making it perfect for experimentation and collaboration.

TensorFlow, backed by Google, is a production-grade library that balances ease of use with performance. Its versatility makes it suitable for everything from research to deployment.





