Alzheimer’s Detection with Convolutional Neural Networks

Project Proposal – Minor Artificial Intelligence for Society

Sverre van Gompel  
19-10-2021



# Contents

[Contents 2](#_Toc85183859)

[1. Background 3](#_Toc85183860)

[2. Objectives 3](#_Toc85183861)

[3. Scope 3](#_Toc85183862)

[4. Solutions and approach 3](#_Toc85183863)

# Background

The medical field is currently experiencing an AI revolution. Many hospitals are conducting their own research on implementing artificial intelligence solutions within their processes. For example, [ETZ in Tilburg recently applied AI to detect fractures on x-ray photo’s](https://www.etz.nl/Over-ETZ/Nieuws/2021/09/AI-toepassing-ziet-breuken). AI has the potential to provide substantial improvements to existing processes within the medical field, as well as the possibility to innovate new solutions.

A possible use case for AI is assisting radiologists in the diagnostic process. An AI could analyse scans and highlight any irregularities it detects. By combining the expertise of radiologists with an AI, misdiagnoses could potentially be prevented, and Alzheimer’s disease could be detected earlier, improving overall outcomes for patients.

# Objectives

The first objective of this project is to create a prototype that can predict Alzheimer’s disease in patients. The prototype must minimise false negative predictions, as missing a hypothetical patient with Alzheimer’s would be undesirable.

The second objective of this project is to write a custom-made neural network from-scratch to achieve the first goal. To do so, much research must be conducted as per the questions in Solutions and Approach. In the event this does not work out, the Keras library will be used instead.

# Scope

*[What will be the end result of the project? Describe what phases of work will be undertaken.]*

## Target audience

## Determinants

## Technology acceptance

# Solutions and approach

The main goal for this project is to create a neural network from-scratch in Python that can analyse images and diagnosing various stages of Alzheimer’s disease. An existing dataset from Kaggle.com will be used to for training, testing, and validation.

To conduct the necessary research for this project, the following research question has been created:

**How can neural networks be used to detect various stages of Alzheimer’s disease?**

To answer the main research question, sub-questions will be researched. The following are technical questions:

* What are neural networks?
* What types of neural networks exist?
* What type of neural network works best for image classification?
* How does this particular type of neural network work?
* What are General Adversarial Networks (GANs)?
* Can GANs provide better performance than CNNs in this project?

The following questions pertain to ethical considerations, GDPR and the potential impact this project may have:

* What potential benefits could this project provide?
* How does GDPR apply to this project?
* What implications would a functional prototype have on patients and medical professionals?
* How should this project be applied to ensure the safety of patients?
* Are there any ways to misuse the technology outside of the intended scope?