K. S. INSTITUTE OF TECHNOLOGY, BENGALURU-560109
DEPARTMENT OF COMPUTER SCIENCE & ENGINEERING

MINI PROJECT - (BCS586)

PROJECT TITLE: An Integrated System for MRI Pre-processing and Tumor Classification		
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ABSTRACT

Brain cancer is a significant cause of death globally, and Magnetic Resonance Imaging (MRI) is a critical tool for its diagnosis. However, the manual analysis of MRI scans by medical experts can be slow and prone to variability. This project presents an optimized, dual-module computerized method designed to enhance the speed and accuracy of brain tumor detection.
The methodology consists of two core modules.

- **Image Enhancement Technique** that utilizes adaptive Wiener filtering, neural networks, and independent component analysis to normalize images, suppress noise, and correct for low contrast.
- **Support Vector Machine (SVM)** to perform robust tumor segmentation and classification on the processed images.

When applied to a diverse dataset of brain tumors, including meningiomas and pituitary tumors, the proposed method demonstrated outstanding performance. It achieved an average **sensitivity of 0.991**, **specificity of 0.991**, **accuracy of 0.989**, and a **Dice Score (DSC) of 0.981**. Furthermore, the system is highly efficient, with an average processing time of only **0.43 seconds**, significantly outperforming existing methods. These results underscore the potential of this dual-module approach to provide a faster, more reliable, and highly accurate tool for clinical brain tumor diagnosis.

Keywords: Magnetic Resonance Imaging (MRI), Image Enhancement, Brain Tumor Segmentation, Neural Networks, Brain Tumor Classification.

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System Requirements (H/W and S/W)

Minimum Hardware Requirements:

- **Processor:** A modern multi-core processor (e.g., Intel Core i5/i7 or AMD Ryzen 5/7).
- **RAM:** 16 GB or higher.
- **Storage:** A SSD with at least 5 GB of space for the project, dataset, and libraries.
- **GPU:** A dedicated NVIDIA GPU with CUDA support is highly recommended.

Minimum Software Requirements:

- **Operating System:** Windows 10, macOS, or a Linux distribution.
- **Programming Language:** Python 3.7 or higher.
- **Libraries:** TensorFlow, Keras, Scikit-learn, OpenCV, NumPy, and Matplotlib.
- **Development Environment:** Any standard IDE like VS Code or PyCharm.

Base Paper Submitted: Yes

Abdullah A. Asiridi, Toufique Ahmed Soomro, Ahmed Ali Shah, Ganna Pogrebna, Muhammad Irfan, and Saeed Alqahtani, "Optimized Brain Tumor Detection: A Dual-Module Approach for MRI Image Enhancement and Tumor Classification," IEEE Access, Vol. 12, 2024, pp. 42868-42887.

Note: Not For Student Use

ACCEPTED	REJECTED	RE SUBMIT
Reason for Rejection:		
Reason for Re Submit:		

Project Coordinators **HoD**

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