Malignant Lymphoma
Classification

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Abstract

Being able to determine the specific subtype of cancer is the first step towards treatment, as cancer treatment relies completely on early diagnosis of the cancer type to help control it in its early stages. Blood cancer types are the most spreading ones.

Previous studies have provided evidence for automatic cancer tissue analysis by using deep learning strategies that retrieve and organize discriminating insights from the images automatically. Therefore, in this study an innovative and empowered deep learning.

framework is proposed to classify three types of lymphoma as Follicular Lymphoma (FL), Chronic Lymphocytic Lymphoma (CLL) and Mantle Cell Lymphoma (MCL). Which are the most common three types of non-Hodgkin Lymphoma cancer. In this research, we developed and advanced CNN model that efficiently predicts the type of non-Hodgkin Lymphoma with an accuracy of 98%.

A publicly available dataset from National Institute of Ageing (NIA) is used in this study. This study performs the histogram normalization on all the images to enhance the performance of model. The data augmentation has been carried out on the dataset so that overfitting can be avoided, we also segmented the images to get higher accuracy..

Introduction

Lymphoma is a blood disease (cancer) that develops in the immune cells, which are the cells that mainly defend our bodies from infections and viruses. Thus, a vulnerable body with no defense system requires attention from researchers and machine learning specialists to help eliminate it, Because lymphocytes have physiologic immune functions that vary both by lineage and by stage of differentiation, the classification of lymphomas arising from these normal lymphoid populations is complex

Lymphoma is mainly regarded as: Hodgkin Lymphoma and non-Hodgkin Lymphoma. Having only two developing sorts or Lymphoma by high rate gives us the opportunity to focus and find a suitable solution for both of them. Lymphomas types are classified based on the normal counterpart, or cell of origin, from which they arise.

We decided to focus on the most common three types of non-Hodgkin lymphoma types among cancer patients, which are: CLL (Chronic lymphocytic leukemia): is a type of cancer of the blood and the bone marrow, MCL (Mantle cell lymphoma): which is a cancer type that make B cells cancerous, FL (Follicular lymphoma): which is a cancer type that involves certain types of white blood cells known as lymphocytes.

CLL	FL	MCL
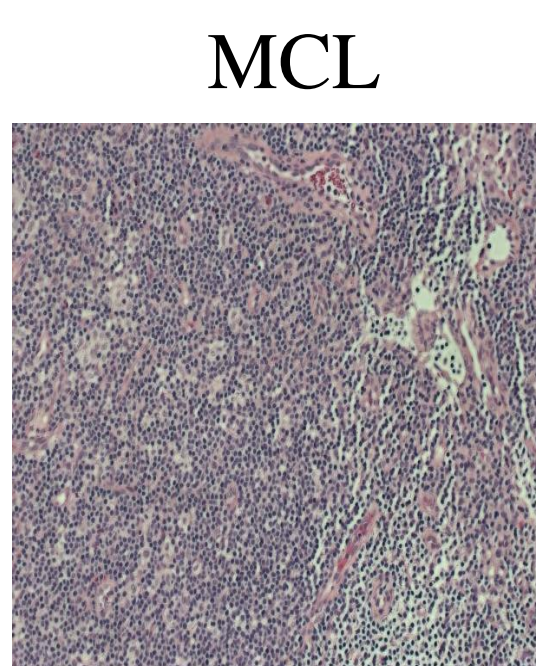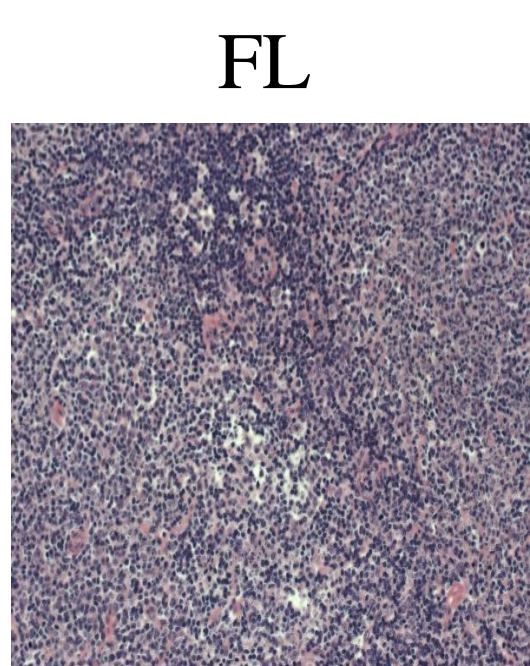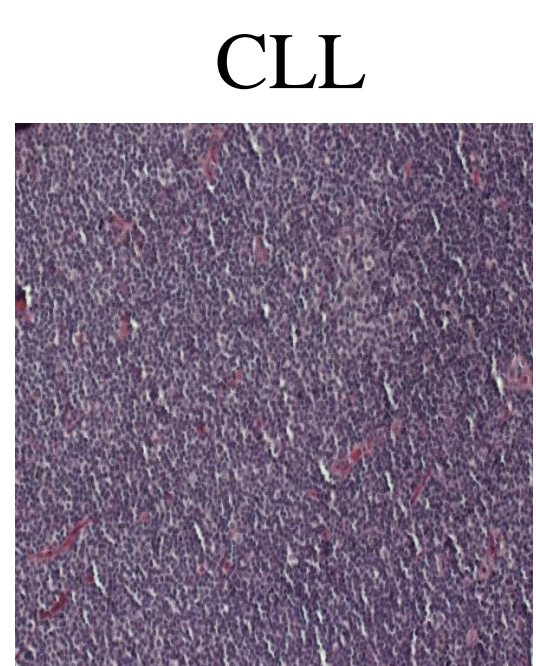
Methods

- Machine Learning Technique (Traditional Approach)
  - SVM
  - Logistic Regression
  - Decision Tree
  - KNN
- Deep Learning Algorithm
  - Convolutional Neural Network (CNN)
- Google Collaboratory
- Python Programming Language & Libraries (Tensorflow, Numpy, Keras)
- HTML,CSS & JavaScript & Bootstrap
- JQuery & Ajax
- PHP with execution of Python script using exec() Method

Sequence Diagram
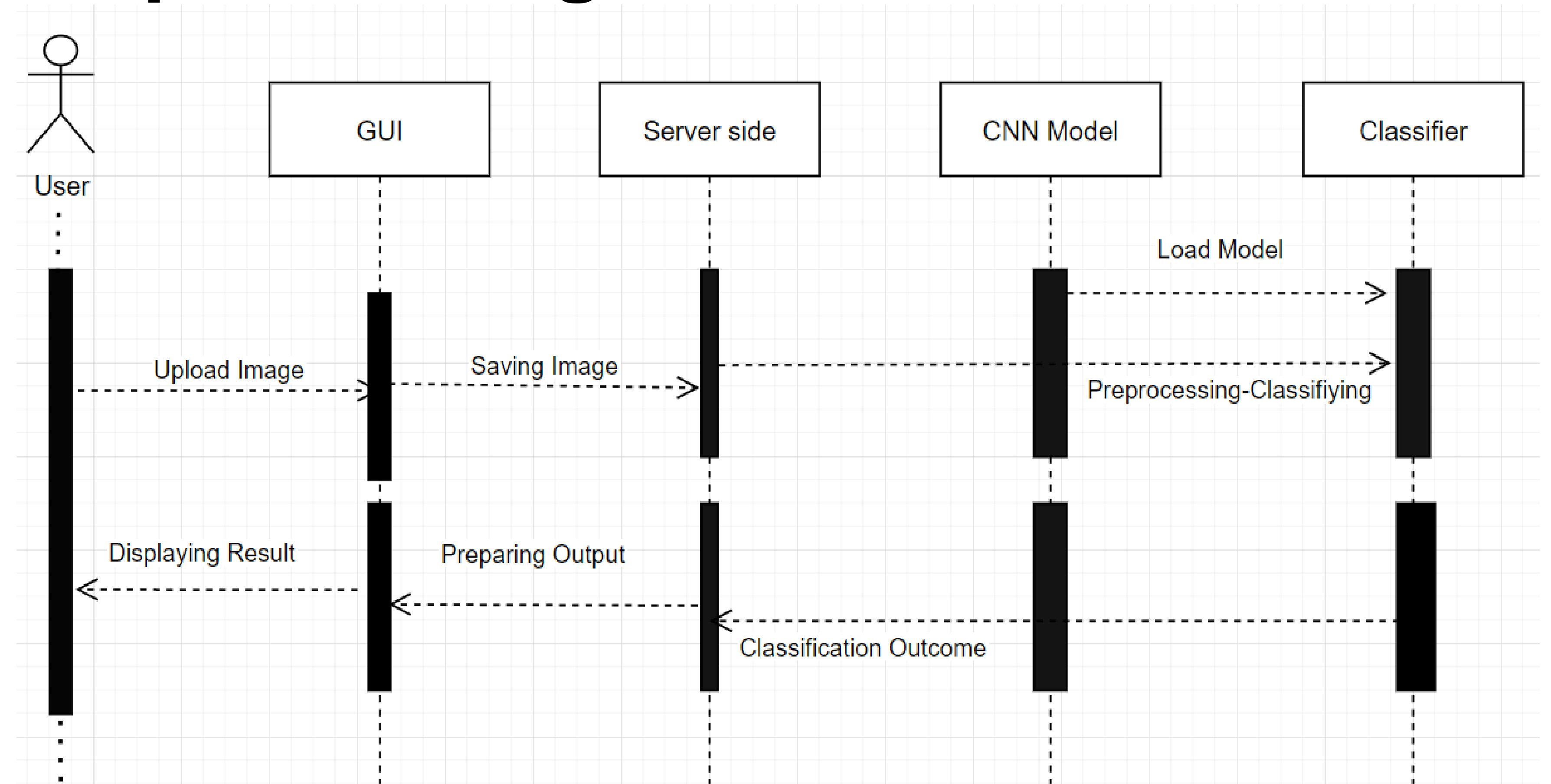
Conclusion

Critically, the development of inexpensive point-of-care diagnostic platforms will accelerate the discovery of 3 types of Non-Hodgkin Lymphoma Cancer, especially in countries with health systems devoid of adequate laboratory infrastructure, also enriching the scientific research related to this specific type of cancer by providing illustrative feature maps that helps to precise understanding the causes of this disease.

Since the most common treatments of this disease are Chemotherapy and radiotherapy, those are sharp & may cause severe side effects that needs accurate procedures & diagnosis

Our most important take-away is that having scarce amount of data doesn't necessarily mean a weak model, furthermore, the feature-rich data, which is data with high frequency for its distinct/desirable features offsets for the scarcity of our data, that helped us to build a CNN Model , train on the dataset , and be able to classify the images to one of the three Non-Hodgkin Lymphoma Cancer.

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