

Emerging Technologies Lecture 3 Notes

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Definition

Artificial Intelligence (AI) algorithms are step-by-step methods or instructions that help machines perform tasks requiring human-like intelligence such as learning, decision-making, and problem-solving.

- **Explainable (Whitebox) Algorithms** → Transparent and easy to understand.
- **Unexplainable (Blackbox) Algorithms** → Complex and hard to interpret.

1. Explainable (Whitebox) Algorithms

Explainable (white-box) algorithms are models whose decisions can be easily understood by humans, with clear steps showing how the output is reached.

Example:

A rule-based traffic fine system: If you exceed the speed limit by a certain amount, a fixed fine is applied. The rules are clear, and you can easily see how the decision (fine) was made.

a) Decision Trees

A decision tree is a model that works like a flowchart, where a series of yes/no questions are asked to reach a final decision or prediction.

Example: Identifying an animal:

- Does it have feathers? → Yes → It's a bird.
- Does it have fur? → Yes → It's a mammal.

Example: Deciding what to wear based on weather:

- Is it raining? → Yes → Wear a raincoat
- Is it raining? → No → Is it sunny? → Yes → Wear light clothes
- Is it sunny? → No → Wear normal clothes

b) Linear Regression

Linear regression is a machine learning method that uses past data to find a straight-line relationship between variables and predict numerical values.

Examples of Linear Regression:

- **House price prediction:** Bigger house size → higher price
- **Study vs marks:** More study hours → higher score
- **Salary prediction:** More experience → higher salary
- **Sales prediction:** More advertising → more product sales

c) Rule-Based Systems

Rule-Based Systems:

Rule-based systems use a set of “if-then” rules to make decisions. These rules are written by humans to guide the computer on what action to take in different situations.

Example: In a game:

- If there is an obstacle ahead → then jump
- If enemy appears → then attack
- If health is low → then hide or heal
- If coin is found → then collect it

2. Unexplainable (Blackbox) Algorithms

Unexplainable (Black-box) Algorithms:

Black-box algorithms are advanced AI models whose internal decision process is hidden or too complex to understand clearly. We can see the input and output, but not how the result is produced.

Examples:

- Face recognition in smartphones
- YouTube or TikTok recommendation systems
- Spam email detection
- Self-driving car decision-making systems

Multiple Choice Questions (MCQs) on Artificial Intelligence Algorithms

1. What are AI algorithms?

- a. Random computer games
- b. Step-by-step methods for machines to perform intelligent tasks
- c. Only hardware parts of a computer
- d. Internet browsing tools

Answer: b. Step-by-step methods for machines to perform intelligent tasks

2. Which of the following is a feature of explainable (white-box) algorithms?

- a. Hidden decision process
- b. Difficult to understand
- c. Transparent and easy to understand
- d. No output is given

Answer: c. Transparent and easy to understand

3. What do black-box algorithms mean?