Project Title:

Brain Tumor Segmentation

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Brain Tumor Segmentation

1. Project Overview

Objective: Segment tumor regions from brain MRI scans.

Dataset: Multi-modal MRI from the BRATS collection.

Challenge: Tumors vary in shape, size, intensity; manual annotation is time-consuming.

2. Preprocessing

- Z-score normalization applied to non-background regions per modality.

- Binarization using intensity thresholds (e.g., FLAIR 0.7, T1ce 0.9).

- Morphological filters and region properties used to isolate candidate tumor areas.

- Tracking tumors across slices to detect most likely segmentation.

3. Model Architecture

- Cascade CNN: Processes both local and global information.

- Distance-Wise Attention module to focus on likely tumor regions.

- Efficient and simple structure compared to very deep models.

4. Results & Performance

- Achieved competitive Dice scores on BRATS 2018/2020 datasets.

- Clear visualization of edema, tumor core, and enhancing tumor.

- Faster inference due to optimized structure and reduced ROI.

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5. Deployment & Demo

- Built as a Kaggle Notebook for demo and visualization.

- Can be deployed using Streamlit or Flask on a local or free cloud server.

- User uploads MRI image and gets classified segmentation output.

6. Conclusion & Future Work

- Deep learning model successfully segments brain tumors.

- Helps radiologists diagnose faster and more accurately.

- Future: Integrate 3D U-Net, more attention modules, web/mobile app deployment.

7. References

- Kaggle Notebook: https://www.kaggle.com/code/mariaoyshi/brain-tumor-segmentation

- Based on BRATS Dataset (multimodal brain MRI images)

- CNN + Attention-based deep learning models for medical imaging.