Case Study Rubric – Predicting Brain Tumors Using Image Analysis

DS 4002 – Fall 2024 - Instructors: Juwon Park

General Description: Submit to canvas a link to your case study repository

Why am I doing this? You are undertaking this project to explore the intersection of data science and real-world applications within the healthcare industry. This case study is designed to enhance your analytical skills, familiarize you with advanced image classification tools, and demonstrate how data-driven insights can revolutionize early detection and diagnosis in medical imaging.

What am I going to do? To begin, read the rubric and the deliverable in their entirety. Research types of image classification models, such as Convolutional Neural Networks (CNNs), available for this project. Gather and preprocess a dataset of brain MRI images, and use your chosen deep learning model to train and test its ability to classify MRI scans as tumor or non-tumor. Evaluate the performance of your model using appropriate metrics like accuracy and loss. Then, produce a short presentation showcasing your findings.

Tips for success:
   ● Do your Research: Be sure you are very familiar with the image classification model you choose. Research how this model has been applied in medical imaging before, and ensure it is appropriate for the dataset and task at hand.
   ● Ask for Help: Be sure to reach out to the professors if you need support with coding, preprocessing, or model evaluation.
   ● Have Fun: Let the data guide your approach! Be curious, creative, and enjoy the process of using AI to solve a meaningful real-world challenge**.**

How will I know I have Succeeded? You will meet expectations on the case study when you follow the criteria in the rubric below.

Formatting	● Repository – a Gitbhub repository containing all materials

	● To ensure **reproducibility**, the repository will adapt parts of
	
	    the TIER Protocol 4.0. In a nutshell, the top level page of the repository should contain:
	      ▪ A README.md file (which auto displays)
	      ▪ A LICENSE.md file (use MIT as default)
	      ▪ A SCRIPTS folder
	      ▪ A DATA folder
	      ▪ AN OUTPUT folder
	
	● Presentation
	
	● Report: about 1-2 pages, Presentation: about 7 slides
	● PDF format for submission to Canvas

Github Repository	● <u>Goal</u>: Explain the purpose of your model and the overall findings
	    ● Contents:
	
	    o README.md: discusses project overview, background research, links, etc
	
	      ▪ Section 1: Software and platform section: The type(s) of software you used for the project.
	
	      ▪ Section 2: A Map of your documentation
	
	      ▪ Section 3: Instructions for reproducing your results.
	
	    o DATA: this folder includes original source data
	
	    o SCRIPTS: This folder contains all the source code for your project.
	
	    o OUTPUT: This folder contains all of the output generated by your project, e.g. figures, tables, etc.
	
	    o LICENSE: This file explains to a visitor the terms under which they may use and cite your repository.

Presentation	● <u>Goal</u>: Display the analysis and findings in an easy-to-digest manner. Should be entertaining and eye-catching.
	● Presentation
	   o Order:
	   o Title & Outline
	   o Motivation/Context/Hypothesis/Research Question/Modeling Approach/Goal/Etc.

	o Data Explanation/Acquisition o Analysis Plan and Justification o Tricky Analysis Decision o Bias and Uncertainty Validation o Results/Conclusions o Next Steps o References/Resources/Acknowledgements o Closing Slide
References	● All references should be listed at the end of the document ● Use IEEE Documentation style ([link](#))