Alzheimer's disease prediction: Deep Learning approach

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Outline

Why Alzheimer's disease?

- Alzheimer's disease attacks the healthy cells of the brain;
- Affected patients are suffering from
  - long-term memory loss;
  - impaired thinking;
  - disorientation;
  - behavioural abnormalities;
- 5.0 million adults had Alzheimer's disease in the USA, in 2014;
- This number is expected to reach nearly 14 million by 2060;
- This increase will be a challenge for medical systems and professionals working in this field.
  - $https://www.cdc.gov/aging/dementia/index.html$

The power of Deep Learning algorithms

- **Computer Vision**
- **Image Classification**
- **Deep Learning**
- **Convolutional Neural Networks (CNNs)**

Our main goal:

In the context of detecting Alzheimer's disease, these fields come together by using CNNs to classify MRI scans to predict the presence/absence of Alzheimer's disease.

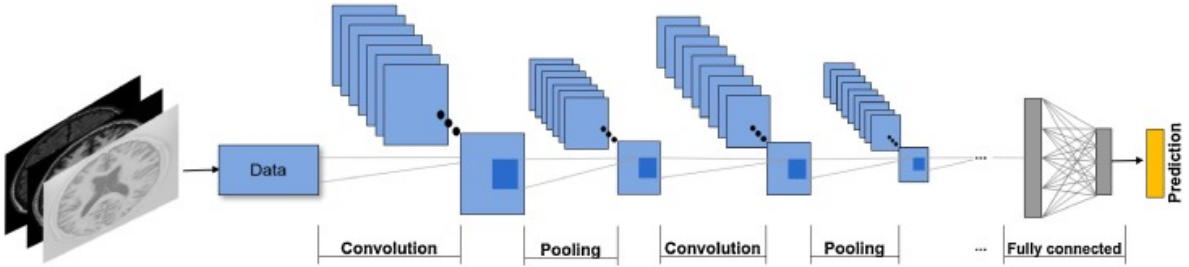
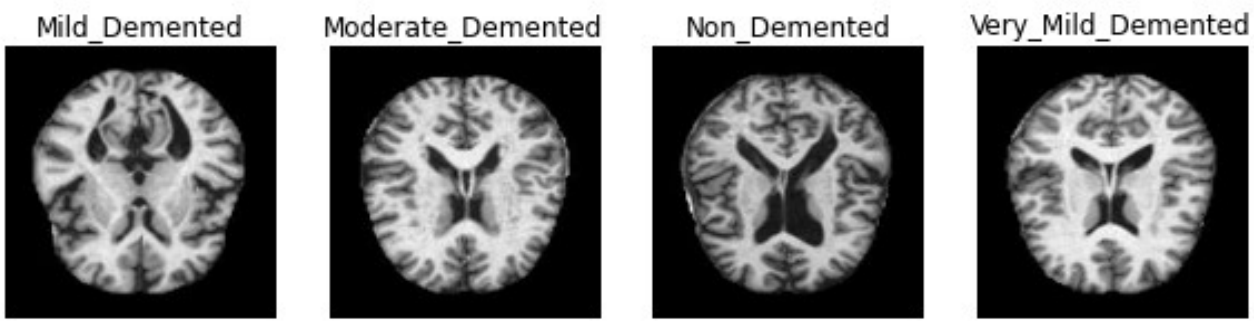


Figure 3. An architecture of CNN model

Dataset: MRI Scans

- Our Dataset is collected from several websites/hospitals/public repositories;
- The Dataset is consists of total 6400 MRI (Magnetic Resonance Imaging) scans with 4 classes:
  1. **Mild Demented** (896 images)
  2. **Moderate Demented** (64 images)
  3. **Non Demented** (3200 images)
  4. **Very Mild Demented** (2240 images)



Results: Accuracy Score and Loss Value

- Our model has an accuracy of 99 % on validation and test datasets. So, the model is performing well!

```
16/16 [==============================] - 3s 154ms/step - loss: 0.0160 - accuracy:
[0.015980279073119164, 0.9937565326690674]
```

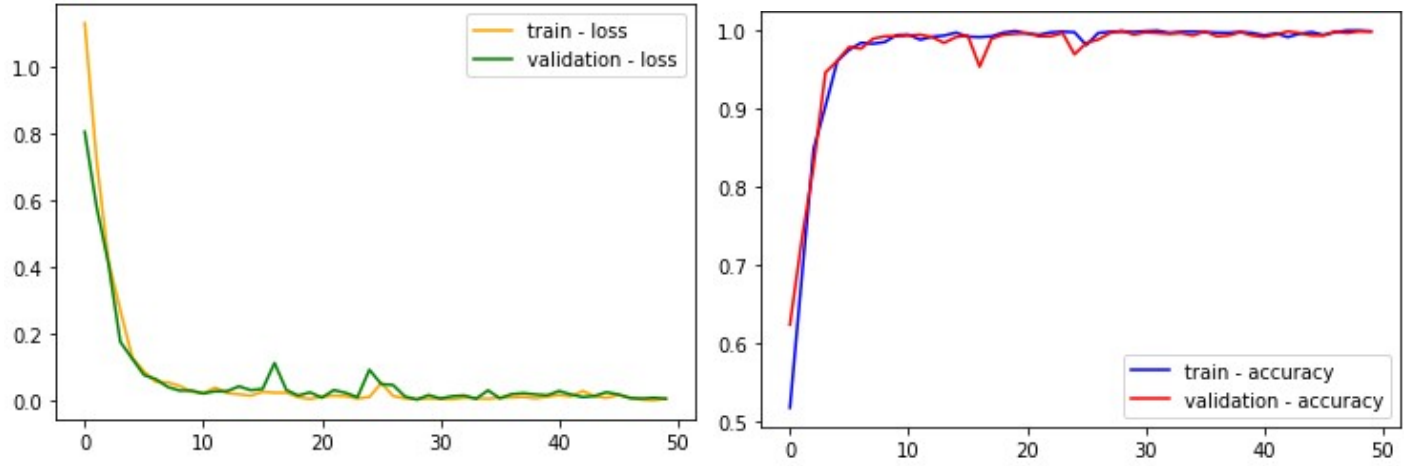


Figure 7. Loss vs Accuracy

Webb Application: Alzheimer's Disease Prediction

Brain MRI scans

Alzheimer's Disease Prediction

Predicts the diagnosis of Alzheimer's disease based on the patient's MRI image.

This application uses CNN model

Limitations

- The lack of large and diverse medical dataset;
- Imbalanced datasets, where the number of samples in different classes is unequal
- The lack of pre-trained models specifically trained on brain MRI scans;

Future directions

- Multi-modality medical image analysis;
- Transfer learning for medical image analysis;
- Image segmentation for medical imaging.

Thank you for your attention!