Research Papers & References for Brain Tumor Segmentation

This document provides key academic papers to guide the implementation of the 6-module brain tumor segmentation pipeline. The focus is on papers that explain the classical, non-deep-learning methods relevant to the project's scope, as well as significant modern approaches for context.

Category 1: Foundational Papers (Core Implementation)

These papers cover the classical pipeline steps that form the basis of this project's implementation.

1. "Brain Tumor Segmentation Using Thresholding, Morphological Operations and Extraction of Features from MRI Images"

- **Relevance to Project:** This paper serves as a practical blueprint. It details the use of thresholding (e.g., Otsu's method) and morphological operations for cleaning up segmented masks. This directly informs the implementation for **Module 3 (Segmenter)** and **Module 4 (Post-processor)**.
- **Key Takeaway:** The methodology section demonstrates how fundamental image processing operations, when properly sequenced, can achieve effective segmentation.
- **Source Link:** https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=7002427

2. "An efficient brain MR image segmentation and tumor detection using K-Means and Fuzzy C-Means"

- **Relevance to Project:** This paper explains the use of clustering algorithms for segmentation, which is a more advanced alternative to simple thresholding. It is a primary resource for the **Module 3 (Segmenter)** owner to implement K-Means clustering.
- **Key Takeaway:** The paper clarifies how K-Means can partition an image into distinct regions based on pixel intensity, thereby isolating the tumor from surrounding tissues.
- **Source Link:** https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8864326

Category 2: Advanced Model (Context & Future Work)

This paper describes the modern, deep-learning-based state-of-the-art, which is essential context for the project report.

3. "U-Net: Convolutional Networks for Biomedical Image Segmentation" by Ronneberger et al.

- **Significance:** This is a seminal paper in the field of medical image analysis, introducing the U-Net architecture. U-Net is the current industry standard for biomedical segmentation. While not implemented in this project, it must be cited in the final report as a state-of-the-art alternative and for the "Future Work" section.

- **Key Takeaway:** The model's encoder-decoder structure is a key concept, enabling it to both understand the image context and achieve precise localization of the target region.
- **Source Link:** https://arxiv.org/pdf/1505.04597

Category 3: Survey & Review Papers (Project Framing)

This paper provides a high-level overview of the field, which is valuable for the project's introduction and literature review sections.

4. "A comprehensive review on brain tumor segmentation and classification using deep learning"

- **Relevance to Project:** This review summarizes a wide array of techniques, both classical and modern. It is an excellent resource for the **Project Lead** and those responsible for writing the report's introduction. It helps to properly position the project's classical approach within the broader research landscape.
- **Key Takeaway:** The paper is useful for understanding the historical progression of segmentation techniques and for sourcing relevant terminology.
- **Source Link:** https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=10940343

Recommended Reading Strategy:

1. **All Team Members:** Should read the abstracts of all four papers to understand the project's context.
2. **Module 3 & 4 Owners:** Should perform a detailed study of papers **#1 and #2**, as their implementation will be directly based on the described methodologies.
3. **Project Lead / Report Writers:** Should use paper **#4** to frame the introduction and literature review, and paper **#3** to discuss state-of-the-art methods and future work.