University Cadi Ayyad

National School of Applied Sciences of Safi

Department of Computer Science, Networks, and Telecommunications (IRT)

4th Year Computer Engineering

{ IMAGES CLASSIFICATION APPLICATION }

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I. Project goal:

The project's objectives include performing image classification model using the ML.Net library, training TensorFlow models outside of ML.Net, integrating them into an ML.Net model, and ultimately utilizing this image classification model within a Windows Forms application

II. Project context:

Our project focuses on creating a user interface (UI) using .NET Windows Forms, allowing the user to upload human brains images and detect the presence of brain tumors and classify them into one of the three types: Meningioma, Pituitary, Glioma, or identify cases where there is no tumor. The application is using two models, one trained using ML.Net and the other using the library of TensorFlow. The classification results will be displayed on the screen, indicating both the presence or absence of a tumor and the respective type, along with a percentage representing the truthy of the classification.

III. Used tools and Technologies:

Visual Studio Community:

Microsoft Visual Studio Express is a set of integrated development environment that Microsoft developed and released free of charge. They are function-limited version of the non-free Visual Studio and require mandatory registration. Express editions started with Visual Studio 2005.

C#:

C# is a general-purpose high-level programming language supporting multiple paradigms. C# encompasses static typing, strong typing, lexically scoped, imperative, declarative, functional, generic, object-oriented, and component-oriented programming disciplines

ML.Net:

ML.NET is a machine learning framework for .NET. **ML.NET** supports sentiment analysis, price prediction, fraud detection, and more using custom **models**.

TensorFlow:

TensorFlow is a free and open-source software library for machine learning and artificial intelligence. It can be used across a range of tasks but has a particular focus on training and inference of deep neural networks.

Kaggle:

Kaggle is a data science competition platform and online community of data scientists and machine learning practitioners under Google LLC.

Python:

Python is a high-level, general-purpose programming language. Its design philosophy emphasizes code readability with the use of significant indentation. Python is dynamically typed and garbage-collected. It supports multiple programming paradigms, including structured, object-oriented and functional programming

Keras:

is an open-source high-level neural networks API written in Python. It is primarily used for building and training deep learning models, particularly neural networks

ONNX:

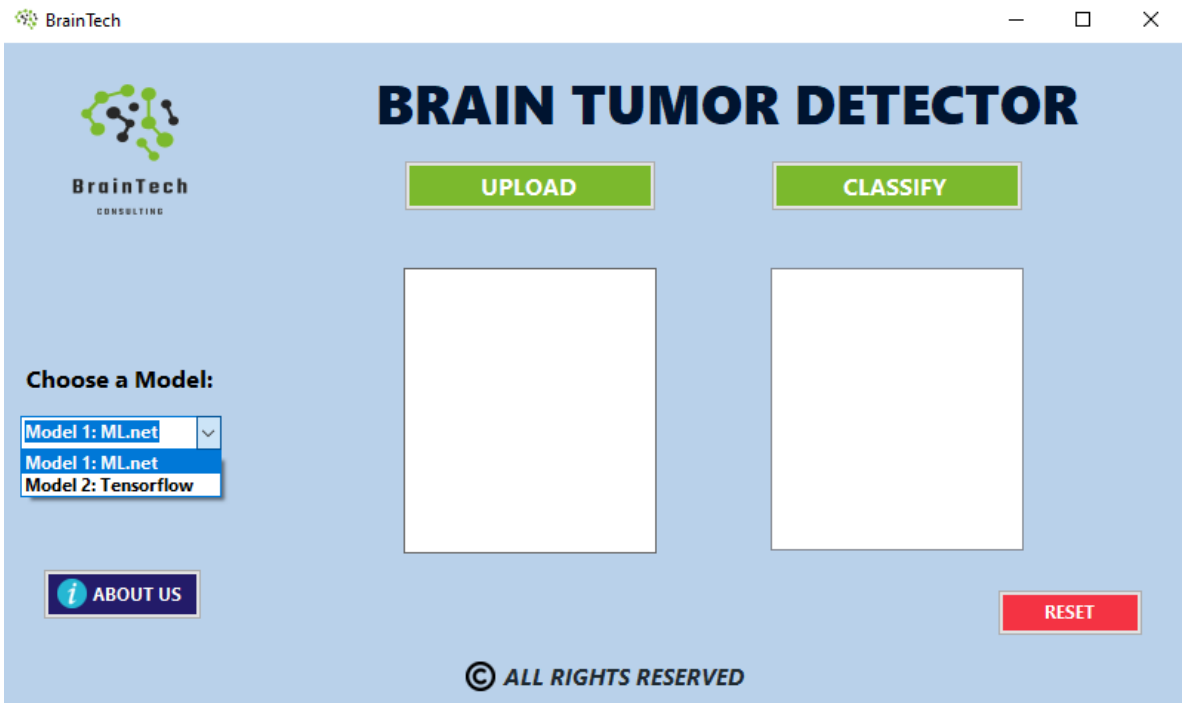
The **Open Neural Network Exchange** is an open-source artificial intelligence ecosystem of technology companies and research organizations that establish open standards for representing machine learning algorithms and software tools to promote innovation and collaboration in the AI sector.

IV. Dataset Description:

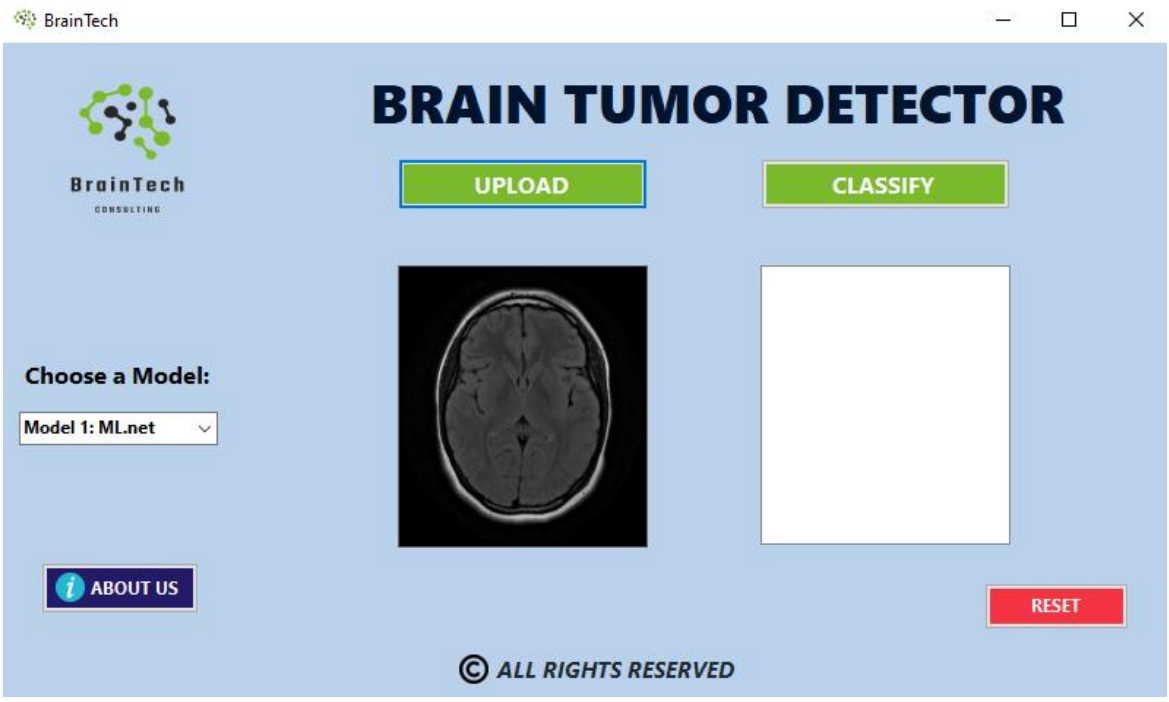
We trained our models using a dataset downloaded from Kaggle and organized it within a folder structure. In this structure, each subfolder contains images associated with a specific tumor category, and these subfolders are titled with the names of their corresponding categories. This naming convention serves as the label for the images within each subfolder.

V. Implementation and App Presentation:

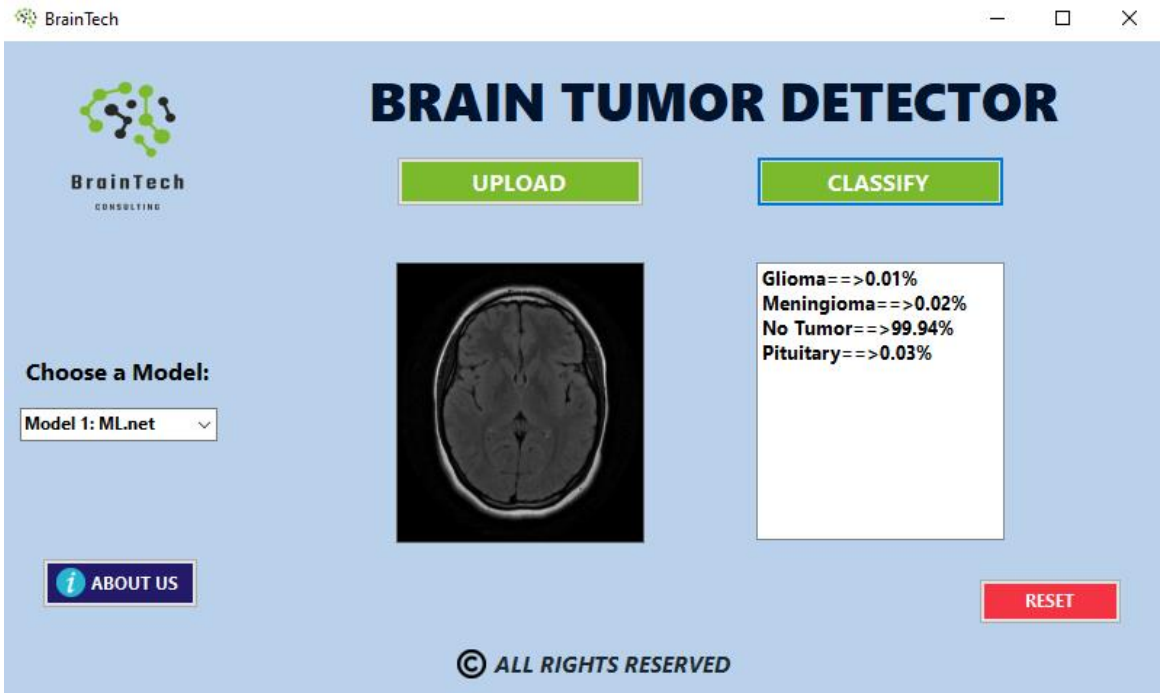
1. Choose the model to use for classifying the image:



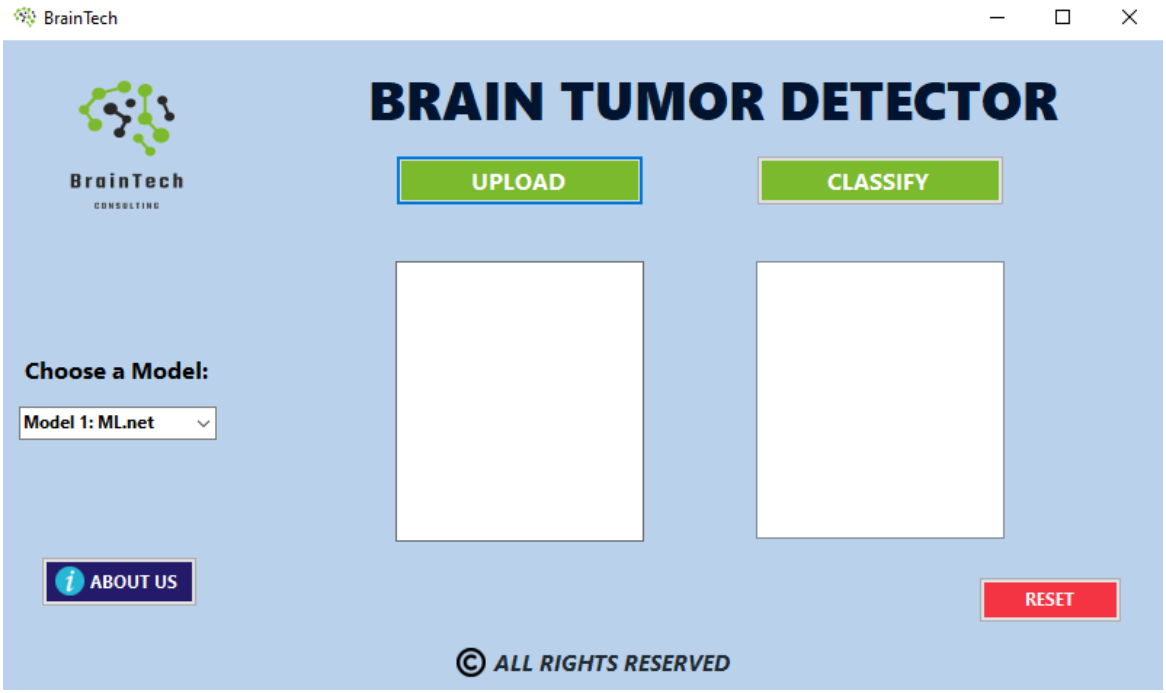
2. Upload the brain image:



3. Display the results for each case along with the percentage:



4. Clear the form:



VI. Conclusion:

In conclusion, our project successfully leverages the power of ML.NET and TensorFlow to provide an accurate and efficient solution for brain tumor detection. By integrating advanced technology with healthcare, we aim to enhance diagnostic accuracy and ultimately improve patient outcomes.