

Chapter 2 Answer Key

GUIDED NOTES

Key Terms

1. Artificial Intelligence (AI): Technology that allows computers to perform tasks that normally require human intelligence.
2. Algorithm: A set of rules or steps that tell a computer how to solve a problem.
3. Data: Information that AI uses to learn patterns and make decisions.
4. Machine Learning: A type of AI where computers learn from examples instead of being directly programmed.
5. Training: The process of showing AI many examples so it can find patterns and improve.

Main Concept Overview

Fill in the blanks:

1. Instead of giving computers **specific** instructions for every situation, machine learning allows AI to learn from **examples**.
2. When training AI, it makes its best guess, checks if it was right, and adjusts to do better with more **practice**.
3. AI systems are good at recognizing **patterns** in data and making **predictions** based on what they've learned.

Matching Section

- C 1. Data: Information that AI uses to find patterns
A 2. Algorithm: Step-by-step instructions that tell a computer how to solve a problem
E 3. Machine Learning: Type of AI that learns from examples instead of being directly programmed
B 4. Training: The process of showing AI many examples so it can improve
D 5. Artificial Intelligence: Technology that allows computers to perform tasks that typically require human intelligence

True/False Questions

- F 1. AI systems do not understand meaning like humans; they only recognize patterns.
T 2. Machine learning allows computers to learn without being programmed for every situation.
T 3. AI needs specific training for each different job it performs.
F 4. Even trained AI systems make mistakes and need to continuously improve.
F 5. Current AI does not have feelings or consciousness like humans.

Fill in the Table

Training Step	What Happens
Gathering data	Collecting labeled examples (like pictures, text, or numbers) that the AI will learn from
Learning patterns	The AI analyzes the data to find connections and recognize important features
Making predictions	The AI uses what it learned to make guesses about new information it hasn't seen before
Getting feedback	The AI checks if its predictions were right or wrong, which helps it improve

Critical Thinking Questions (Sample Answers)

1. How is the way AI learns different from how you learn in school?

Sample Answer: AI learns by analyzing huge amounts of data and finding statistical patterns, while humans learn through understanding concepts and making meaningful connections. AI needs thousands of examples to learn something simple like recognizing cats, while humans might only need to see a few cats. Humans can apply knowledge across different situations more easily, while AI is limited to what it was specifically trained for. However, both AI and humans improve with practice and feedback.

2. Why is it important for humans to stay involved in decisions made by AI?

Sample Answer: Humans should stay involved in AI decisions because AI lacks understanding of context, ethics, and real-world consequences. For example, in healthcare, an AI might recommend a treatment based on patterns in medical data, but a doctor understands the patient's full situation, preferences, and other factors the AI might not consider. AI might also have biases based on its training data that humans need to recognize and correct. Some decisions also involve ethical judgments that AI isn't equipped to make.

How AI Works

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Artificial Intelligence	Training	Testing
Prediction	Pattern	Machine
Learning	Feedback	Data
Algorithm		

How AI Works

Across 1

4. Technology that allows computers to perform tasks that normally require human intelligence, such as making decisions or recognizing patterns. (abbrv.)

6. A regular and repeating arrangement or sequence that AI systems can identify in data.

8. The process of showing an AI many examples so it can find patterns and learn to make accurate predictions.

9. A set of rules or step-by-step instructions that tell a computer how to solve a problem or complete a task.
10. A guess or forecast that an AI makes based on patterns it has learned from data.
11. Checking how well an AI performs on new information it hasn't seen before.

10. Information about whether an AI's predictions are right or wrong, which helps it improve over time.	examples and adjusting their understanding.	3. Information that AI systems use to learn patterns and make predictions.	7. A type of AI where computers learn from examples instead of being directly programmed for every situation. Learning
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Across

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6. A regular and repeating arrangement or sequence that AI systems can identify in data.

8. The process of showing an AI many examples so

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8 T R A I N I N G

9 A L G O R I T H M

10 F E E D B A C K

9. A set of rules Down 2. A guess or 5. Checking how

or step-by-step instructions that tell a computer how to solve a problem or complete a task.

10. Information about whether an

1. The process where AI systems improve their performance by analyzing examples and adjusting their understanding.

3. Information that AI systems use to learn

forecast that an AI makes based on patterns it has learned from data.

well an AI performs on new information it hasn't seen before.

7. A type of AI where computers learn from

9. A set of rules or step-by-step instructions that tell a computer how to solve a problem or complete a task.
10. Information about whether an AI's predictions are right or Down
 1. The process where AI systems improve their performance by analyzing examples and adjusting their understanding.
 2. A guess or forecast that an AI makes based on patterns it has learned from data.
 3. Information that AI systems use to learn patterns and make predictions.
 4. A type of AI where computers learn from examples instead of being directly
 5. Checking how well an AI performs on new information it hasn't seen before.
 7. A type of AI where computers learn from examples instead of being directly

- 9. A set of rules or step-by-step instructions that tell a computer how to solve a problem or complete a task.
- 10. Information about whether an AI's predictions are right or wrong, which helps it improve over time.

Down

- 1. The process where AI systems improve their performance by analyzing examples and adjusting their understanding.
- 2. A guess or forecast that an AI makes based on patterns it has learned from data.
- 3. Information that AI systems use to learn patterns and make predictions.
- 4. The ability of an AI system to learn from examples instead of being directly programmed for every situation.
- 5. Checking how well an AI performs on new information it hasn't seen before.
- 6. A type of AI where computers learn from examples instead of being directly programmed for every situation.
- 7. Learning

Chapter 2 Lecture Notes, Schedule & Resources

Lecture Outline

Introduction

- AI performs tasks typically requiring human intelligence
- AI's importance in students' daily lives (phones, games, streaming)
- Foundational components: data and algorithms

Key Components of AI

Data and Algorithms

- Data: information AI uses to learn (examples, patterns, statistics)
- Algorithms: rules computers follow to process data
- Metaphor: ingredients (data) + instructions (algorithms) = result

Machine Learning

- Different from traditional programming (learning vs. explicit instructions)
- Learning through examples rather than memorizing rules
- Visual metaphor: recognizing animals by seeing examples vs. memorizing features

Training Process

- Gathering labeled examples
- Finding patterns in data
- Making predictions
- Receiving feedback on accuracy
- Adjusting to improve

Real-World Applications

- Examples for middle schoolers: video game NPCs, music recommendations, photo filters
- Classroom demonstration of simple AI application
- Impact on students' daily lives

Impact and Limitations

- Limitations: pattern recognition vs. true understanding
- Importance of quality data and human oversight
- Basic ethical considerations (fairness, privacy)

Discussion Prompts

1. "How is teaching a computer to recognize cats different from teaching a friend?"
2. "Why might an AI make different recommendations for different people? Is this fair?"
3. "What jobs could AI help with? What jobs would be difficult for AI?"
4. "If an AI makes a mistake, who's responsible?"
5. "How might AI change learning in school?"

Supplementary Content

Key Facts

1. “Artificial intelligence” was first coined in 1956 at Dartmouth College.
2. AI can beat human champions at chess and Go, once thought to require human intuition.
3. Modern video games use AI to adjust difficulty based on player performance.
4. Voice assistants use AI to convert speech to text and understand requests.
5. Most AI systems are “narrow AI” for specific tasks; “general AI” doesn’t yet exist.

Common Misconceptions

1. AI doesn’t “think” like humans • it identifies patterns but doesn’t truly understand meaning.
2. AI doesn’t automatically learn everything • each system needs specific training.
3. Current AI lacks feelings, consciousness, or self-awareness, despite movie portrayals.

Hands-on Activities

1. Human vs. AI Pattern Recognition

Materials: Cards with patterns, paper, pencils

Instructions:

1. Small groups, one student acts as “AI”
2. “AI” guesses the rule others use to sort cards
3. “AI” gets only feedback (correct/incorrect), no explanation
4. Discuss how the “AI” learned through examples, not direct instructions

Outcome: Students understand learning through examples and feedback

Assessment: Students can explain how machine learning differs from traditional programming and why feedback is crucial for improvement

2. Training a Simple Classifier

Materials: Sticky notes, markers, chart paper

Instructions:

1. Students create “image dataset” by drawing simple objects (stars, circles, triangles)
2. Place “images” on chart divided into categories
3. Develop simple “rules” for classifying new drawings
4. Test rules on new drawings and track accuracy
5. Refine rules based on mistakes to improve performance

Outcome: Students understand how training data affects performance

Safety Considerations: None required

Assessment: Students can explain why diverse training data is important for AI fairness

3. AI Decision Chain

Materials: Index cards, string, markers

Instructions:

1. Create a “decision tree” showing how AI makes simple decisions
2. Students create decision trees for a simple task (like recommending a movie or game)
3. Trace different paths based on different inputs
4. Discuss how structure affects outcomes and where biases might occur

Outcome: Students understand how AI makes decisions based on data patterns

Assessment: Students can create a simple decision tree that leads to reasonable outcomes