Class 7

# Answer Key

## Artificial Intelligence (Ver. 2.0)

## 1. Exploring AI Domains and Emerging Frontiers

### Ai Task (Page 10)

Do it yourself.

### Ai Reboot (Page 13)

1. c. 2. a. 3. b.

### Video Session (Page 11)

Do it yourself.

### Ai Task (Page 17)

Do it yourself.

### Ai Task (Page 18)

Do it yourself.

### Ai Quiz

| | | | | |
|---|---|---|---|---|
| 1. c. | 2. b. | 3. a. | 4. b. | 5. b. |
| 6. b. | 7. c. | 8. c | 9. b. | 10. a. |

### Exercise

**A.**

| | | | | |
|---|---|---|---|---|
| 1. False | 2. False | 3. False | 4. True | 5. True |
| 6. True | 7. True | 8. False | 9. True | 10. False |

**B.**

1. Artificial Intelligence
2. Self-Driving cars
3. ChatGPT
4. Weak
5. statistical data
6. Perseverance, Curiosity
7. cobots
8. Sudowrite
9. Tesla's Autopilot
10. Tempus

**C.** 1. According to Barr and Feigenbaum, AI is the part of computer science concerned with designing intelligent computer systems, that is, systems that exhibit characteristics we associate with intelligence in human behaviour – understanding language, learning, reasoning, solving problems, and so on.

2. Computer Vision enables machines to interpret, analyse, and pull meaningful data from images and videos, replicating human sight. It makes use of cameras, sensors, and data from images and videos. For instance, self-driving cars use cameras to detect traffic and sensors to measure the distance between vehicles and other objects on the road.

3. NLP is a branch of AI that helps machines understand, translate, and respond to human language like humans' speech and words. In short, it allows machines to speak and read like us. Some examples of Natural Language Processing in real life are:
   - Voice assistants like Siri and Alexa responding to questions such as "What is the weather today?"
   - Chatbots on platforms like Amazon answering queries like "I need help with my order."
   - Google Translate using NLP to accurately translate text into a chosen language.
   - Email services using NLP to filter messages into categories like spam based on the language used."

4. AI Artificial Intelligence (AI) plays a significant role in space exploration by helping scientists and engineers explore space more efficiently and safely. It uses intelligent systems capable of analysing data, making decisions, and controlling spacecraft—often without human intervention. AI proves highly effective in remote and hazardous environments such as outer space.

5. CIMON, an AI-powered assistant robot aboard the International Space Station, which communicates with astronauts and helps them follow procedures.

6. Artificial Intelligence (AI) is making a significant impact in the creative arts by seamlessly blending technology with human creativity. It supports artists, musicians, and designers in developing innovative forms of expression. By analysing patterns in existing works, AI can generate original content such as music, stories, and visual art.

   For example:
   - Edmond de Belamy, a portrait created using a Generative Adversarial Network (GAN), which was trained on thousands of classic portraits to produce a new, unique artwork.
   - AIVA (Artificial Intelligence Virtual Artist), which studies compositions by great musicians like Bach and Beethoven and creates original music in similar styles.

7. Khanmigo, developed by Khan Academy, serves as a virtual tutor, helping students understand concepts, solve math problems, and write essays.

8. The two emerging frontiers in AI are as follows:
   - **Healthcare:** Artificial Intelligence (AI), through its varied domains, is revolutionising the global healthcare system. It is enhancing diagnosis, treatment, patient care, and administrative processes. For example, Google DeepMind's AI can detect over 50 eye diseases from retinal scans with expert-level accuracy.
   - **Education:** AI is increasingly being used in education to enhance learning, personalise teaching, and streamline school administration. It enables smarter, more tailored, and more efficient educational experiences for both students and educators. For example, Adaptive

learning platforms, where AI customises lessons and materials based on each student's pace, strengths, and weaknesses. For instance, Socratic by Google uses AI to help students solve problems by scanning questions and providing step-by-step explanations.

**Ai Lab** (Page 22)

Do it yourself.

**Ai Ready .....1** (Page 23)

Do it yourself.

## 2. Natural Language Processing(NLP)

**Ai Task** (Page 26)

Do it yourself.

**Ai Reboot** (Page 31)

1. d. 2. c. 3. e. 4. b. 5. a.

**Video Session** (Page 32)

Do it yourself.

### Ai Quiz

1. b. 2. c. 3. a. 4. b. 5. b.
6. a. 7. b. 8. b.

## Exercise

**A.** 1. True 2. True 3. False 4. False 5. True

**B.** 1. Siri, Alexa 2. Sentiment Analysis 3. NLP
4. Replica AI 5. vocabulary

**C.** 1. Natural Language Processing is a core domain of AI that allows machines to understand, interpret, and generate human language — the most natural form of communication. It bridges the gap between humans and machines, making interactions more intuitive, effective and natural.

2. Some of the common types of NLP technologies are as follows:
   - Sentiment Analysis is a process used to determine whether a piece of text is positive, negative or neutral.

- Semantic search involves understanding the intention behind any search. It also optimises the search process by providing possible search predictions.
- Optical Character Recognition converts written and printed text into machine-readable data.
- Speech recognition involves converting spoken words into machine-readable data.
- Machine Translation, translates the source language into the target language without human interference.

3. The two uses of NLP are NLP are as follows:
   - **Text Classification:** AI powered by NLP automatically categorises text into predefined labels or categories. For example, email filtering—Gmail classifies emails into Primary, Spam, Social, Promotions, etc., based on their content. This helps users keep their inbox organised. Similarly, Google News uses NLP to categorise news articles by topic.
   - **Voice Assistants:** Voice assistants like iPhone's Siri and Amazon's Alexa understand speech patterns and provide helpful responses. Smart Assistants operate on a voice recognition system. They respond to users with a keyword like "Hey Siri" or "Alexa".
4. Working of NLP can be understood by following the given steps:

   **Step 1:** Understanding Language: NLP helps computers make sense of human language, like the way we speak or write.

   **Step 2:** Cleaning the Input: When we give input (like speech or text), NLP first cleans it — this means removing extra symbols or mistakes so the computer can understand it better.

   **Step 3:** Using AI to Learn: The computer then uses AI to learn from the input. It looks at patterns and meaning to figure out what we're trying to say.
5. Language learning apps use NLP to help users learn pronunciation, grammar, and vocabulary through collaborative conversations. They analyse user input and provide real-time corrections and responses. Duolingo offers grammar corrections by using NLP to adapt lessons.
6. NLP extracts the main points or generates a shorter version of a long document or article, a capability known as NLP's Text Summarisation feature. Tools like SMMRY and QuillBot provide automatic text summaries, while Microsoft Word and Notion AI offer summary tools for long documents or meeting notes.
7. NLP supports individuals with disabilities by enabling language transcription and text-to-speech features, making information more accessible.

## Ai Lab (Page 35)

Do it yourself.

## Ai Ready .....2 (Page 36)

Do it yourself.

# 3. Statistical Data

**Video Session** (Page 39)

Do it yourself.

**Ai Reboot** (Page 43)

It enables real-time tracking of student progress during classes, with the goal of providing immediate support to those who are struggling. Platforms like Knewton Alta and Quizlet use AI to monitor student performance and adapt instruction through personalised learning resources.

**Ai Task** (Page 46)

Do it yourself.

## Ai Quiz

1. b. 2. c. 3. d. 4. b.

## Exercise

**A.** 1. True 2. False 3. False 4. True

**B.** 1. Uncertainty 2. Beijing 3. AI 4. Reports

**C.** 1. Statistical data in AI is increasingly being used in the field of education. It enables real-time tracking of student progress during classes, with the goal of providing immediate support to those who are struggling. Platforms like Knewton Alta and Quizlet use AI to monitor student performance and adapt instruction through personalised learning resources. Some systems even analyse student attention and behaviour using video or activity data, enhancing engagement in digital classrooms.

2. Statistical data powered by AI is improving urban planning by enabling smart, sustainable, and citizen-focused cities. Smart cities like Singapore use AI to reduce traffic, manage resources, track air quality, and plan infrastructure. It also helps identify risk zones for better safety and development.

3. The data collected can be either primary, gathered firsthand by the researcher, or secondary, obtained from existing sources like books, websites, or reports.

4. Instead of looking at long lists of numbers, data can be shown using bar graphs, pie charts, line graphs, histograms, and other visual tools. These visuals help in identifying patterns, trends, and comparisons quickly. Data visualisation makes complex information more accessible and is widely used in fields like business, science, and education to support decision-making.

5. The following points highlight the importance of statistical data in AI
   - AI uses statistics to analyse data, extract patterns, and make predictions.
   - Statistical techniques help forecast outcomes using past data.

- Statistics quantifies uncertainty, aiding accurate decisions.
- Different metrics like precision, recall, and F1-score assess model performance.
- It helps AI understand cause-effect relationships for better predictions.
- It identifies trends, outliers, and meaningful patterns in data.
- It uses statistical methods to learn, reason, and predict.

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Do it yourself.

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Do it yourself.

# Test Sheet–1

(Based on Chapters 1 to 3)

**A.** 1. c 2. b 3. b 4. a 5. b
6. c 7. d 8. b

**B.** 1. Artificial Intelligence 2. Self-Driving cars 3. Siri, Alexa
4. Sentiment Analysis 5. Uncertainty 6. Beijing
7. AI 8. Reports

**C.** 1. False 2. False 3. True 4. True 5. True
6. False 7. False 8. True

**D.** 1. Computer vision enables machines to interpret, analyse, and pull meaningful data from images and videos, replicating human sight. It makes use of cameras, sensors, and data from images and videos. For instance, self-driving cars use cameras to detect traffic and sensors to measure the distance between vehicles and other objects on the road.

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# 4. AI & Ethical Considerations

**AI Reboot** (Page 55)

Many pictures and videos used to train AI are shared online without hiding people's faces or details. This can be unsafe. To keep data safe, it should be locked with special codes (encryption), only shared with people who are allowed (access control), and stored in secure places where others can't easily get to it.

**Video Session** (Page 57)

Do it yourself.

**AI Task** (Page 58)

Do it yourself.

## AI Quiz

1. a. 2. c. 3. b. 4. b.

## Exercise

**A.** 1. True 2. False 3. False 4. True

**B.** 1. Anonymity 2. Encryption 3. Misinformation 4. Transparency

**C.** 1. NLP tools process large amounts of text and speech data to understand what people say. If this data isn't protected properly, it can expose private conversations, personal details, or sensitive information without the user's permission. When a computer is trained with American or British accents, it may misinterpret a strong accent saying "Turn on the light" as "Turn on the lice". It may also incorrectly mark a text as misspelt or grammatically wrong based on regional language.

2. Computer Vision can sometimes cause problems if it makes mistakes, treats people unfairly, or is used in the wrong way. That's why it is important to check and test the data carefully to make sure it is fair for everyone. This is especially important in areas like hospitals, police work, and job hiring.

3. Maintaining anonymity in visual datasets is challenging because videos and images often capture identifiable features such as faces. Even if names are removed, individuals can still be recognised through facial features, clothing, or surroundings. To address this, ethical practices suggest using synthetic datasets and applying techniques that protect visual data from identification, ensuring personal privacy is respected.

4. Bias in NLP refers to the tendency of AI systems to learn and reflect unfair or harmful patterns from the data they are trained on. For instance, if a chatbot is trained only on limited or biased messages, it may develop unfair behaviours and treat certain people unjustly.

   Types of Bias:

Historical Bias: This occurs when AI systems learn from past data that contains stereotypes or unfair associations. For example, if the term "nurse" is mostly linked with women in the training data, the AI may wrongly assume that only women can be nurses, resulting in gender bias.

Representation Bias: This arises when the dataset over-represents some groups and under-represents others. When certain communities are excluded or overly focused on, the AI may make inaccurate or unfair assumptions about the entire population.

**Ai Lab** (Page 60)

Do it yourself.

**Ai Ready .....4** (Page 61)

Do it yourself.

# 5. Sustainability and Sustainable Development Goals

**Ai Task** (Page 64)

Do it yourself.

**Video Session** (Page 69)

Do it yourself.

**Ai Reboot** (Page 71)

1. Climate Action
2. Partnerships for the Goals
3. No Poverty
4. Quality Education
5. Sustainable Cities and Communities
6. Responsible Consumption and Production
7. Life on Land
8. Clean Water and Sanitation
9. Decent Work and Economic Growth

**Video Session** (Page 72)

Do it yourself.

## Ai Task (Page 72)

Do it yourself.

## Ai Quiz

1. d. 2. a. 3. c. 4. b. 5. b.

# Exercise

**A.** 1. False 2. True 3. True 4. False 5. True

**B.** 1. Better health 2. Non-renewable 3. Sustainability 4. Social systems
5. Reduced Inqualities

**C.** 1. The term sustainability refers to meeting our needs without exploiting the environment or depleting resources, ensuring that future generations can also meet their needs. For example, using cotton carry bags instead of plastic is a habit of sustainability.

2. a. No Poverty aims to end poverty in all its forms everywhere. Artificial Intelligence (AI) can help achieve this goal by analysing patterns of poverty across different regions, enabling governments and organisations to target aid more effectively.

   b. Affordable and Clean Energy aims to ensure access to affordable, reliable, sustainable, and modern energy. AI contributes by improving energy grid efficiency, forecasting demand, and supporting renewable energy systems. These efforts help deliver cleaner and more dependable energy to communities while reducing environmental impact.

   c. Life Below Water aims to conserve and sustainably use oceans, seas, and marine resources. AI plays a crucial role by monitoring ocean pollution, combating illegal fishing, and promoting marine biodiversity conservation. These technologies help track environmental changes, enforce regulations, and support efforts to protect and restore marine ecosystems.

3. Industry, Innovation and Infrastructure aims to develop resilient infrastructure and encourage sustainable industrialisation. AI supports this goal by enhancing smart manufacturing processes, enabling continuous infrastructure monitoring, and accelerating research and development. These technologies help build stronger industries and infrastructure that are efficient, sustainable, and adaptable to future challenges.

4. The 17 Sustainable Development Goals can be grouped into three broad categories:
   - Economy: Economic sustainability is vital for economic growth, innovation, and infrastructure. The economy can be strengthened by affordable and clean energy, decent work, and economic growth, industry, innovation, and infrastructure, responsible consumption and production, and partnerships for the goals.
   - Society: Society emphasises human well-being, equity, and social systems. Eradicating poverty, ensuring zero hunger, promoting good health and well-being, providing quality education, and achieving gender equality are essential for society's well-being.

- Biosphere: The biosphere embodies environmental sustainability, encompassing the natural systems that support life on Earth. Clean water and sanitation, climate action, life below water, life on land come under this category.

**Ai Lab** (Page 75)

Do it yourself.

**Ai Ready .....5** (Page 76)

Do it yourself.

# 6. Introduction to System Thinking and System Map

**Video Session** (Page 79)

Do it yourself.

**Ai Reboot** (Page 81)

1. A system is a set of interconnected parts that work together to achieve a specific goal or function. Each part has a role to play, and the success of the system depends on how well these parts work in harmony.

   Example : Smartphone

   A smartphone is a system made up of parts like the operating system, hardware (screen, CPU, memory), battery, and network.

2. Systems thinking is especially crucial in areas like climate change and healthcare.

**Ai Task** (Page 88)

Do it yourself.

**Video Session** (Page 91)

Do it yourself.

**Ai Task** (Page 100)

Do it yourself.

**Ai Task** (Page 101)

Do it yourself.

## Ai Quiz

1. c. 2. a. 3. b. 4. d. 5. c.

# Exercise

**A.** 1. True 2. False 3. True 4. False 5. False

**B.** 1. Negative 2. Temperature 3. Systems 4. Voice 5. Network

**C.** 1. Systems thinking is an approach used to understand complex problems by viewing them as interconnected systems. It involves examining the various aspects, patterns, relationships, and feedback loops within the system, rather than focusing on individual components in isolation. By understanding how different elements influence each other and work together, systems thinking helps us identify root causes, anticipate potential outcomes, and make more informed decisions.

2. Feedback loops are cycles where a chain of cause and effect eventually loops back to influence the original element. These loops explain system dynamics and are key to predicting long-term outcomes.

   - Reinforcing Loop (Positive Feedback): Amplifies the original effect, often leading to growth or escalation.

   Example: More users on a social platform → more content shared → more users join.

   - Balancing Loop (Negative Feedback): Counteracts change, helping the system maintain stability.

   Example: A thermostat increases heating when the temperature drops, and turns it off when the desired level is reached.

3. A systems map helps in problem-solving by providing a visual representation of the components within a system and the relationships between them. Here's how it contributes to solving problems:

   - Identifying Connections: It helps to visualize how different elements or factors in a system are connected. This allows you to see the bigger picture and understand how changes in one part of the system might affect other parts.
   - Understanding Feedback Loops: Systems maps reveal feedback loops, both positive and negative. These loops help identify how actions in one part of the system can either reinforce or dampen changes elsewhere, which is critical for understanding the dynamics of complex problems.
   - Recognizing Leverage Points: By showing the relationships between various components, systems maps help identify leverage points—key areas where small changes can create a significant impact, allowing for more efficient problem-solving.
   - Highlighting Potential Issues: Systems maps can highlight potential bottlenecks or areas of conflict within a system, enabling proactive identification of issues that might hinder the system's overall effectiveness.
   - Clarifying Complex Problems: For complex or interconnected problems, a systems map simplifies the understanding of how various elements influence each other, making it easier to develop solutions that consider all aspects of the problem.

4. A leverage point in systems thinking is a small change or intervention that can produce a significant impact on the entire system. Its importance lies in the following:
   - Efficient Problem-Solving: By focusing on leverage points, you can make a minimal effort that leads to large-scale improvements or solutions, saving time and resources.
   - Maximizing Impact: Identifying the right leverage point allows you to address the root causes of issues, rather than just treating symptoms, leading to more effective long-term solutions.
   - System Optimization: Leveraging these points helps in optimizing the system, improving performance, and achieving desired outcomes with less effort.
5. Coral bleaching occurs when coral reefs experience significant stress due to factors such as temperature rise or pollution. Here's how it happens:
   - Corals have a symbiotic relationship with algae. These tiny algae live inside coral tissues and provide essential nutrients to the coral in exchange for a protected environment.
   - When water temperatures rise or pollution increases, the algae become stressed and expel themselves from the coral. Without the algae, the corals lose their vibrant colour and turn white.
   - This process, called coral bleaching, weakens the corals, making them more susceptible to diseases and sometimes leading to their death. Bleached corals can survive for a short time but are under extreme stress, which affects the overall health of the reef and the marine life that depends on it.

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Do it yourself.


**Ai Ready .....6** (Page 105)

Do it yourself.

# Test Sheet–2

(Based on Chapters 4 to 6)

**A.** 1. a 2. c 3. d 4. a 5. c
6. a 7. b 8. d

**B.** 1. Anonymity 2. Encryption 3. Misinformation
4. Better health 5. Non-renewable 6. Negative
7. Temperature 8. Systems

**C.** 1. True 2. False 3. False 4. True 5. True
6. True 7. False 8. True

**D.** 1. NLP tools process large amounts of text and speech data to understand what people say. If this data isn't protected properly, it can expose private conversations, personal details,

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