



# Sadiq Public School

Do the right, fear no man

**Subject: Computer Science**

**Class: H1**

**Saturday, 16<sup>th</sup> November, 2024**

**Lesson: This Lesson is about Artificial intelligence (AI)**

## **A: Inquiry**

Do you know about AI and its impact on society and environment?

## **B: Information:**

**Artificial intelligence (AI)** is a machine or application which carries out a task that requires some degree of intelligence when carried out by a human being. These tasks could include

- » the use of a language
- » carrying out a mathematical calculation or function
- » recognising a person's face
- » the ability to operate machinery, such as a car, an aeroplane or a train
- » analysing data to predict the outcome of a future event, such as weather forecasting.



AI has made substantial progress in recent years, and its integration with robotics has proven to be a natural progression. While AI in robotics is not yet widespread, it's rapidly gaining momentum as AI systems become more advanced. The combination of AI and robotics holds tremendous potential, leading to increased productivity and efficiency, improved safety and greater flexibility for workers in a variety of professions. One of the key ways in which AI is used in robotics is through machine learning. This technique enables robots to learn and perform specific tasks through observing and mimicking human actions. AI gives robots a computer vision that enables them to navigate, detect and determine their reactions accordingly. This helps them go beyond simply performing repetitive tasks to become true "cognitive collaborators."

Another way that AI is used in robotics is through edge computing. AI applications in robotics require the interpretation of massive amounts of data gathered by robot-based sensors in real time, which is why this data is analyzed close to the machine, rather than being sent off to the cloud for processing. This approach provides machines with real-time awareness, enabling robots to act on decisions at a rate much quicker than human capabilities allow.

AI also helps robots learn to perform specific tasks through the use of various sensors, which may include:

- Time-of-flight optical sensors
- Temperature and humidity sensors
- Ultrasonic sensors
- Vibration sensors
- Millimeter-wave sensors

These sensors help robots to learn and adapt, making them more intelligent and better equipped to act and react in different scenarios.

These are just a few of the ways that artificial intelligence is used in conjunction with robotics.

### **Applications of AI in Robotics**

In the world of robotics, AI has proven to be a valuable asset in a variety of applications. From customer service to manufacturing, AI has made its mark and continues to revolutionize the way we think about and interact with robots. Let's take a closer look at some of the key areas where AI is being used alongside robotics today.

**Customer Service:** AI-powered chatbots are becoming increasingly common in customer service applications. These automated service agents can handle simple, repetitive requests without the need for human involvement. The more these systems interact with humans, the more they learn. And as AI systems become more sophisticated, we can expect to see more and more robots being used in customer service in both online and brick-and-mortar environments.

**Assembly:** AI has proven to be an invaluable tool in robotic assembly applications, especially in complex manufacturing industries such as aerospace. With the help of advanced vision systems, AI can enable real-time course correction and can be used to help a robot automatically learn the best paths for certain processes while in operation.

**Packaging:** AI is used in the packaging industry to improve efficiency, accuracy and cost-effectiveness. By continuously refining and saving certain motions made by robotic systems, AI helps make installing and moving robotic equipment easier for everyone.

**Imaging:** Across many industries — including assembly and logistics — accurate imaging is crucial. With the assistance of AI, robots can achieve enhanced visual acuity and image recognition competencies, enabling greater accuracy in even the smallest of details.

**Machine Learning:** Machine learning is a powerful tool for robots. By exploring their surroundings, robots can learn more about their environment, find ways around obstacles and solve problems to complete tasks more efficiently. From home robots like vacuum cleaners to manufacturing robots in factories, machine learning is helping robots become more intelligent and adaptable in their work.

These are just a few of the many applications of AI in robotics today. As these technologies continue to expand and grow in sophistication, it is likely that we will see even more innovative applications in the near future.

### **Use of AI in Medical Field**

The Internet-of-Things (IoT) era promises hundreds of billions of devices or physical objects connected to the Internet. These objects include sensors, actuators, and processing elements that help us gather data, make intelligent decisions, and optimize processes. IoT is expected to have a potential economic impact of more than \$10 trillion per year by 2025, with \$2 trillion (its largest fraction) coming from smart healthcare applications. Smart healthcare encompasses applications of various Artificial Intelligence / Machine Learning technologies in healthcare. These applications will be enabled by various technologies:

**(i) Neural network-based disease detection** using wearable medical sensors present in smartwatches and smartphones that communicate with a health server to enable a physician to keep track of a patient's health. These sensors include Galvanic skin response, heart rate, skin temperature, blood oxygen, blood pressure, accelerometer, gyroscope, etc. These neural networks can be embedded inside an App in the smartwatch or

smartphone. Just one neural network could detect many diseases using multiple heads, one per disease. This can be done very energy- efficiently, thus not draining the battery of these devices much. They could be personalized by deciding which diseases the user is interested in monitoring and attaching the corresponding heads to the neural network body. After the disease is detected, the same models can be used to maintain well-being by flagging extreme manifestations of the condition.

**(ii) Interpretability:** Decisions made by the machine learning models need to be interpretable in order to foster confidence in their decision-making. A new type of machine learning model, called differentiable logic networks, can provide this interpretability since they are based on Boolean logic even though they are trained in the same way as neural networks. Interpretability is a very important criterion in Medicine to first ensure no harm comes to the patient based on the predictions made by the machine learning model.

**(iii) Personalized medical decision-making:** Several therapies or interventions are often available for many diseases. Which one is employed for a particular patient is often decided based on trial and error. With the advent of transformers that can capture spatiotemporal characteristics of data obtained from patient cohorts that have previously undergone various therapies, it is now possible to predict which therapy would work best for a particular patient. This opens up a new era of personalized medical decision-making.

## The impacts of AI on society, the economy and the environment

As a result of increasing automation over the next few decades, the human race will need to consider the impacts that AI will have on society, the economy and the environment. So should we all be worried? In this section, we will consider a number of existing AI technologies, plus some predictions for the future, to help stimulate discussions.

- Please read what your text book says about copyright issues (Topic 7.2 Page# 189-193)
- Please watch the brief youtube video <https://www.youtube.com/watch?v=ad79nYk2keg>  
<https://www.youtube.com/watch?v=eaJd3muf2E> <https://www.youtube.com/watch?v=ng4c1g3COfs>

### C: Absorbing the information:

- Write your own summary notes about AI and its impact and use of AI in different fields.

### D: Practicing

**Q1.** In 2017, Diane Bryant, the chief operating officer of Google Cloud, claimed that AI can:

- help us manage the Earth's very scarce resources
- improve cancer diagnosis using precision medicine leading to customised treatments
- lead to improvements in human rights in many countries due to cloud computing, better connectivity and reduced costs in developing faster computers.

Describe, with examples, why Ms Bryant's claims could help people in the future.

**Q2.** Give **three** different examples of AI. For each of your examples, give **one** benefit and **one** drawback to the general public.

- Write your answers into an email message and send it to your teacher.

**Students:** if you have any questions about the topic, anything you didn't understand, please send an email to your teacher

Class	Teachers' Name	Teachers' Abbreviation	Teachers' Email Address	Instructions
H1A	Bilal Mustafa Khan	BMK	<a href="mailto:bilal.rohaila@gmail.com">bilal.rohaila@gmail.com</a>	H1A students will send their home assignments to their subject teacher (BMK) for checking and getting feedback.
H1G	Fatima Saeed	FTS	<a href="mailto:famisaeed@gmail.com">famisaeed@gmail.com</a>	H1G students will send their home assignments to their subject teacher (FTS) for checking and getting feedback.