Parkinson's Disease Detection using TensorFlow

Ainala Varalakshmi, Jason Jonathan David P.
varalaxmi.ainala@gmail.com
Computer Science and Cognitive Systems
Loyola Academy Degree and PG College, Hyderabad, India

Abstract

Parkinson's disease is a degenerative neurological disorder that affects millions of people worldwide. Early detection of Parkinson's disease can help improve treatment outcomes and quality of life for patients. Spiral drawings are commonly used to assess motor function in Parkinson's disease patients.

In this project, I propose a deep learning-based approach for Parkinson's disease detection using spiral images. A deep learning model achieves high accuracy and low loss in distinguishing Parkinson's disease patients from healthy controls.

In conclusion, this approach has the potential to be used as a screening tool for Parkinson's disease in clinical settings.

Keywords: medicine, Neurology, Parkinson's disease, Early detection, clinical settings, Spiral images, Deep learning, Machine Learning, web-app, dataset, Convolutional neural network.

Introduction

Parkinson's disease is a neurological disorder that affects movement. It is caused by the gradual degeneration of dopamine-producing neurons in the brain, which are responsible for controlling movement and coordination. The exact cause of Parkinson's disease is unknown, both genetic and environmental factors are believed to play a role. Age is also a significant risk factor, as the incidence of Parkinson's disease increases with age.

While there is no cure for Parkinson's disease, The only solution is Early Detection of Parkinson's disease.

Early detection of Parkinson's disease is important because:

1. It can lead to better treatment outcomes
2. Improved symptom management
3. Psychological benefits
4. Increased opportunities to participate in clinical trials and research studies.

We propose an image classification of hand drawn spiral images which will help a doctor make better decisions on the motor functioning of the patient in early stages of Parkinson's disease.

Technologies Utilized

For the development of the web-app, some knowledge about full stack development was required. Parkinson's Disease Detection is built using TensorFlow - deep learning library, the user interface website was built using HTML, CSS, Python and flask.

Methodology

I propose an image classification CNN model which will help a doctor make better decisions on the motor functioning of the patient in early stages of Parkinson's disease.

Advantages:

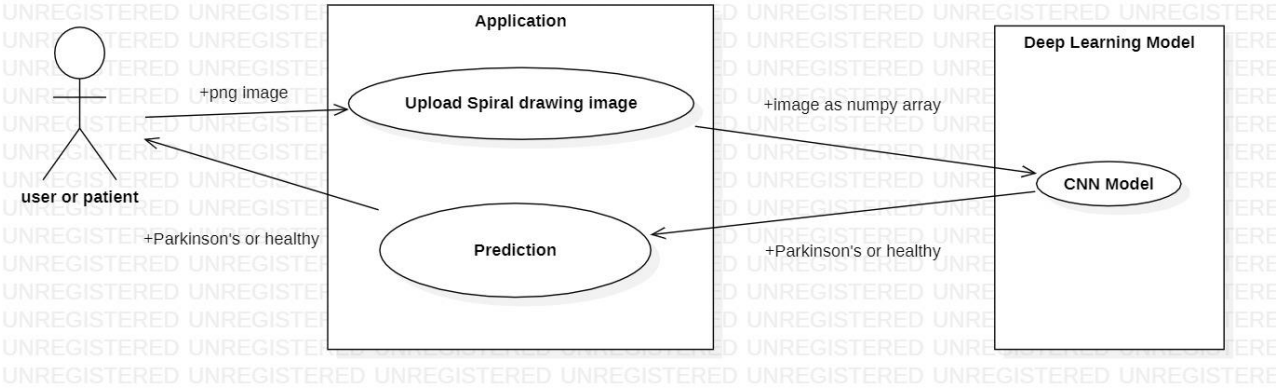
1. It is Affordable as compared to using MRI, CT Scanners for early stages of Parkinson's.
2. It is Efficient as it takes less time in prediction and implementation.
3. It can be highly available and marketable to health professionals to use it on a daily basis as and when needed.

Problem Definition:

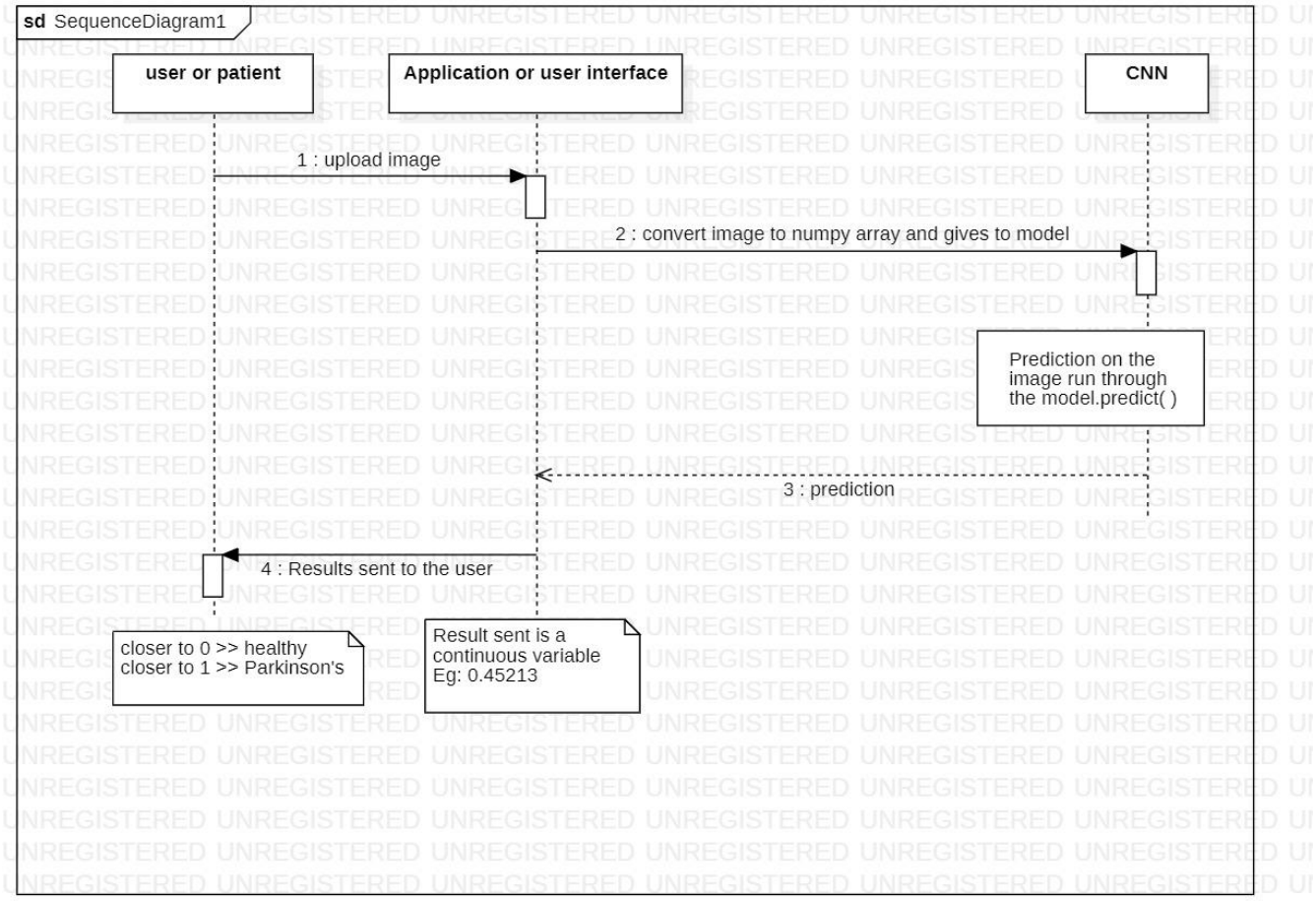
This project aims at deploying a web-app that is able to detect Parkinson's disease using the motor inefficiencies of the patients while drawing spiral images.

UML Diagrams

Use-case Diagram:

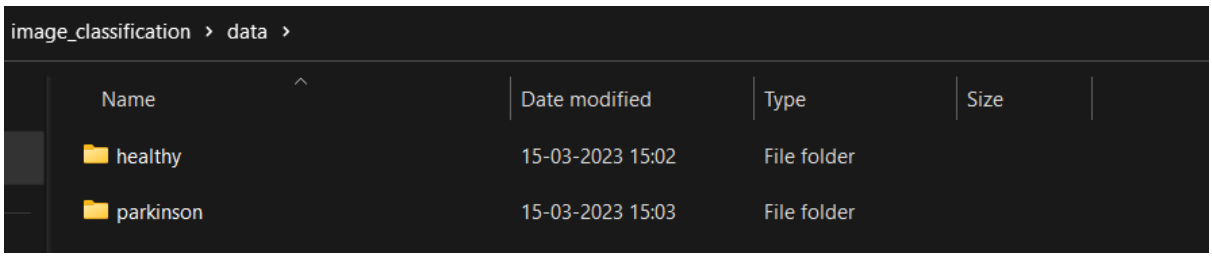


Sequence Diagram:



The Database

The database to build the deep learning model is spiral images dataset

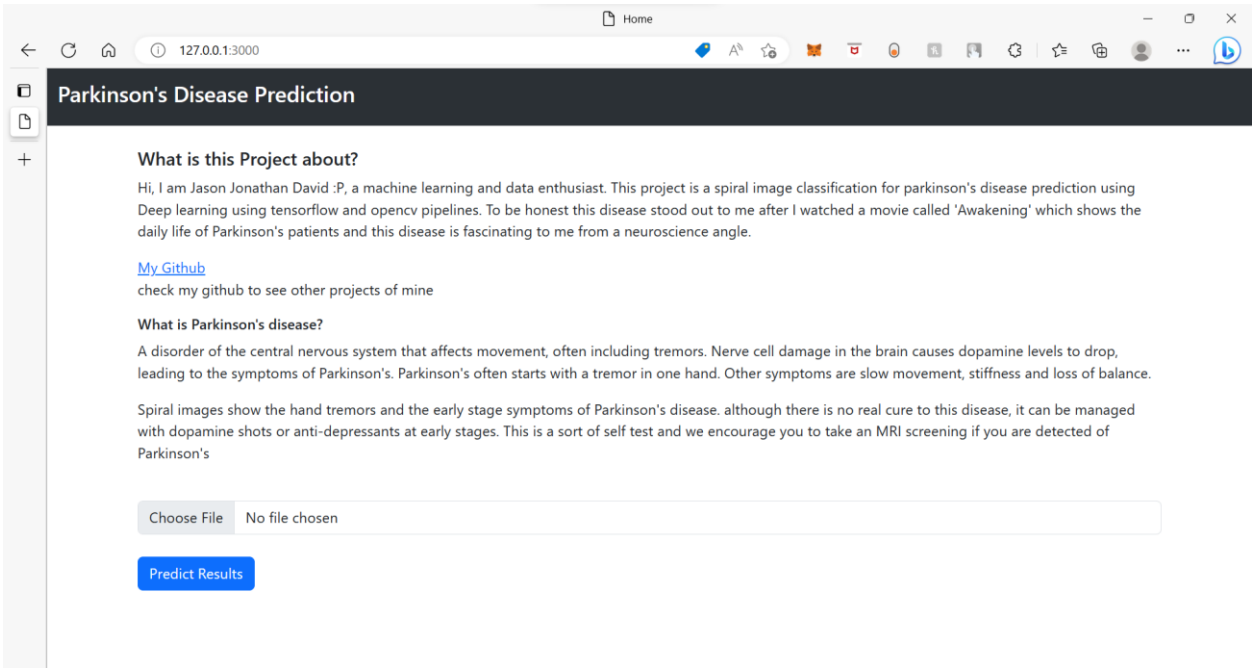


Healthy dataset

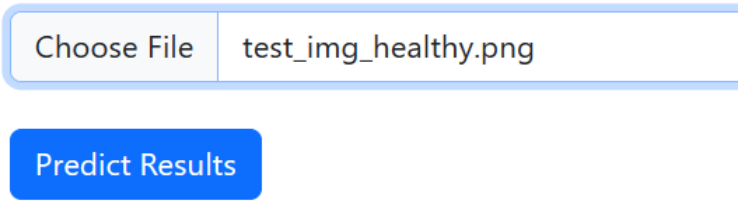
Parkinson's Disease

Output

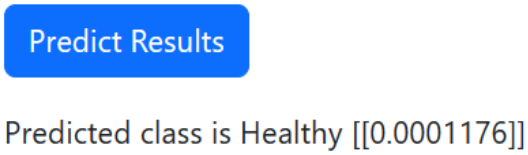
Home Page



Choose the Spiral image from your local device



and click on predict Results to see the results

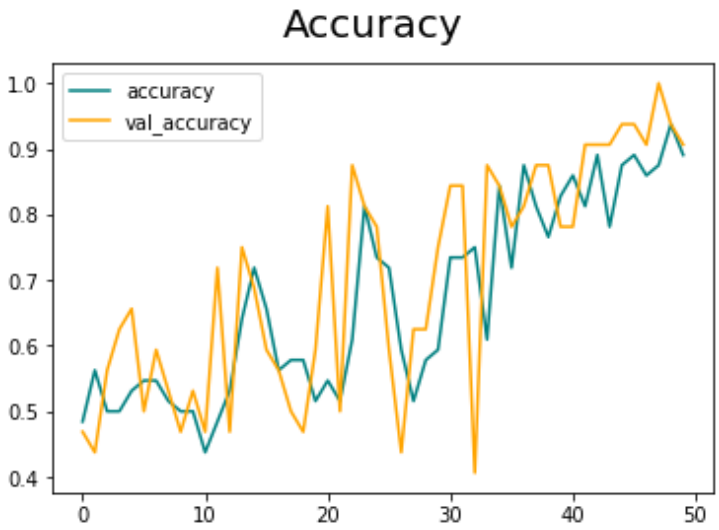


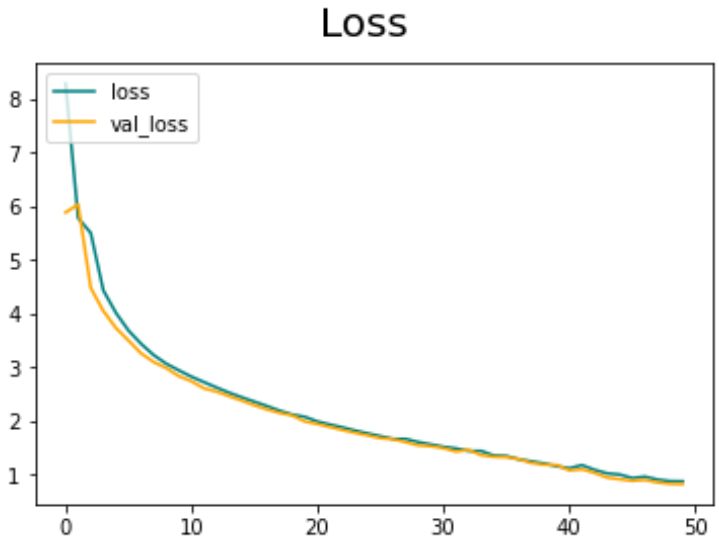
The image is predicted to be of a healthy person.

Conclusion

This is the process of early detection of Parkinson's disease using spiral image hand drawings. The elimination if human bias and other elements make the process simple and effective to use and also accurate.

The model is accurately predicting 8 out of 10 images and with a total accuracy of 90% and minimal loss as seen in below graphs





References

CNN Architecture:

https://towardsdatascience.com/convolutional-neural-network-cnn-architecture-explained-in-plain-english-using-simple-diagrams-e5de17eacc8f

Image Classification:

https://github.com/nicknochnack/ImageClassification

Early detection of Parkinson's disease using machine learning

Anitha R, Nandhini T, Sathish Raj S, Nikitha V

Department of Computer Science and Engineering, SRM Valliammai Engineering College, Tamil Nadu, India

http://ijariie.com/AdminUploadPdf/EARLY_DETECTION_OF_PARKINSON_S_DISEASE_USING_MACHINE_LEARNING_ijariie11591.pdf

Dataset:

https://www.kaggle.com/datasets/kmader/parkinsons-drawings

data pipeline:

https://www.tensorflow.org/guide/data