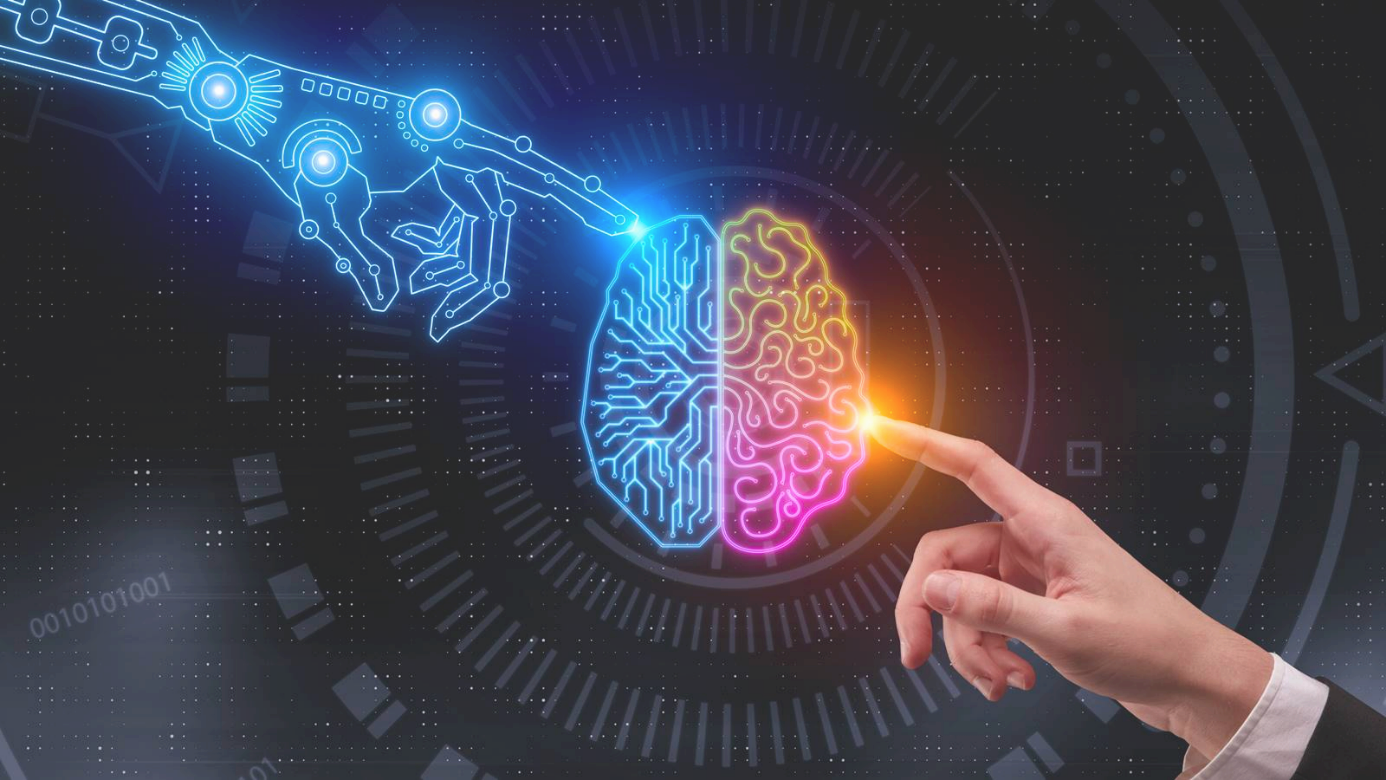
Alzheimer’s Detection with Convolutional Neural Networks

Research Document – Minor Artificial Intelligence for Society

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# Introduction

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. This leads to the following question:

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

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# What are neural networks?

Neural networks, also known as artificial neural networks (ANNs) or simulated neural networks (SNNs), are a subset of machine learning and are at the heart of deep learning algorithms. Their name and structure are inspired by the human brain, mimicking the way that biological neurons signal to one another ( IBM Cloud Education, 2020).

Artificial neural networks (ANNs) are comprised of a node layers, containing an input layer, one or more hidden layers, and an output layer. Each node, or artificial neuron, connects to another and has an associated weight and threshold. If the output of any individual node is above the specified threshold value, that node is activated, sending data to the next layer of the network. Otherwise, no data is passed along to the next layer of the network ( IBM Cloud Education, 2020).

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

To answer the main research question, the following sub-questions will be researched:

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