**3. AI and the Blockchain**

a)

AI or narrow AI is where we currently are in our development of AI. General AI is what we are working to get to. Narrow AI is the ability of a machine to learn how to perform a single task. This knowledge is gained from completing a previous task, it is not necessarily reused when attempting to complete a new task, it will generally start a new task from scratch and not make use of previous information. Narrow AI has many adaptions in today society.

There are face/image recognition AI software. This is software which can sort through thousands of photos and learn to identify individuals faces or different objects. These services are provided by companies such as Apple and Facebook.

Another emerging use for AI is autonomous cars. This is being done by allowing some autonomous cars onto the street to collect large sums of real-world data. From this data, the AI can learn how to adapt to different driving situations.

Whereas general AI is a large step ahead from narrow AI. General AI is software that can complete any task that a human could complete. It is the idea of creating a machine that can learn, think, and understand. People working on general AI are having to find a way to make a machine conscious. This sort of AI is generally what is seen in sci-fi movies.

b)

A Turing complete program or a programming language that allows you to operate Turing complete programs is one where the program can express all possible programs. It was invented by Alan Turing alongside the concept of a Turing machine, which is a theoretical computer that can run any program. So, anything that is equivalent to the Turing machine is Turing complete.

Turing machine will involve using loops to configure the output. An important characteristic of Turing complete program is that when it does go into a loop, you do not know if the machine will reach a conclusion and stop running as it may get stuck in a continuous loop. This statement was proved by Alan Turing himself. This means that if you set a Turing complete program a task it has an unpredictable run time.

An incomplete Turing program is a program which is simple enough that it doesn’t have the ability to have unlimited loops. You can work out how long a task will take an incomplete Turing program.

Turing complete programs can:

* Make Decisions
* Run Forever
* Use infinite memory
* Read and write data to RAM

c)

On the blockchain there are some applications which are Turing complete, whilst some are not. But for Bitcoin, it was purposely designed so that it is not Turing complete. This is to help reduce the complexity of the system, thus therefore minimising the level of risk. Furthermore, keeping the whole process as simple as possible the developers can better understand and predict the way in which Bitcoin will react.

However, Craig Wright believes that Bitcoin is Turing complete, because it would be sufficient to show that Bitcoin uses a dual stack architecture that acts as a dual counter machine. Such systems have already been demonstrated as being Turing complete (Wright, 2017).

Other blockchains such as Ethereum have been designed as Turing complete. This allows for the Ethereum network to be able to operate smart contracts. Ethereum will be able to recognise and input any agreement in the future. The Turing completeness designed into Ethereum means that it will be to complete any task that it is given, if it is provided with enough time and processing power (Turing Complete, 2022).

d)

Blockchain technology looks like it is going to be a perfect partnering technology to AI. As blockchain is a good method of storing and collecting information safely and AI operates by analysing data (Shroff, 2020). Many AI sources will begin to start running on the blockchain networks, which will increase the AI’s ability to machine learn. The effects of the combination of these two technologies is going to have a significant impact in almost all industries.

AI will benefit blockchain by creating an incredibly reliable technology enabled decision making system. With AI, the blockchain technology will become safer by securing future applications. An example of this is the use of AI to make decisions about if a financial transaction is fraudulent or not. AI can also help to improve the efficiency and optimise the running of the blockchain network.

Blockchain will massively enable the use of AI. As AI is fuelled by large sums of data, it must rely on this information to be accurate and not tampered with. It is also critical that some of this data that the AI is accessing is not breached. That is where blockchain technology will help, with the use of encrypted distributed data storage, sensitive data can remain safe whilst AI works on it. \*\*\*