**Modified**

Now, you're probably getting quite confused at this point. You've heard terminologies like artificial intelligence (AI), intelligent systems, machine learning, and many more. The question arises: Are they the same or different, and how are they related? With the abundance of terminologies like intelligent agents, cognitive computing, computational intelligence, machine intelligence, and more, confusion can arise. Let's demystify these terms.

Starting with artificial intelligence (AI), it's become an umbrella term, used across paradigms to describe systems with intelligent traits. If a system possesses characteristics of intelligent behaviour, it's referred to as powered by AI. However, AI's definition isn't uniform; it varies among people. Some define AI as a system that thinks, while others emphasize acting.

The benchmark for intelligent thinking or acting can either be human or ideal standards called rationality. This gives rise to four AI definitions: thinking like a human, thinking rationally, acting like a human, and acting rationally.

Intelligent agents emerge from these definitions. While some focus on thinking or acting, many AI researchers strive to produce AI systems that act rationally. This is because action is often necessary for usefulness. Rationality, aiming for outcomes that benefit humans and the world, becomes a defining factor. Intelligent agents, built using AI technologies, embody this paradigm.

Machine learning, a popular field, falls under AI. It develops technologies enabling AI systems to learn—a key trait of intelligent systems. While machine learning contributes to AI, other subfields are essential for tasks like problem-solving and reasoning.

Cognitive computing, championed by IBM's Watson, mimics human thinking. It aims to develop systems that think and reason similarly to humans. Another paradigm is computational intelligence and soft computing, using heuristic approaches like genetic algorithms and neural networks.

Machine intelligence, used interchangeably with AI by some, is another term in this landscape. All these distinctions lead back to intelligent systems. In our unit, we adopt these various techniques. As long as your system integrates relevant technologies—machine learning, reasoning, problem-solving—it's considered intelligent.

This broad definition allows us to explore different technologies' suitability across domains. Now, let's look at recent achievements. Google DeepMind's milestone of beating a human champion in the complex game Go showcases machine intelligence. Another complex task, autonomous driving, is achieved by machines, demonstrating their abilities. IBM Watson's success on the Jeopardy! game show and OpenAI's GPT models exemplify conversational AI's advancements.

So, these technologies enable machines to engage in intelligent conversations, even in specialized domains like programming.

**Summarise**

The lecture addresses the confusion surrounding terms like AI, intelligent systems, and machine learning. These terms, often used interchangeably, can cause misunderstandings. AI serves as an overarching term for intelligent systems, encompassing various definitions and viewpoints. These definitions range from systems that think or act like humans to systems that think or act rationally. The concept of intelligent agents emerges from these definitions, focusing on systems that act rationally to achieve positive outcomes.

Machine learning, a subset of AI, empowers systems to learn—a vital characteristic of intelligent behaviour. This, along with other subfields, contributes to building comprehensive AI systems. Cognitive computing mimics human thinking, while computational intelligence employs heuristic approaches. The terms "machine intelligence" and "AI" can sometimes be used interchangeably.

Ultimately, all these distinctions circle back to the broad concept of intelligent systems. These systems, equipped with various technologies, exhibit intelligent traits such as problem-solving, reasoning, and learning. Recent achievements in the field, like Google DeepMind's Go victory and advancements in conversational AI by OpenAI's GPT, exemplify the progress in developing intelligent systems that can engage in complex tasks and meaningful conversations.

***Important***

**ARE AI AND MACHINE LEARNING THE SAME?**

You have heard about terminologies such as artificial intelligence AI. You also heard about intelligence systems and then machine learning. Are they the same thing, are they different and how are they related?

**ARTIFICIAL INTELLIGENCE (AI)**

AI has now been used as an umbrella, buzzword, echo verse, almost every paradigms for building system that are intelligent. Different people will have different definitions for AI. Many AI researchers aim to produce AI system that act rationally.

**AI'S DEVELOPMENTS**

Google DeepMind has achieved the important milestone of defeating the human champion in the game Go. Now the machine has been able to achieve this level of intelligence and perform rival, less car, autonomous driving as well.

**SIX TECHNOLOGIES ADVANCING ARTIFICIAL INTELLIGENCE**

OpenAI chat, GPT. And another probably less popular, less famous is Google's Bark AI. These are the technologies that allow the machine to have a very intelligent and meaningful conversation with human.

**Original**Now, you probably getting quite confused at this point. You have heard about terminologies such as artificial intelligence AI. You also heard about intelligence systems and then machine learning and many more Terminologies. So the question is, are they the same thing, are they different and how are they related? So, because of the plethora of Terminologies here and there are also some other terminologies including intelligent agents, cognitive computing, computational intelligence, machine intelligence, subcomputing. So it may cause some confusion. So, here, let me try to demystify these terminologies here. Let's start with the first one. So, artificial intelligence AI, this has now been used as an umbrella, buzword, echo verse, almost every paradigms for building system that are intelligent. And so, if you have a system that considered to have some of these characteristics of being an intelligent systems, then we will refer to the system being powered by AI. And with this particular terminology is very popular one AI. Then again, is not a unique definition for AI because different people will have different definitions for AI. Some people will define AI as a system that only need to think. And some other people define AI as system that require to act. On the other hand, doesn't matter whether the system is only able to think or is also able to act. Now, what would be the benchmark for this thinking or acting to be considered to be intelligent? Then this benchmark can be either used human as the benchmark for intelligence or using some ideal standards, ideal benchmark called rationality to indicate whether the system that performing that thinking or that acting can be considered to be intelligent or not. So, because of you have the two dimensions. One is that differentiates between thinking and acting, and the other one differentiates between intelligence being achieving human level intelligence or some ideal level of intelligence called rationality. So, we arrive at four different definitions for AI system. The AI system that thinks like a human, or an AI system that thinks rationally. And also the AI system that act like a human. And the AI system that acts rationally. Then we have the concept of intelligent agents. Now, among the four definitions you still remember from the previous slide, we talked about system that think rationally, system that act rationally, system that think like a human, system that act like a human. Then many AI researchers aim to produce AI system that act rationally. Because just think alone most of the time is not sufficient for the system to be useful for humans. And so the system also need to act, need to perform some action to make changes into the physical world or the cyber world. And then these actions need to be performed in a way that is achieved a really good outcome. So we don't want to perform some random action or an action that cause harms. We want action that achieve good outcomes for humans, for the world. And so that's why we aim for system that act rationally because we then can define rationality as achieving the good outcomes. Now if you focus on this paradigm of AI to build system that act rationally, then you essentially join to build intelligent agents which is the name for system that act rationally. So you can see that intelligent agents essentially just use AI technologies in order to build a system that acts rationally. And then we have machine learning, which is very popular these days. In the end, machine learning is a subfield of AI and you can clearly see that this subfield aim to develop the technologies to allow the AI system to be able to learn. And you remember in our earlier slides we talked about a system that is able to learn as being one of the characteristics of intelligent systems. So now clearly this subfuel allow us to be a system that can learn, but then we also need all the subfuels in order to develop system that can solve problem, that can perform reasoning, inference and so on and so forth. So machine learning is just one of the important contributors to build AI. Then we have cognitive computing and this has been advocated by IBM, the company that developed the Watson cognitive computing technology. And so typically it's referred to the technology platform that enable computers to mimic the way that human mind works. And so in a way is aiming towards develop system that applier human by the development of thinking in the same way that human would think and solve problem and reason. And then there are some paradigms of artificial intelligence that been devoted by quite a number of AI researchers called computational intelligence and soft computing. So the researchers working in this paradigm trying to solve the problems using some heuristic based approaches. So some of the example is genetic algorithms, evolutionary computing or particle swarm optimizations and ant colony optimization and fursy systems and so on and so forth. And also neural networks typically has been developed by these researchers as well. And then we also have the terminologies called machine intelligence which is essentially used by some people to refer to AI. So instead of calling artificial intelligence, they call machine intelligence. All right, so now after we have seen all these differentiations of many different terminologies and so on and so forth, now we can come back to looking at intelligent systems. Now our unit we will adopt all of those techniques that I mentioned in those previous slides. So as long as the system that you develop carry some of the technologies in those lives, could be machine learning, could be reasoning, could be complex problem solving, could be genetic algorithm, could be neural network, then we will refer to those systems as intelligent systems. So our definition of intelligent systems becomes very broad so that when you learn about those technologies and you build system, you build a solution that enabled by one of those technologies, then the solution that you develop will be considered intelligent systems. By doing that, we allow ourselves to study those different technologies and then learn about their suitability in different problem domains, in different applications in order to assess whether a particular technique or a particular technology will be suitable to solve the problem that we have in a particular domain. And therefore we will be able to choose the right solution, the right technique, and the right technologies. So with that, let's go to looking into a number of recent achievements of intelligent systems. So, Google DeepMind has been developed and achieved the important milestone of defeating the human champion in the game Go, which is a very complex game with a very large surf space. And therefore this is an important milestone for the machine to achieve towards its ability to become intelligent or driving a car. So this is a very complex task that require the person who is capable of doing this to have intelligence in terms of having skills, having the knowledge in order to choose the right action, in order to safely navigate the car from the origin to the desired destination, safely and legally. And so you can see that this is a complex task that humans with our intelligent capabilities is able to perform quite well. Now the machine has been able to achieve this level of intelligence and perform rival, less car, autonomous driving as well. You probably have heard about IBM Watson, the cognitive computing technologies developed by IBM, and then know this is an important milestone that AI has achieved, because this kinetic computing technology is able to defeat these very intelligent human champions of this Jeopardy game show, okay? And then able to understand human speech and then answer the questions and doing that better than the human champions, the former champions of Jeopardy game show. And now we are going to look at the very important achievements of intelligence systems that just become popular and famous very recently. So OpenAI chat, GPT. And another probably less popular, less famous is Google's Bark AI. And so these are the technologies that allow the machine to have a very intelligent and meaningful conversation with human, answering many questions and answer them those questions in a very knowledgeable way. And these questions come in not only about some general English or human language based text, but also in the domain such as programming. So you can ask Chachi PT to write a program for you, for instance.