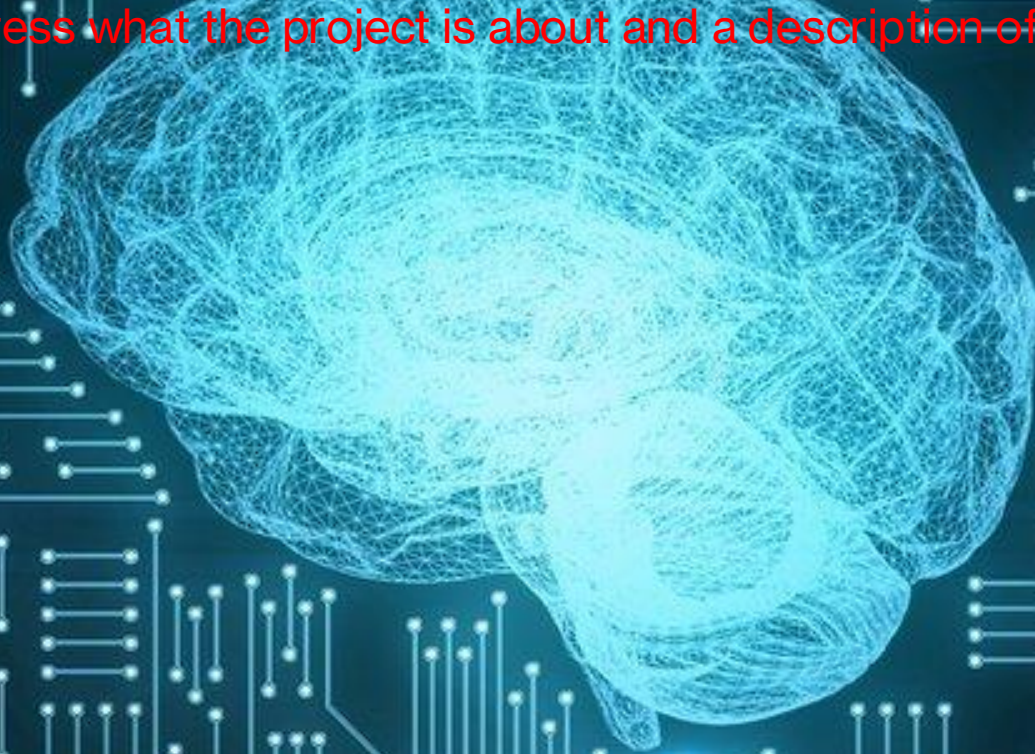


# A precise AI model to accurately diagnose health

related issues

Presentation purpose – to address what the project is about and a description of the development process.





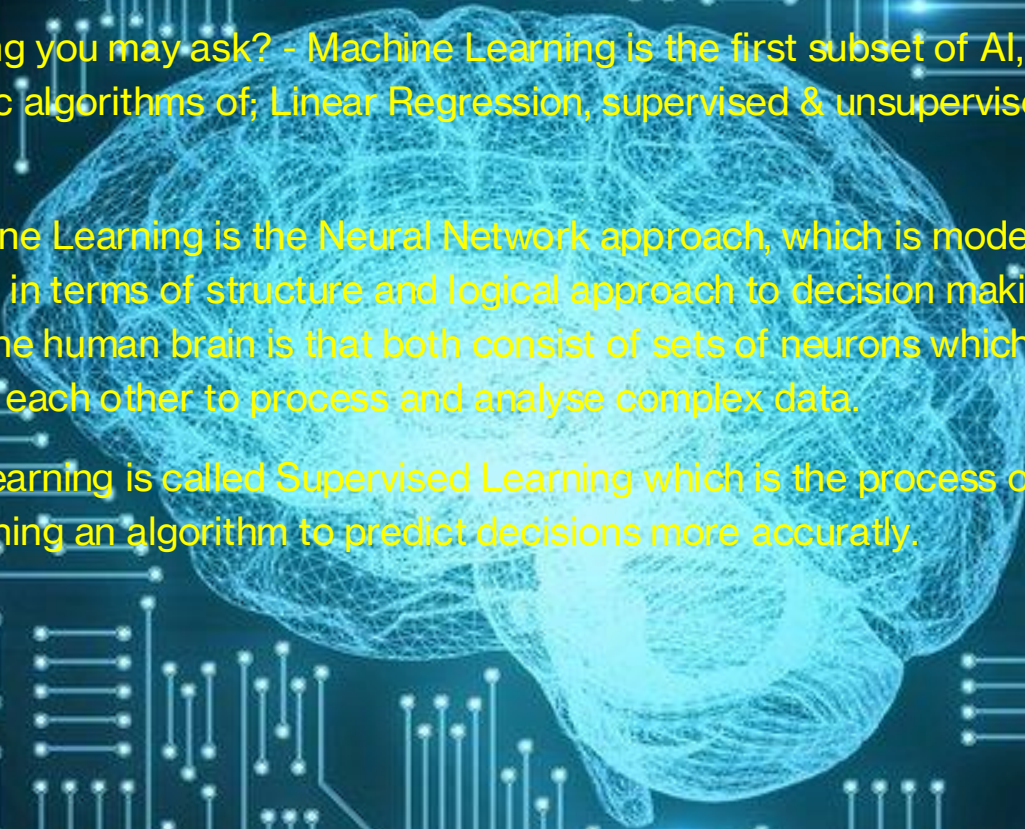
# What is AI

- AI stands for 'Artificial Intelligence', which enables computers & machines to simulate the human brain, to mimic human creativity, learning & Autonomy.
- There are many definitions of what exactly Artificial Intelligence is, a good in depth definition is; "AI is a field of computer science focused on creating smart machines that can perform tasks that typically require human intelligence". - What is Artificial Intelligence (AI)?Google Cloud<https://cloud.google.com/learn/what-is-artificial-intell..>
- Artificial Intelligence is a broad term which encompasses various subsets, which range from; Artificial Intelligence, Machine Learning, Deep Learning & Generative AI
- AI has a plethora of domains including but not limited to; Health care, education & the Automotive industry.



# What is Machine Learning?

- What exactly is Machine Learning you may ask? - Machine Learning is the first subset of AI, which deals with developing models which implement specific algorithms of; Linear Regression, supervised & unsupervised learning to make predictions or decisions based on data.
- The most popular form of Machine Learning is the Neural Network approach, which is modeled or developed in close resemblance to the human brain in terms of structure and logical approach to decision making. A clear example of similarity between a neural network and the human brain is that both consist of sets of neurons which send impulses via nodes (Synapses for a human brain) to each other to process and analyse complex data.
- The simplest type of Machine Learning is called Supervised Learning which is the process of grouping objects or data into classifications and then training an algorithm to predict decisions more accurately.

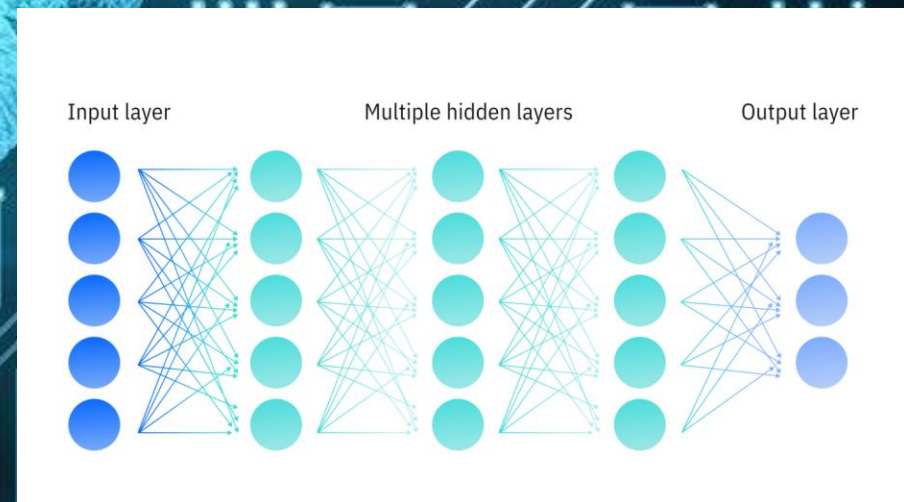




# What is Deep learning?

- The next subset of AI is DeepLearning, which builds on the notion of Neural Networks and creates a concept of multilayered neural Networks which is a more accurate way of mimicking the complex decision making of the human brain
- A large advantage to DeepLearning is that it doesn't require any human intervention, which means it allows machine learning to operate at a large scale which means it is useful for applications which use natural language processing (ChatGPT, DeepSeek, & Google Gemini).

- Unlike the previous section, DeepLearning includes an output layer , usually hundreds of hidden layers and an output layer which altogether enable unsupervised learning!





# Generative AI

- What is Generative AI? - Generative AI (also referred to as GenAI) is a subsection of AI which builds on the notion of DeepLearning which is used to build complex original content, such as; Text, images, Video & Audio.
- Generative AI has evolved from one thing to the other over the previous decade. GenAI has evolved into three types of DeepLearning models, including;
- Variational autoencoders – which is a model that was introduced in 2013, which is a model that is capable of generating multiple versions of content in response to the what the user prompts, in the case of this project, this will be used for simulated user data.
- Diffusion Models – These were introduced in 2014, which effectively add noise to the image and then remove that noise to generate original images in response to prompts.
- Transformers - A transformer is something which is trained on sequenced data to generate extended sequences of content (Senetences & Code).



# Practical benefits of AI

- AI has 5 key benefits across many industries including: Automation of repetitive tasks, Enhanced Decision Making, Fewer human Errors, 24x7 availability, 24x7 availability, Reduced Physical Risk. However, there are many risks to AI which can affect your business, including; Data Risks, Model Risks, Operational Risks, as well as Ethics & Legal Risks.

Benefits	Weaknesses
<b>Automation of repetitive tasks:</b> AI has the ability to 'automate' tasks in which a human or some other entity may find tedious such as data collection, entering and preprocessing, as well as, physical tasks including; warehouse stock picking and manufacturing processes.	<b>Data Risks:</b> AI relies on data sets to calculate decisions and analyze predictions. Sometimes, these data sets can become vulnerable to data poisoning, data tempering, data bias and cybersecurity threats. However, there are ways to limit these threats, two ways of implementing these is by protecting data integrity and implementing security and availability throughout the entire AI lifecycle, from training to deployment and then to post deployment.
<b>Enhanced Decision Making:</b> AI possesses the ability to calculate more accurate predictions and more reliable data driven decisions.	<b>Model Risks:</b> There may be some instances where 'Threat Actors' may target AI models for theft, reverse engineering or unauthorised manipulation. There may also be some instances where an attacker might compromise a model's integrity by tampering with its architecture, weights or parameters, which are the core components which determine an AI model's behavior, accuracy and performance.
<b>Fewer Human Errors:</b> AI reduces human error by a substantial amount, being able to guide the human (user) through the proper process to complete their goal/objective. In fact, AI can solve a problem independently by not needing human interaction altogether, allowing total autonomy from its designer.	<b>Operational Risks:</b> Like any model, an AI model may become susceptible to operational risks such as model drift, bias and breakdowns in the governance structure. If these problems are left unchecked, they can lead to system failures and cybersecurity vulnerabilities.

# AI Ethics and Governance

- AI has various ethical and legal procedures that are used to 'asses' how well an AI system will perform in an industry setting and what procedures it will follow to keep itself and the user safe.
- An ethical approach to AI goernance will require the involvement of many stakeholders, which will include, developers, users, policymakers & ethicists. All of which are used to help make sure the AI System align with societies values. Here are some Ethical AI lawful procedures that keep in line with society's values:

<b>Explainability &amp; Interprability</b> ----->	<ul style="list-style-type: none"><li>• AI systems will become more advanced over time, which means humans may struggle to comprehend and retrace how an algorithm came to a result. This is where Explainable AI come in, this is a set of processes or methods which enables human users to interpret, trust and comprehend the results and output created by an algorithm.</li></ul>
<b>Fairness and inclusion</b> ----->	<ul style="list-style-type: none"><li>• We know that Machine Learning is a form of statistical discrimination this is where the discrimination becomes objectionable when it places privileged groups at a systematic advantage and certain unprivileged groups at a systematic disadvantage, which could lead to potential harms. To eliminate this, practitioners may try to minimize algorithmic bias across data collection and model design.</li></ul>
<b>Robustness and Security</b> ----->	<ul style="list-style-type: none"><li>• This section handles exceptional conditions, such as abnormalities in inputs or malicious attacks, without causing unintentional harm, also, it is able to withstand against intentional and unintentional interference by protecting against exposed vulnerabilities.</li></ul>



## AI in Healthcare

- AI has various applications in Healthcare, ranging from; improving diagnostics, personalising treatments by analysing patient data & Clinical decision support.
- Within Healthcare, AI utilises Machine Learning, deep learning and other technologies to process vast data sets, which improves speed and efficiency by reducing the amount of time it takes to prescribe a patient their medication and run tests to predict what could happen in the near future.

**Return of Investment:** Back in 2023, a study operated by Microsoft found that healthcare organizations achieved a demonstrable return on AI investments within 14 months, with an estimated US\$3.20 mean ROI for every dollar spent on an AI project and initiative.

**Operational efficiency:** AI can be used to automate several tasks which means decisions will be speed up compared to if a human were to make a decision. An example of this would be using Natural Language Processing for speech – text capabilities to streamline the electronic health records documentation process. Furthermore, going back to previous slide of GenAI, GenAI can be used to guide staff through processes in healthcare.

**Personalized medicine:** Within Healthcare, AI can be used to develop a personalized medicine program for a patient, by analyzing data to predict the most effective therapies.

**Accelerated research and discovery:** AI can be used to enhance research and development processes, accelerate drug discovery, optimize clinical trials & aid in personalized medicine.