



AI Tool - Brain Tumor Classification

using CNN & Transfer Learning



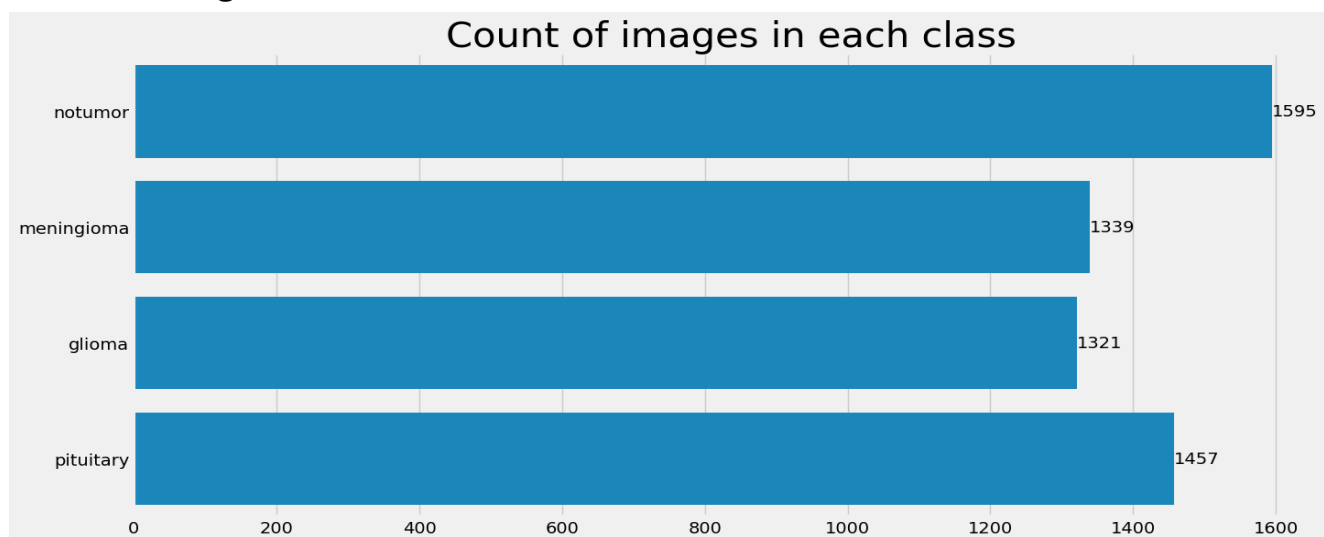
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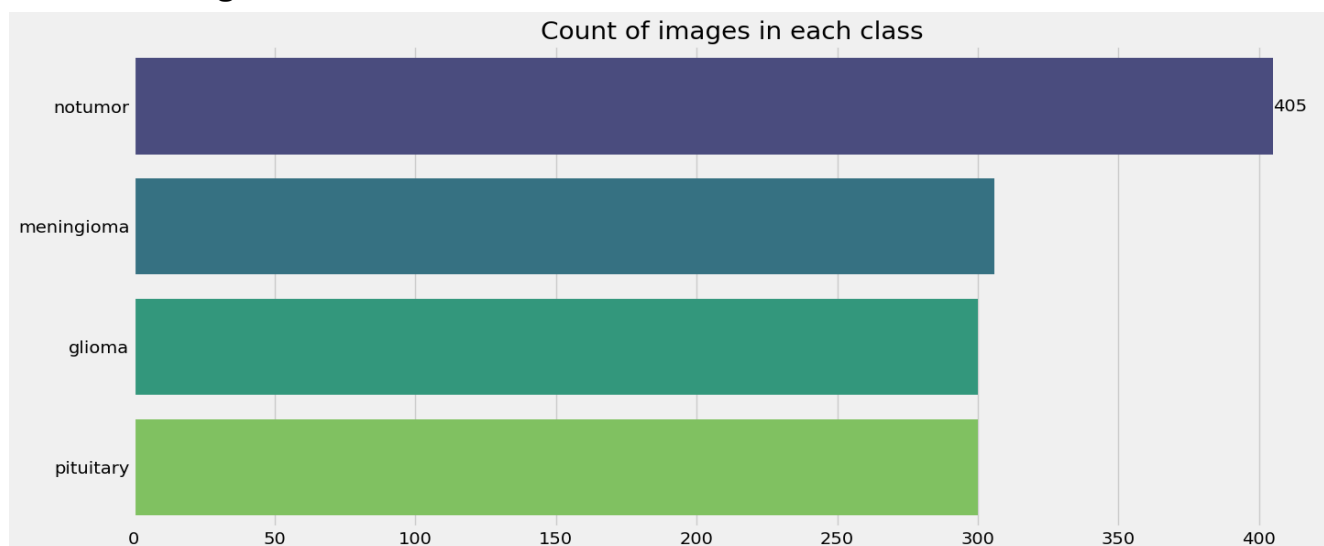
1. Dataset Selection

- **Dataset Name:** Brain Tumor MRI Dataset
- **Source:** [Kaggle / <https://www.kaggle.com/datasets/masoudnickparvar/brain-tumor-mri-dataset>]
- **Classes:**
 - Glioma Tumor
 - Meningioma Tumor
 - Pituitary Tumor
 - No Tumor

Count of images in each class in **train data**



Count of images in each class in **test data**



2. Tools and Technologies Used

- **Programming Language:** Python
 - **Libraries:**
 - **TensorFlow, Keras:** for deep learning model building and training
 - **NumPy, Pandas:** for data manipulation
 - **Matplotlib, Seaborn, Plotly:** for data visualization
 - **Scikit-learn:** for model evaluation and performance metrics
 - **PIL:** for image loading
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3. Evaluation and Results

Train Loss: 0.0087

Train Accuracy: 99.72%

Validation Loss: 0.0420

Validation Accuracy: 98.93%

Test Loss: 0.0457

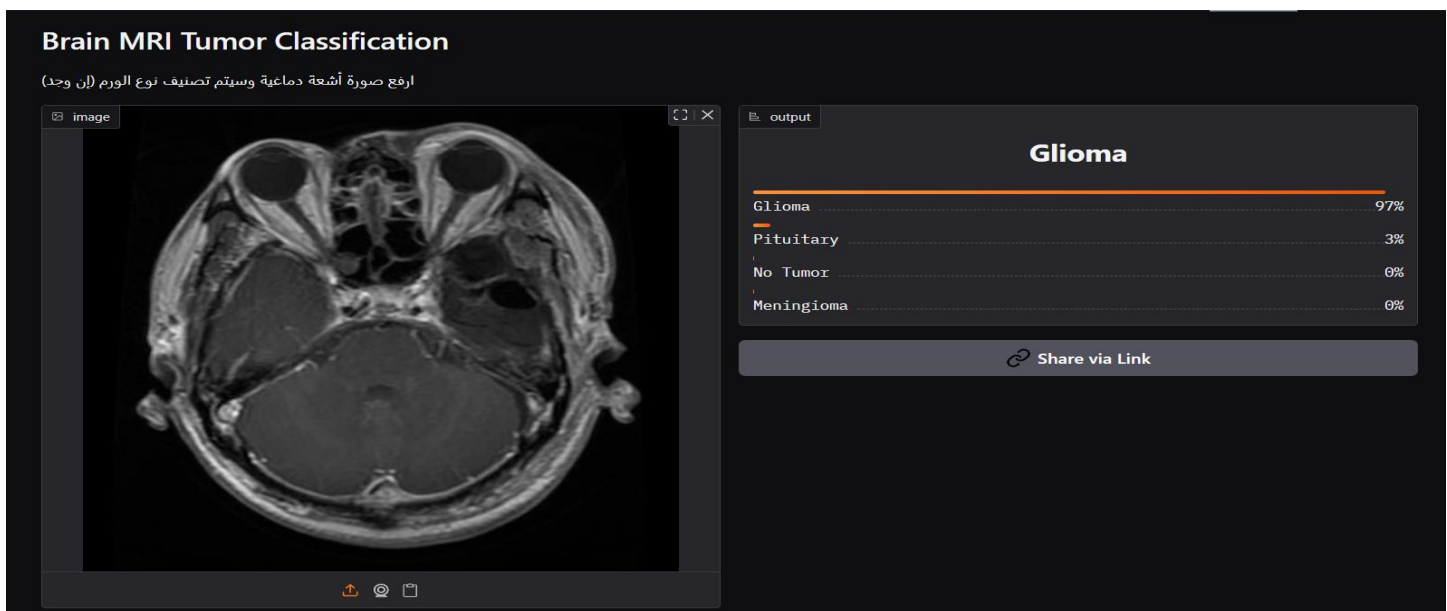
Test Accuracy: 98.93%

4. Source Code

- **Link to Source Code:**
<https://github.com/Romisaa582/Brain-Tumor-Detection-project>
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5. Deployment as API

- We deployed the model on **Hugging Face Spaces** using **Flask**.
- The trained model was exported and used to create an inference API.
- **Main Files:**
 - brain_mri_model.keras : Trained model
 - app.py : Inference logic using Flask
 - requirements.txt: Dependencies
- **API links :**
 - **Hugging Face model files :**
[<https://huggingface.co/spaces/samxrashed/braintumorclassification/tree/main>]
 - **API Endpoint:**
[<https://samxrashed-braintumorclassification.hf.space/predict>]
 - **We created a Gradio demo page for testing the model only:**
[<https://huggingface.co/spaces/samxrashed/braintumor>]

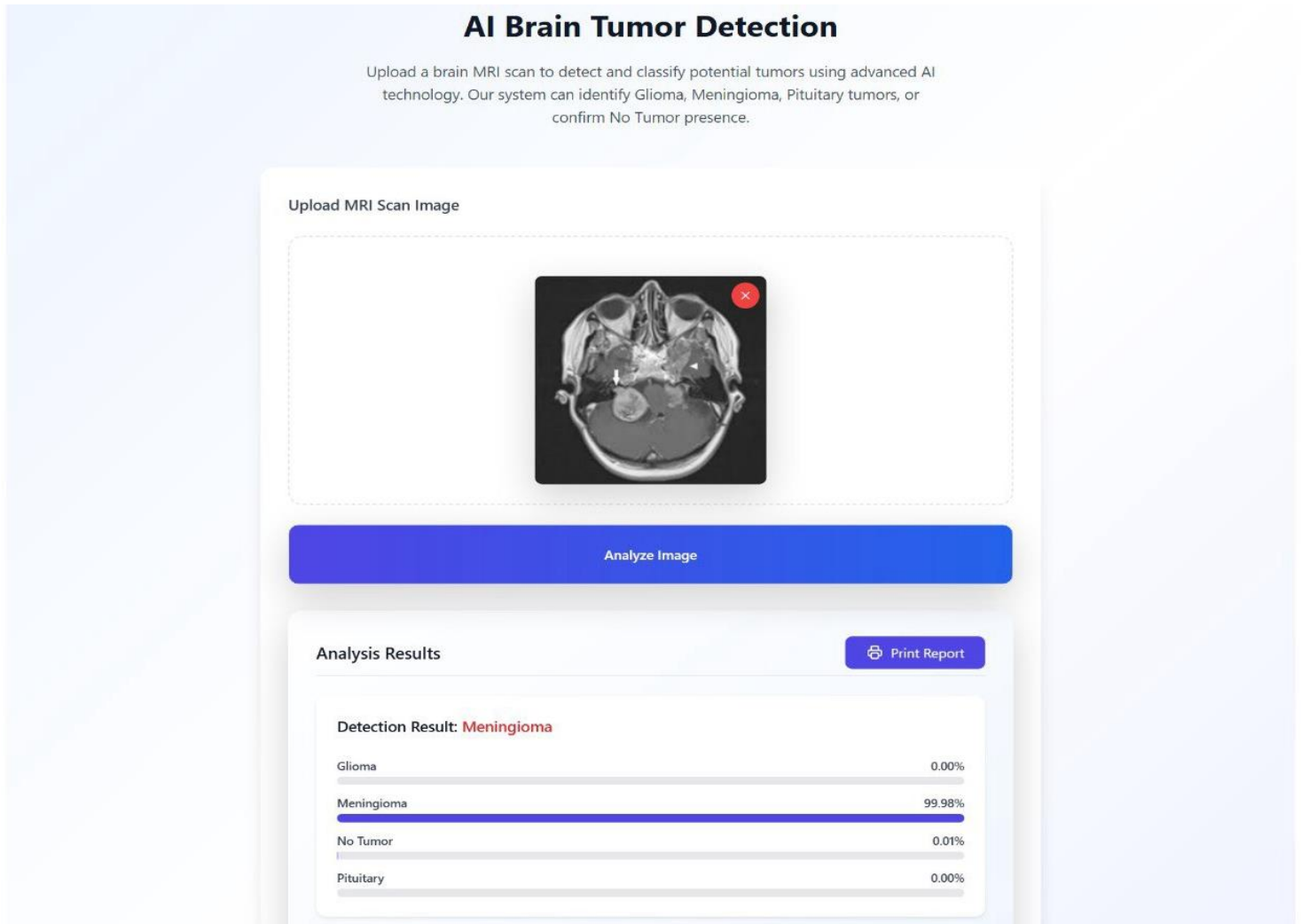


This interface was built for demonstration and testing purposes only. It allows users to upload MRI images and view the predicted tumor class in a simple and interactive way.

6. Web Integration and testing

- The API was tested and connected to a web.
- The frontend takes the uploaded image and sends it to the Hugging Face API, then displays the result.

Frontend Demo Screenshot:



7. Conclusion:

In this project, we successfully developed and deployed a deep learning model capable of classifying brain tumors from MRI scans into four categories using the Xception architecture and transfer learning. The model achieved high accuracy and generalization performance, proving its effectiveness in medical image classification tasks.

Furthermore, we integrated the model into a functional web-based API and tested it using a Gradio interface for demonstration. This setup ensures that the system is both technically sound and accessible for further use or development.

This project lays a solid foundation for future enhancements, including expanding the dataset, improving the model's explainability, and integrating it into real-world medical systems.