Machine Learning

Artificial Intelligence (AI) is a broad term covering the concept of machines mimicking human functions like learning and problem-solving.

Machine Learning is a specific approach within AI that focuses on using algorithms to learn from data.

Machine learning allows computers to **learn without explicit programming**. By **analysing large amounts of data**, algorithms **identify patterns and relationships**. These patterns are then used to **make predictions** or decisions on new, unseen data. The more data the machine learning model is trained on, the better it becomes at recognising patterns and improving its accuracy.

Examples of machine learning:

Recommendation algorithms – eg. on Netflix/Amazon/Spotify etc

Image recognition algorithms – eg. facial recognition used by security forces or tagging on social media;

Self-driving cars

Supermarkets – eg. robots packing efficiently; personalising customer recommendations

Medical – used to analyse images (X-rays, MRI scans), blood test etc to identify diseases

Concerns over machine learning?

Bias, transparency (how data is used)**, accountability, job displacement, security, privacy** (large amounts of data used in machine learning)

Questions

1. Artificial Intelligence (AI) is a field of computer science that focuses on:

   (a) Making computers faster
   (b) Enabling machines to exhibit human-like intelligent behaviour
   (c) Upgrading computer hardware
   (d) Creating user-friendly interfaces

2. Machine learning is a subfield of AI that allows computers to learn from:
   (a) User manuals
   (b) Specific instructions
   (c) Pre-written code
   (d) Large amounts of data

3. Which of the following is NOT a benefit of using machine learning?
   (a) Improved accuracy in tasks like spam filtering
   (b) Automating repetitive tasks
   (c) Understanding human emotions
   (d) Making data-driven predictions

4. An example of machine learning in action is:
   (a) Following a set of instructions in a program
   (b) Recommending movies based on your watch history
   (c) Performing basic calculations
   (d) Using a keyboard and mouse

5. Bias in a machine learning system can occur when:
   (a) The training data is very large.
   (b) The training data reflects existing biases.
   (c) The computer hardware is outdated.
   (d) The machine learning algorithm is complex.

6. What are some of the benefits of using machine learning in technology?

7. One concern surrounding machine learning is bias. Explain how bias can be introduced into a machine learning system.

8. What is the importance of using large datasets for training machine learning models?

9. Imagine a program that is designed to identify spam emails. Briefly describe the steps involved in training a machine learning model for this task.

10. What are some of the ethical considerations when developing and deploying AI and machine learning systems?

ANSWERS

1. (b) Enabling machines to exhibit human-like intelligent behaviour
2. (d) Large amounts of data
3. (c) Understanding human emotions
4. (b) Recommending movies based on your watch history
5. (b) The training data reflects existing biases.

6. Faster data processing; spotting patterns or making predictions that humans wouldn't spot or just doing this faster and more efficiently. Automation of repetitive tasks frees up humans for other tasks. Recommendations may be a benefit to people who can more quickly find content they want.

7. Bias can be introduced by using data sets that contain existing biases. Eg. if women have traditionally not done certain jobs, then machine learning will 'learn' that these jobs are only for men. Using data sets that are too small can also lead to bias. Unconscious programmer bias can also cause algorithmic bias.

8. It is important to use large data sets to reduce bias and to improve the accuracy of predictions and decision-making.

9. Thousands of emails would be fed into the system. These emails would be labelled as 'spam' or 'not spam'. As long as the data given to the system was itself accurate the system will learn to recognise spam emails.

10. **Bias** in training data can lead to discriminatory outcomes, and the lack of **transparency** in machine learning systems makes it difficult to identify and address potential biases or errors. **Privacy** concerns arise due to the vast amount of data used for training, and **job displacement** due to automation requires focus on retraining the workforce. Establishing clear **accountability** for developers and users is crucial, and international collaboration is necessary to prevent the weaponisation of AI and ensure its responsible development for the benefit of society.