# ANSWER KEY
## Artificial Intelligence

## 1. Excite

**Δi Reboot** (Page 19)

1. Natural Language Processing, usually shortened as NLP, is a domain of AI which works with the interactions between humans and computer systems using natural language.
2. Data, Natural Language Processing and Computer Vision.

## Δi Quiz

| | | | | |
|---|---|---|---|---|
| 1. b | 2. b | 3. c | 4. a | 5. d |
| 6. a | 7. b | 8. a | 9. b | 10. a |
| 11. b | 12. c | | | |

## Exercise

**A.**

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

**B.**
1. Rock paper scissors      2. Capabilities      3. Narrow
4. Data Science      5. John McCarthy      6. Human-Machine Interaction
7. Machine translation      8. Computer Vision      9. AI systems

**C.**
1. In simple terms, we can define AI as a machine that can simulate human thought process and can take actions based on those thoughts and even draw conclusions. It should also be able to correct itself, if it makes a mistake. This also means that AI based computer would be able to make a decision in a given situation like human beings and in some cases even better.
2. Following are the types of AI:
    a. Artificial Narrow Intelligence
    b. Artificial General Intelligence
    c. Artificial Super Intelligence
3. The machine can mimic human behaviour with the ability to learn and solve problems. It can think, learn and decide in a similar manner as humans would do in a situation.
4. AI machines are expected to perform the following tasks:
    a. Generalised Learning      b. Reasoning
    c. Problem Solving:      d. Adaptability
    e. Perception

5. Data, Natural Language Processing and Computer Vision.

6. Data are the facts and figures which are processed to find meaningful results. Data plays a pivotal role in the field of AI. Data collection is the process of collecting and sourcing information from numerous sources.

7. Following are the types of NLP:
   a. Optical Character Recognition
   b. Speech Recognition
   c. Machine Translation
   d. Natural Language Generation
   e. Sentiment Analysis
   f. Semantic Search

8. HMI can be defined as the interaction and communication between a human and a machine. It is a dynamic technical system which finds novel methods to let the communication take place between humans and computers.

## Ai Ready ............................................................................................................. 1

1. Nowadays, we have a plethora of devices that can connect to the Internet and access information. These interconnected devices are known as IoT. Amazon Echo, wearable fitness bands being among many such examples.

2. AI machines cannot have their own emotions, but they can mimic emotion, such as empathy. They can also read emotions like facial expressions, gestures, tone of voice, force of keystrokes, and more to determine a person's emotional state.

3. A CV can perform the following tasks:
   • Object Classification: It can analyse and identify a particular object among many in an image or a video.
   • Object Identification: The system analyses visual content and identifies a particular object of an image or a video.
   • Object Tracking: The system processes any given video and finds the object that matches the searching criteria and then tracks its movements.

4. Some of the examples of HMI are as follows:
   • Touchscreens
   • Keyboards
   • ATM
   • Natural user interfaces

# 2. Relate

### Ai Reboot (Page 38)
AI helps the banks and financial sectors in various ways. AI predicts future scenarios by analysing past user experiences. This way it suggests the banks for future outcomes and trends. It also helps banks to identify frauds and detect anti-money laundering patterns.

### Ai Reboot (Page 48)
1. Smart Cities offer many benefits to its residents but there are many challenges in establishing it. Some of them are:

a. Financial challenges due to lack of proper funds

b. Growing population

2. Smart hubs, smart cameras, smart lighting and smart speakers.

## Δi Quiz

| 1. b | 2. a | 3. b | 4. b | 5. d |
|------|------|------|------|------|
| 6. a | 7. d | 8. b | | |

# Exercise

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

6. True 7. False 8. True 9. True

**B.** 1. Facebook 2. Google Assistant 3. E-commerce 4. Google Maps 5. Smart city

6. Smart 7. AI 8. Smartphone 9. Garbage

C. 1. The three examples of AI that are used in everyday life are:

a. Facebook   b. Amazon   c. Google Maps

2. For Security and Surveillance, AI program functions by using Computer Vision. The video surveillance cameras have AI programs that analyse images and audio in order to recognize humans, various objects, vehicles and actions. The Artificial Intelligence program sends an alert if it detects some unusual activities breaking the set rules.

3. Fyle is an expense management app. It is used to manage expenses, approve workflows, check real-time policy, etc.

4. Education sector can highly benefit with the use of AI. Now, primarily its being used as a tool to develop skills and test systems. Today essay-grading systems are in place to grade the children's thoughts in its primary stage. It can also be used in providing individualized learning, which is a challenging task at teacher's level.

5. Information and Communication Technology (ICT) is used to improve the operations efficiently, share the data with the residents easily, provide quality government services and citizen's well-being effectively.

6. The concept of smart living is based on making life easier for the people using various electronic appliances. These appliances are capable of understanding the user's behaviour patterns and work accordingly.

7. Smart cameras, smart thermostats and smart speakers.

8. Smart Homes provide insights to efficient energy usage. They also enhance people's level of safety. The benefits are:

a. Power Saver: Smart Homes are great at saving power.

b. Increased energy efficiency: The Smart Home technology makes it possible to make the home energy-efficient.

c. Protect home and its belongings: The home is protected from intruders with AI systems.

d. Interactive home: The AI enabled appliances are controlled through voice or smart phones.

9. Following are some of the benefits of Smart Cities:

a. They have data-driven and more effective decision-making standards.

b.  Smart Cities have smart street lights. The lighting can be customised as per the activities on the street.
   c.  Parking sensors provide real time information about the free parking spaces to make it hassle-free.
   d.  Garbage sensors equipped trucks are used for automatic waste collections.
   e.  They have adequate water supply.
   f.  They have better transportation facilities.
10. Smart Cities offer many benefits to its residents but there are many challenges in establishing it. Some of them are:
   • Financial challenges due to lack of proper funds.
   • Growing population.
   • Digital security issues.
   • Lack of high-speed internet facility and connectivity issues.
   • Lack of digital awareness among residents.
   • Technological challenges with coverage and capacity.
   • Difficulty in implementing government's policies and legislation.

## Δi Ready ....................................................... 2

1.  Do yourself.
2.  Yes, there are some disadvantages of living in smart cities. Some of them are as follows:
   • Very expensive
   • Lack of public awareness and social responsibility
   • Lack of high speed internet facility and connectivity issues
   • Security issues in terms of public data
3.  Some of real-life applications of AI are as follows:
   • Voice assistants like Siri, Google Assistant, etc.
   • Google Maps for navigation
   • e-commerce websites help in interactive and personalized buying experience
   • Autonomous flying machines or drones
4.  Safety is largely the responsibility of the driver, who must continuously observe, analyze, decide, and act. Not only do drivers have to follow the rules of the road, but they also have to communicate with each other and other road users to navigate ambiguous or contested situations; think about how you wave or nod to someone to signal "You go first."

# Test Sheet–1
### (Based on units 1 to 3)

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

**B.** 1. Capabilities    2. Human-Machine Interaction    3. Narrow
4. E-commerce    5. Google Maps    6. Garbage    7. Smart    8. Violence

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

**D.** 1. In simple terms, we can define AI as a machine that can simulate human thought process and can take actions based on those thoughts and even draw conclusions. It should also be able to correct itself, if it makes a mistake. This also means that AI based computer would be able to make a decision in a given situation like human beings and in some cases even better.

2. AI in e-commerce helps in interactive and personalized buying experience. With the AI-enabled systems, companies can see their customer's preferences and can boost their sales by reliable and customized shopping experiences. AI helps in the real time database analysis to predict the number of customers willing to buy a new product and also helps in running a cashierless store.

3. Data are the facts and figures which are processed to find meaningful results. Data plays a pivotal role in the field of AI. Data collection is the process of collecting and sourcing information from numerous sources.

4. Following are the types of NLP:
   a. Optical Character Recognition
   b. Speech Recognition
   c. Machine Translation
   d. Natural Language Generation
   e. Sentiment Analysis
   f. Semantic Search

5. For Security and Surveillance, AI program functions by using Computer Vision. The video surveillance cameras have AI programs that analyse images and audio in order to recognize humans, various objects, vehicles and actions. The Artificial Intelligence program sends an alert if it detects some unusual activities breaking the set rules.

6. Smart Cities offer many benefits to its residents but there are many challenges in establishing it. Some of them are:
   • Financial challenges due to lack of proper funds.
   • Growing population.
   • Digital security issues.
   • Lack of high-speed internet facility and connectivity issues.
   • Lack of digital awareness among residents.
   • Technological challenges with coverage and capacity.
   • Difficulty in implementing government's policies and legislation.

7. Information and Communication Technology (ICT) is used to improve the operations efficiently, share the data with the residents easily, provide quality government services and citizen's well-being effectively.

8. Smart cameras, smart thermostats and smart speakers.

# 3. Purpose

The growing population along with the economic cost to achieve these goals pose great difficulties.

## Δi Quiz

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

# Exercise

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

**B.** 1. Sustainable Development Goals          2. 70          3. 17.2          4. Pollution

**C.** 1. AI goals include learning, reasoning and creating awareness. AI is being used by many industries which also includes finance and healthcare.

2. AI can help in improving the farming land, agriculture, quality of products, etc. AI can also help with aid distribution in poor and war-torn areas, or where natural disasters have caused heavy destruction.

3. AI can help in achieving this goal by increasing the ability of healthcare professionals to analyse huge data sets, providing better feedback and finding accurately the cause of diseases to discover the cure. Wearable healthcare technology also uses AI to serve the patients and healthcare workers.

4. This SDG aims to guarantee justice and freedom for all people by 2030. The target is to significantly reduce all forms of violence with communities and governments to end conflict and insecurity.

## Δi Ready ......................................................................................................... 3

1. All SDGs are strongly connected to each other. For example, poverty (Goal 1) can cause to hunger and malnutrition (Goal 2), which may lead to health problems (Goal 3) that may prevent children from completing their education (Goal 4) or adults from getting a job (Goal 8).

2. It's necessary that we end all forms of discrimination against women. This is a basic human right. We need to provide equal access to resources, opportunities, power and property to women in the world. This can stimulate economic growth, boost private and public sector, and improve development outcomes for the next generation.

3. With the use of renewable energy solutions (Goal 7) that are cheaper, more reliable and efficient, we can reduce the carbon emissions with further reduce global warming (Goal 13).

4. AI in education can be used to achieve Quality Education goals by developing smart content, providing personalized guidance, round the clock assistance, virtual learning environment and creating more secured online exams.

# 4. Possibilities

AI Reboot (Page 81)

A robotics engineer requires to be good at:

- Creative ideas
- Programming mind-set
- Science, mathematics or applied mathematics, electronics, psychology and cognition.

**AI Reboot** (Page 82)

Niki.ai, Discover.ai and Expertrons

## AI Quiz

| 1. d | 2. a | 3. d | 4. b | 5. a |
|------|------|------|------|------|
| 6. b | 7. c | | | |

## Exercise

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

**B.** 1. Soft, Technical    2. Robotics engineer     3. 270

4. Machine Learning

**C.** 1. Some of the skills required to get a job in the field of AI are:

- Data literacy skills
- Collaboration skills
- Critical thinking skills
- Leadership skills
- Programming language
- Machine learning algorithm
- Artificial neural networks
- Signal processing techniques

2. Following are the soft skills:

- Data literacy skills
- Collaboration skills
- Critical thinking skills
- Leadership skills

3. Organizations expect their employees to work in a collaborative manner. Departments like Design and Marketing need to collaborate with each other to reach to user experience and develop machines accordingly.

4. A Computer Vision Engineer is expected to have mastery over:

- Image generation and segmentation
- Classification of images
- Object detection and tracking moving object over time
- Optical character recognition
- Face detection and recognition

5. Discover.ai, Niki.ai, Expertrons and Niramai Health Analytix

1. The growth in this field has been 244% between 2015 – 2019. It is expected to grow further in the coming years. Machine learning engineers are skilled programmers who develop machines and systems that can learn and apply knowledge without precise direction from a human.

2. AI will change healthcare sector by introducing a variety of applications that can detect cancerous lesions on an image, analyse and quantify physician notes or optimize patient flow in emergency care.

3. Do yourself.

4. A robotics engineer requires to be good at:
   • Creative ideas
   • Programming mind-set
   • Science, mathematics or applied mathematics, electronics, psychology and cognition.

# 5. AI Ethics

## ∆ᵢ Reboot (Page 90)

The increasing usage of AI driven machines will generate huge amounts of wages to their owners leaving behind inequality among the others. When we talk about the impact of this on nations, AI in the hands of few high-income countries will create a huge gap between them and developing countries.

## ∆ᵢ Reboot (Page 94)

1. Artificial Intelligence Ethics can be defined as a set of values, principles and techniques which can be applied in the development and deployment of Artificial Intelligence technologies to guide the moral conduct of a machine towards right and wrong.

   The AI code of ethics also called the AI value platform is a policy statement that defines the role of Artificial Intelligence.

2. AI systems have a training phase in which they learn from a huge data pool to understand images and patterns and act accordingly. Once this training phase is over, it goes to the testing phase to understand its performance. This training phase may also not prepare the system for all the possibilities it may undergo in the real world. It is possible that they may be wrongly used by malicious people for their own gain.

## ∆ᵢ Reboot (Page 98)

Advantages:

a. **Diligent:** AI machines can work 24x7 as compared to humans who can only work only 4-6 hours at a stretch and may need a break to refresh.

b. **Reduction of human error:** Humans tend to make mistakes. AI based systems get better and better as we use them and tend to make less mistakes or no mistakes.

Disadvantages:

   a. **Expensive:** AI machines are very complex in nature, have huge manufacturing costs.

   b. **Health Issues:** With Smart House, having the ability to control everything over a cell phone, ability to complete tasks with the click of a button, makes humans more lazy.

## Δi Quiz

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

# Exercise

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

**B.** 1. 22     2. Joseph Weizenbaum

   3. Institute of Electrical and Electronic Engineers    4. Ownership   5. Accuracy

   6. Correctional Offender Management Profiling for Alternative Sanctions   7. Robots

**C.** 1. The fact remains that the jobs once done by humans are now done by machines much more efficiently and cost effectively. It is clear that the development of AI would replace some jobs completely from the market. This has always been the case with the invention of a new technology, for example, typewriters were replaced by the invention of computers, taxis replaced manual rickshaws.

   2. The need of AI Ethics is to define ownership. It also involves the moral behaviour of humans as they design, create, use and treat artificially intelligent systems. We need national and international regulatory frameworks to ensure that AI benefits humanity as a whole. We need to develop human centered AI for the greater interest of people.

   3. Following are the ethical issues related to AI:

      a. It is blamed that AI continues to widen the Gender Gap. Research proves that only 22% of AI professionals are females. Siri, Alexa, Cortana, the virtual personal assistants are voiced as a female by default which further establishes that AI may continue to reinforce gender biases in our society.

      b. The increasing usage of AI driven machines will generate huge amounts of wages to their owners leaving behind inequality among the others. When we talk about the impact of this on nations, AI in the hands of few high-income countries will create a huge gap between them and developing countries.

   4. Artificial Intelligence Ethics can be defined as a set of values, principles and techniques which can be applied in the development and deployment of Artificial Intelligence technologies to guide the moral conduct of a machine towards right and wrong.

   The AI code of ethics also called the AI value platform is a policy statement that defines the role of Artificial Intelligence.

   5. There are mainly three types of AI bias:

      a. Perceptive biases: There may be operative feelings towards a particular group based upon the group, one belongs to. Approximately 180 human biases are defined by psychologists. These can affect the decisions we make.

b. Incomplete data biases: When the data is not complete, it lacks accuracy. For example, when research is done initially using a particular group, it may not represent the whole population.

c. People: The developers of AI can also be a reason for the bias. The designers focussing on achieving a specific goal with the available data, may not think of the other broader aspects which may land onto these biased results.

6. Following are some ways to prevent AI Bias:
   • Awareness of biases can lead to its prevention.
   • Selecting the training data that is large enough and represents the group appropriately.

7. In 2019, Facebook started allowing its advertisers to post housing and employment ads which were excluding people from different race, religion, gender, etc. Later, this tech giant was sued by the US Department of Housing and Urban Development for purposefully targeting their advertisement. Later, the company announced that it will stop allowing this.

## Δi Ready ......................................................................................... 5

1. No, since AI systems are very powerful but they have some ethical issues related to them. Some of the ethical issues are as follows:
   • Unemployment
   • Gender Gap
   • Accountability
   • Threat to Human Dignity

2. The main cause of the bias in AI systems come from the problem between facts and interpretation of facts. AI systems can take data and draw learnings from them but AI systems are not equipped to understand the reason behind the particular conclusion or learning.

3. There can be some ethical issues with this system like:
   • This can lead to demotivation in students due to comparison
   • This can make students fretful as parents are expecting a lot

4. With Smart House, having the ability to control everything over a cell phone, ability to complete tasks with the click of a button, makes humans lazy. This may promote obesity and various other health problems related to laziness.

# Test Sheet–2

### (Based on units 4 & 5)

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

**B.** 1. Robotics engineer
   2. Correctional Offender Management Profiling for Alternative Sanctions
   3. Joseph Weizenbaum          4. Pollution          5. 270
   6. Ownership      7. Machine Learning                8. 17.2

**C.** 1. True      2. True      3. True      4. True      5. True

     6. True      7. False      8. True

**D.** 1. A Computer Vision Engineer is expected to have mastery over:

- Image generation and segmentation
- Classification of images
- Object detection and tracking moving object over time
- Optical character recognition
- Face detection and recognition

2. Following are the ethical issues related to AI:

a. It is blamed that AI continues to widen the Gender Gap. Research proves that only 22% of AI professionals are females. Siri, Alexa, Cortana, the virtual personal assistants are voiced as a female by default which further establishes that AI may continue to reinforce gender biases in our society.

b. The increasing usage of AI driven machines will generate huge amounts of wages to their owners leaving behind inequality among the others. When we talk about the impact of this on nations, AI in the hands of few high-income countries will create a huge gap between them and developing countries.

3. There are mainly three types of AI bias:

a. **Perceptive biases:** There may be operative feelings towards a particular group based upon the group, one belongs to. Approximately 180 human biases are defined by psychologists. These can affect the decisions we make.

b. **Incomplete data biases:** When the data is not complete, it lacks accuracy. For example, when research is done initially using a particular group, it may not represent the whole population.

c. **People:** The developers of AI can also be a reason for the bias. The designers focussing on achieving a specific goal with the available data, may not think of the other broader aspects which may land onto these biased results.

4. The need of AI Ethics is to define ownership. It also involves the moral behaviour of humans as they design, create, use and treat artificially intelligent systems. We need national and international regulatory frameworks to ensure that AI benefits humanity as a whole. We need to develop human centered AI for the greater interest of people.

5. AI can help in improving the farming land, agriculture, quality of products, etc. AI can also help with aid distribution in poor and war-torn areas, or where natural disasters have caused heavy destruction.

6. Discover.ai, Niki.ai, Expertrons and Niramai Health Analytix

7. Education is one of the most basic public services. It enables people to develop all of their attributes and skills to achieve their potential as human beings and members of the society. Quality Education provides the foundation for equity in society and helps to reach gender equality.

8. Following are the soft skills:

- Data literacy skills
- Critical thinking skills
- Collaboration skills
- Leadership skills