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Brain Tumor Diagnosis System Using Vision Transformers

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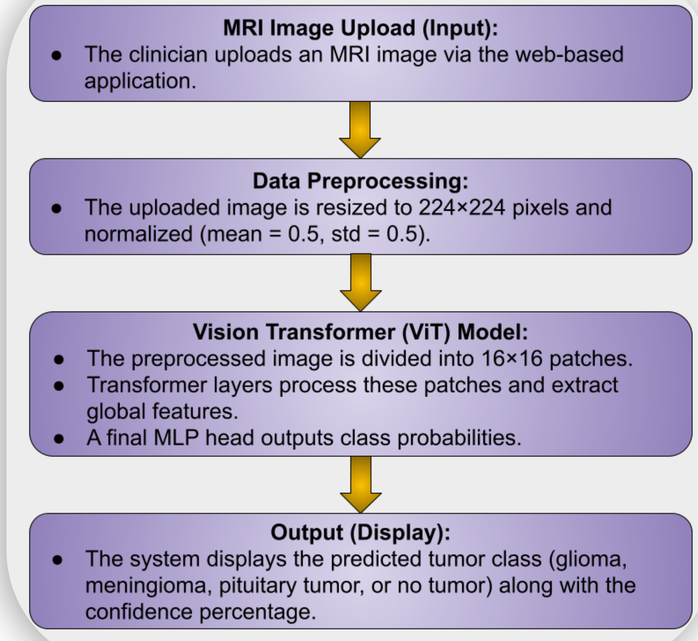
Background

Early diagnosis of brain tumors is critical, yet traditional workflows that include patient screening, laboratory tests, and MRI analysis are often fragmented and slow. Recent advances in deep learning, especially Vision Transformers, provide a promising approach for achieving more accurate and scalable MRI image classification.

Research Question

Can a Vision Transformer accurately classify brain tumor MRIs through a web application to support clinical decisions?

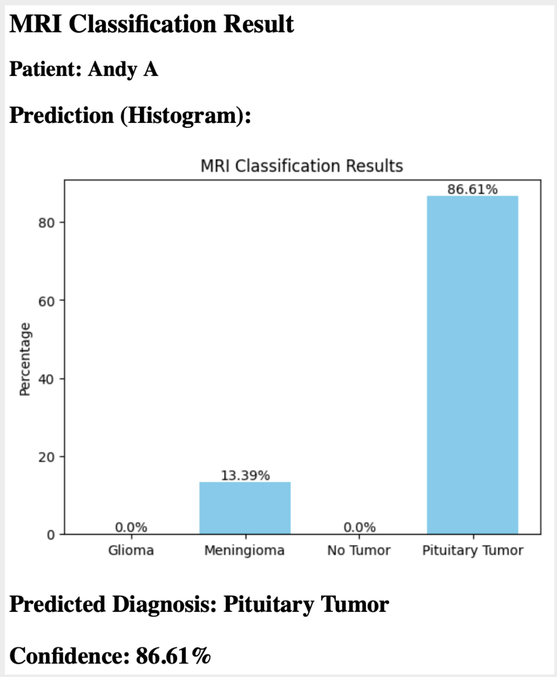


Implications

- **Enhanced Diagnostic Accuracy:** Earlier and more accurate tumor detection improves patient outcomes.
- **Streamlined Clinical Workflow:** Real-time, automated MRI analysis reduces delays and supports faster decision-making.
- **Increased Efficiency:** Automation minimizes radiologist workload and reduces misclassification rates.
- **Scalable AI Framework:** Establishes a robust platform for future integration of advanced diagnostic tools.

Materials & Methods

- **Programming:** Python 3.10, PyTorch (vit-pytorch), Jupyter Notebook
- **Hardware:** Apple Silicon (M3 Pro with GPU/MPS), AWS EC2 (p3.2xlarge)
- **Web & Deployment:** Flask, Docker, Gunicorn
- **Libraries:** scikit-learn, Matplotlib



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