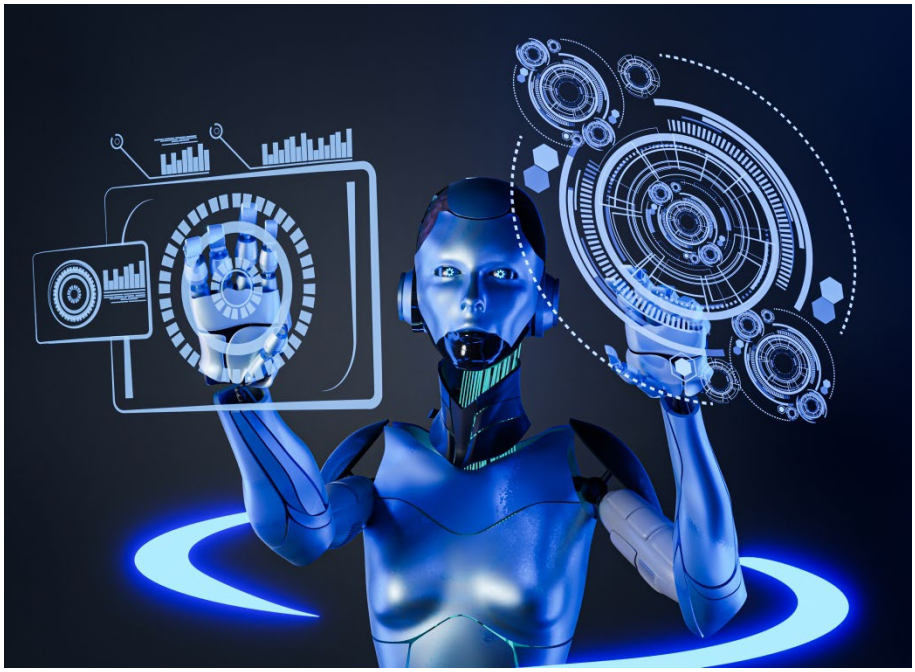
UNIT 7
ARTIFICIAL INTELLIGENCE AND MACHINE LEARNING

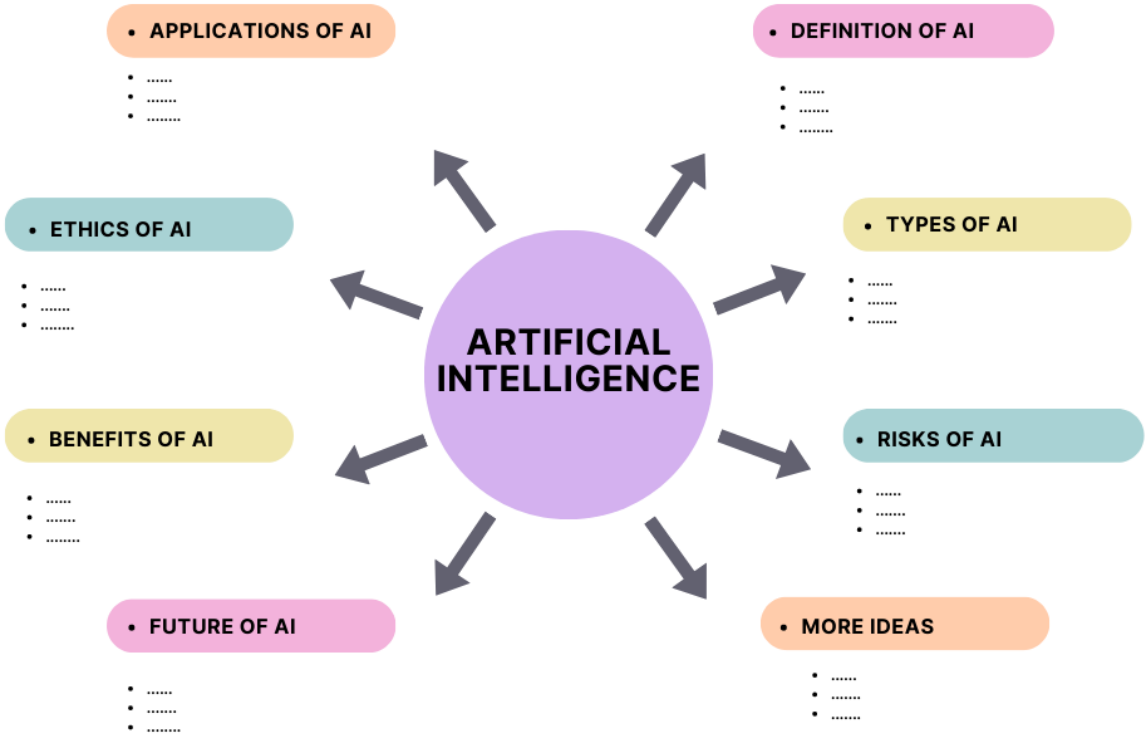


Connect to the topic

1. Look at the picture. How do you feel about the idea of machines being able to learn and make decisions on their own?
2. Can you give an example of how artificial intelligence is used in our daily lives?
3. Do you think it's important for people to understand how artificial intelligence works? Why or why not?

LEAD-IN

Task 1. BRAINSTORM. Work with a partner. Brainstorm what you know about artificial intelligence. Share your ideas with the class.



Task 2. ANALYZE. Read the statistics and discuss it with your partner. Talk about the broader implications of the statistics for the use of AI in various industries and how AI is transforming the way we live and work. Then answer the questions below.

- 83% of companies claim that AI is a top priority in their business plans.
- Netflix makes $1 billion annually from automated personalized recommendations.
- 48% of businesses use some form of AI to utilize big data effectively.
- 38% of medical providers use computers as part of their diagnosis.

1. How does the statistics illustrate the growing importance of AI in modern businesses?
2. What are the benefits of using AI for personalized recommendations, as demonstrated by Netflix?
3. How are businesses using AI to make sense of big data, and what are some of the challenges and opportunities in this area?
4. What are some of the ways that AI is transforming the healthcare industry, and how are medical providers using computers and AI to enhance diagnosis and treatment?
5. What are the potential ethical and societal implications of the increasing use of AI in various industries, and how can we ensure responsible and ethical use of AI technology?

READING AND VOCABULARY 1

Task 3. EXPLORE THE WORDS. Read the sentences with the words from the text. Guess the meaning of the words in bold. Then use one of the bold words to complete each definition below.

1. The **distinction** between hardware and software is crucial in computing.
2. In modern computing, various programming languages and frameworks are **interrelated**, supporting each other's functionalities.
3. The complexity of certain computational problems **necessitates** the use of advanced algorithms and data structures.
4. Computing power has increased significantly over the years, enabling faster data processing that can **exceed** human capabilities.
5. The development of new software technologies **encompasses** a wide range of applications, from database management to web development.
6. The programmer **explicitly** defined the variables and functions in the code, ensuring clarity and precision.
7. The software project followed a **predefined** development plan, ensuring a systematic approach to building the application.
8. The **premise** of cloud computing is to provide on-demand access to a shared pool of computing resources over the internet.
9. As computer scientists, we must **comprehend** complex algorithms and optimize them for efficiency.
10. Programmers **adhere** to coding standards and best practices to maintain clean and maintainable codebases.
11. Designing **intricate** user interfaces for software applications requires attention to detail and user experience.
12. Engineers continually **refine** the software code to eliminate bugs and enhance performance.

_____ a) (adj) connected to one another; having a mutual relationship.
_____ b) (v) to stick to or follow closely.
_____ c) (v) to include, or contain a wide range of things within a specific area.
_____ d) (v) to go beyond a certain limit, boundary, or expectation.

_____ e) (adj) complex, detailed, and having many elements.
_____ f) (n) a difference or contrast that sets something apart from others.
_____ g) (adv) clearly stated, leaving no room for misunderstanding.
_____ h) (v) to require something as essential for a particular purpose.
_____ i) (n) a foundational idea that serves as the basis of an argument.
_____ j) (v) to understand the meaning, significance, or nature of something.
_____ k) (v) to improve or make more precise through revision.
_____ l) (adj) determined, established, or specified in advance before it is used

Task 4. READ FOR MAIN IDEAS. Read the text and choose the statement with the main idea.

A. AI and ML have profoundly transformed technology, employing a data-driven approach for tasks and continuous improvement over time.
B. AI and ML differ from traditional programming through their ability to handle complexity and adapt to new data for continuous improvement.
C. AI and ML encompass various technologies and are capable of addressing a wide range of problems effectively.

AI and ML and Their Distinctions from Traditional Programming

Artificial Intelligence and Machine Learning are two interrelated yet distinct fields that have transformed the modern technology. While both are part of the broader domain of computer science, they differ significantly from traditional programming approaches.

AI refers to the simulation of human intelligence in machines that are programmed to mimic cognitive functions like learning, problem-solving, and decision-making. The goal of AI is to enable machines to perform tasks that would typically necessitate human intelligence, exceeding traditional programming's limitations. AI encompasses a wide spectrum of technologies, including natural language processing, computer vision, robotics, and expert systems.

ML is a subfield of AI that focuses on the development of algorithms and statistical models, allowing computer systems to learn and improve from experience without being explicitly programmed. Instead of following a predefined set of rules, ML algorithms utilize data to recognize patterns, make predictions, and adapt their behavior over time. The fundamental premise of ML is to enable machines to learn from examples, generalizing their knowledge to handle unseen data effectively.

To comprehend the distinctions between AI/ML and traditional programming, we must examine the underlying methodologies and approaches they employ:

Rule-Based vs. Data-Driven Approach

Conventional programming involves explicit instructions provided by human programmers. Developers write algorithms based on predetermined rules and conditions to solve specific problems. The system adheres strictly to these rules and lacks the ability to adapt independently.

In contrast, AI and ML rely on a data-driven approach. Instead of predefined rules, these systems learn patterns and relationships from vast amounts of data. They extract meaningful insights from data and use them to make decisions, making them more flexible and adaptable.

Handling Complexity

Traditional programs are suitable for well-defined tasks with clear rules. However, as tasks become more complex and less deterministic, traditional programming becomes increasingly challenging and impractical.

AI and ML excel at handling complex tasks and large datasets. They can identify intricate patterns and correlations that might be too convoluted for human programmers to code explicitly.

Continuous Improvement

Conventional programs are static and require manual updates whenever changes are necessary. They do not learn or evolve independently.

One of the significant advantages of AI and ML systems is their ability to learn and improve over time. They can adapt to new data, refine their models, and enhance their performance without human intervention.

Generality and Specificity

Traditional programs are typically designed for a specific task or a set of related tasks. They lack the versatility to tackle different problems effectively.

AI and ML models can be generalized to address a broader range of problems within their domain. For instance, an ML model trained to recognize images of animals can be applied to identify various species without significant modifications.

To sum up, AI and ML represent a paradigm shift in computer science, offering novel approaches to problem-solving and decision-making. While traditional programming relies on explicit instructions, AI and ML use data-driven learning to achieve remarkable adaptability and performance. The ability of AI and ML systems to continuously improve and handle complex tasks has paved the way for significant advancements across various industries, propelling us toward a more intelligent and automated future.

Task 5. READ FOR DETAILS. Read the text again and choose the best answer A, B, C, or D to the questions below.

1. What is the primary objective of Artificial Intelligence?
   A. To replace human intelligence entirely
   B. To simulate human intelligence in machines
   C. To create robots with emotions and consciousness
   D. To develop complex mathematical models
2. Which of the following tasks can AI and ML systems perform effectively without explicit programming?
   A. Controlling robotic arms in manufacturing
   B. Creating complex mathematical models
   C. Analyzing large datasets for patterns
   D. Simulating human emotions and consciousness
3. What is the fundamental premise of Machine Learning?
   A. Following predefined rules to make decisions
   B. Simulating human cognitive functions
   C. Adapting independently to new situations
   D. Learning from examples and handling unseen data effectively
4. How do AI and ML differ from traditional programming in handling complexity?
   A. AI and ML use predefined rules for complex tasks.
   B. Traditional programming excels at handling large datasets.
   C. AI and ML identify intricate patterns from data.
   D. Traditional programming adapts independently to new data.
5. What is the main advantage of AI and ML systems over conventional programs?
   A. They are static and require manual updates.
   B. They lack the ability to make predictions.
   C. They learn and improve from experience over time.
   D. They can handle simple tasks more efficiently.
6. In contrast to traditional programming, how do AI and ML make decisions?
   A. By using predefined sets of rules
   B. By extracting insights from vast amounts of data
   C. By relying on human intervention for every decision
   D. By following a fixed pattern for decision-making
7. Which characteristic makes AI and ML more flexible in adapting to changing circumstances?

A. Their reliance on human intelligence
B. Their ability to handle complex tasks
C. Their use of expert systems
D. Their data-driven approach and continuous learning

8. Why are traditional programs limited in addressing different problems effectively?
   A. They are unable to handle large datasets.
   B. They lack predefined sets of rules for various tasks.
   C. They focus on well-defined tasks with clear rules.
   D. They rely on AI and ML for problem-solving.
9. Which statement best describes the nature of AI and ML models?
   A. They are specific to a particular task and cannot be generalized.
   B. They can be applied to a broader range of problems within their domain.
   C. They lack the ability to recognize patterns and correlations.
   D. They focus solely on natural language processing.
10. What is the ultimate goal of AI and ML in terms of tasks that machines can perform?
    A. To perform tasks beyond the limitations of traditional programming
    B. To replicate human intelligence exactly
    C. To achieve superhuman intelligence
    D. To eliminate the need for human intervention in decision-making

Task 6. WORK WITH WORDS. Look at different ML techniques and methods and match them with their explanations.

Machine Learning Techniques and Methods

1. Supervised Learning	a) A subfield of ML using neural networks with multiple layers to process and learn from data.
2. Unsupervised Learning	b) ML without labeled data; the algorithm discovers patterns and relationships on its own.
3. Reinforcement Learning	c) Training an ML model using the entire dataset at once.
4. Transfer Learning	d) Combining multiple ML models to improve overall prediction accuracy.
5. Deep Learning	e) A type of ML where an agent learns to make decisions in an environment by receiving feedback and rewards.
6. Ensemble Learning	f) A type of ML where the algorithm is trained on labeled data, associating input with the correct output.
7. Batch Learning	g) Using pre-trained models as a starting point for new tasks to save training time.

Task 7. ANALYZE. Identify and match the appropriate machine learning techniques to their corresponding real-world tasks.

Supervised Learning	Reinforcement Learning	Deep Learning
Unsupervised Learning	Transfer Learning	Ensemble Learning
	Batch Learning	

1. **Email Spam Classification**
   Given a dataset of emails labeled as either "spam" or "not spam," determine the machine learning technique that can classify new emails based on their content.

2. **Ensemble of Decision Trees**
   Predict whether a customer will purchase a product based on various features like age, gender, and previous purchases. Choose the appropriate machine learning technique that uses a combination of models to improve prediction accuracy.
3. **Customer Segmentation**
   Analyze a dataset of customer purchase history without labeled categories. Find the machine learning technique that groups customers into distinct segments based on their buying behavior.
4. **Image Recognition for Custom Dataset**
   Use a pre-trained model on a large dataset to recognize common objects, then fine-tune it on a smaller dataset specific to a different task, such as recognizing specific types of flowers. Select the corresponding machine learning technique.
5. **Game Playing Agent**
   Train an AI agent to play a computer game. Choose the machine learning technique where the agent learns from feedback and rewards to make decisions that maximize performance.
6. **Sentiment Analysis**
   Determine the machine learning technique for classifying customer reviews as positive or negative based on the text.
7. **Image Classification**
   Train a model to recognize different objects in images, such as cats, dogs, cars, or bicycles. Identify the machine learning technique best suited for this task.

Task 8. EXPLORE THE WORDS. These definitions will help you understand the terms about AI and ML. Add one of the bold words to each blank to complete the sentences.

a. **expert system** – AI systems that emulate the decision-making ability of human experts in specific domains.
b. **bias** – systematic errors in AI and ML models that result from biased training data.
c. **overfitting** – a situation where an ML model performs well on training data but poorly on new, unseen data.
d. **underfitting** – a situation where an ML model is too simplistic to capture underlying patterns in the data.
e. **feature extraction** – the process of selecting relevant features from raw data to be used in ML models.
f. **feature scaling** – normalizing data attributes to ensure all features contribute equally to the ML model.
g. **cross-validation** – a technique to assess ML model performance by dividing data into subsets for training and testing.
h. **regression** – ML technique used for predicting continuous numerical values.
i. **recall** – the proportion of true positive predictions to the total number of actual positive instances.
j. **gradient descent** – an optimization algorithm used to minimize errors and update model parameters.

1. _____ was applied to standardize the numerical attributes, ensuring each feature contributed equally to the final decision tree model.
2. The machine learning model's performance significantly improved after applying _____ to update its parameters and minimize prediction errors during training.
3. To ensure fairness and reduce_____, the AI team carefully curated a diverse and representative dataset for training the facial recognition system.

4. The medical diagnosis system achieved high _____ by correctly identifying a significant proportion of true positive cases for a specific disease.
5. The simple linear regression model resulted in_____, as it couldn't capture the complex relationships between the variables in the financial data.
6. Before feeding the data into the neural network, a process of _____ was employed to select the most relevant attributes for predicting customer preferences.
7. The accuracy of the spam classifier was evaluated using_____, dividing the dataset into subsets for training and testing to measure its overall performance.
8. The hospital implemented a /an _____ in its diagnostic department to assist doctors in diagnosing rare diseases with high accuracy.
9. The team noticed signs of _____ when their image classification model performed exceptionally well on the training set but failed to generalize to new images.
10. In the stock market prediction task, the team utilized a _____ model to forecast the continuous values of future stock prices.

Task 9. WORK WITH WORDS. Fill in the missing words in the sentences.

expert	descent	regression	underfitting	extraction	feature
cross-validation	overfitting	bias	recall		

Machine Learning Techniques and Pitfalls

Within the constantly changing domain of AI and ML, a range of techniques are crucial for building robust and proficient models. Gradient 1) _____ stands as a powerful optimization algorithm, iteratively adjusting model parameters to minimize prediction errors during training. However, one must beware of the potential for 2) _____in the data, as these training datasets can lead to skewed and inaccurate results.

When models are too simplistic to capture complex patterns, they may suffer from 3) _____, resulting in poor performance. To combat this, feature 4) _____ becomes crucial in selecting relevant attributes from raw data, enhancing the model's ability to make meaningful predictions.

To ensure a model's generalizability, 5) _____ is utilized, dividing the data into subsets for comprehensive evaluation. On the other hand, an 6) _____ system, emulating human decision-making, excels in specific domains, providing valuable insights and recommendations.

Conversely, an 7) _____ model performs exceedingly well on the training data but fails to perform on new data, highlighting the need for careful model evaluation. Techniques like 8) _____ aid in predicting continuous numerical values, while 9) _____ serves as a metric for the model's ability to correctly identify positive instances.

To maintain consistency and avoid dominance of certain features, 10) _____ scaling normalizes data attributes, ensuring a balanced contribution to the ML model. As practitioners navigate the complexities of AI and ML, understanding these techniques and their potential pitfalls is crucial for building effective and accurate models.

SPEAKING 1

Task 10. COMMUNICATE. Work in small groups. Discuss the questions below.

Privacy Concerns

1. How do AI and ML technologies raise concerns about personal data privacy?
2. What are the ethical implications of collecting and using individuals' data to train AI models?

3. Should people have more control over their data, even when it's used for training AI models? How can this be practically implemented?
4. How do data breaches and unauthorized data usage raise ethical concerns in AI and ML applications, especially in industries like healthcare and finance?
5. What are the potential implications of using personal data collected for one purpose in an entirely different context?
6. How can AI technologies like data anonymization and federated learning help mitigate privacy concerns in the sharing of sensitive data?
7. Can privacy and innovation coexist in the realm of AI and ML, or is there an inherent conflict?

Impact on Jobs and Society

1. What are the potential effects of AI and automation on the job market and employment?
2. How can society prepare for the workforce changes caused by AI, such as job displacement and skill shifts?
3. What are some potential strategies to reskill and upskill the workforce to adapt to the changing job landscape due to AI and automation?
4. How can governments collaborate with industries to create policies that ensure a smooth transition for workers displaced by AI-driven automation?
5. What industries are most at risk of job displacement due to AI, and how can we best address these challenges?
6. Can AI play a role in creating new job opportunities, and if so, what are some examples of emerging roles or industries?
7. What ethical considerations should organizations take into account when deciding to automate certain job roles with AI, especially in sectors involving human interaction?

Task 11. ANALYZE. Read the case studies with ethical dilemmas, identify a problem and provide solutions.

Facial Recognition and Privacy Concerns

A technology company develops a highly accurate facial recognition system that can identify individuals in real-time from CCTV footage and public images on the internet. The system aims to enhance security and assist law enforcement agencies in identifying criminals.

The use of this facial recognition system raises privacy concerns as it can potentially track individuals without their knowledge or consent. The system's deployment in public spaces and the potential for misuse infringe upon people's right to privacy. The dilemma is how to balance security needs with individual privacy rights, especially considering the potential for mass surveillance and wrongful identifications.

Bias in Hiring Algorithms

A large organization adopts AI-powered algorithms to streamline its hiring process. The algorithms process resumes and applications, aiming to eliminate bias by focusing solely on skills and qualifications.

Despite the intention to eliminate human bias, the algorithms end up favoring candidates from certain demographic groups due to biased training data. The dilemma arises as the company grapples with accusations of perpetuating systemic bias, even though human involvement is minimal. Balancing the quest for objective hiring with the need to rectify algorithmic bias becomes a complex ethical challenge.

Autonomous Vehicles and Moral Decision-Making

A car manufacturer develops fully autonomous vehicles that can make split-second decisions in life-threatening situations. These decisions involve choosing between minimizing harm to passengers or pedestrians, raising questions about the ethical principles guiding AI's decision-making.

In the event of an unavoidable accident, should the autonomous vehicle prioritize the safety of its occupants or pedestrians? The dilemma delves into the challenge of programming moral decisions into AI systems and the ethical implications of determining whose lives should take precedence in a crisis situation.

LISTENING

Task 12. COMMUNICATE. You are going to listen to a podcast about generative AI, discuss the questions below with your partner before you start listening.

- Have you heard about generative AI before? If yes, what do you know about it? If not, what do you think it might involve?
- What are some examples of AI technologies you're familiar with? How do you think generative AI might differ from those?

Task 13. LISTEN FOR DETAILS. Scan the QR code and listen to the podcast "Generative AI", then choose the correct answer A, B, C, or D for the questions below.

1. What is generative AI?
   A. A subset of AI that focuses on improving existing algorithms.
   B. AI designed to automate routine tasks in business operations.
   C. AI technology that can generate various types of content.
   D. AI specifically developed for medical diagnostics.
2. What does ChatGPT offer as an interface to the generative pre-trained transformer (GPT)?
   A. A platform for real-time video chats with AI.
   B. A user-friendly way to program AI robots.
   C. An interface for generating images from text prompts.
   D. A chat interface that responds with generated content.
3. Which technology introduced in 2014 allowed the generation of realistic images, voices, music, and text?
   A. Transformers
   B. Artificial neural networks
   C. Deep learning
   D. Generative adversarial networks (GANs)
4. How does generative AI differ from traditional AI?
   A. Generative AI can only identify patterns.
   B. Traditional AI can identify patterns, make decisions, analyze and classify data, and detect fraud.
   C. Generative AI focuses on decision-making.
   D. Traditional AI can produce deepfakes.
5. What is one potential risk associated with generative AI?
   A. Increased efficiency in creative content production.
   B. Enhanced user experiences through customization.
   C. Copyright infringement and data privacy violations.
   D. Improved transparency and accountability.
6. What concept forms the basis of the transformer architecture in AI models?
   A. Attention

B. Neural networks
C. Deep learning
D. Classification

7. What did Google Bard, a public-facing chatbot, generate wrong information about?
   A. The inventor of transformers
   B. The first AI-powered chatbot
   C. The discovery of a planet in another solar system
   D. The benefits of deep learning
8. What did DALL-E, a multimodal form of GPT, primarily generate content from?
   A. Text prompts
   B. Audio recordings
   C. Mathematical formulas
   D. Visual images
9. What does GPT stand for in the context of AI?
   A. Generative Programming Technique
   B. Generalized Problem-solving Tool
   C. Generative Pre-trained Transformer
   D. Global Processing Technology
10. What capability does DALL-E 2 offer that its earlier version did not?
    1. Generating text prompts from images
    2. Generating multiple styles of imagery
    3. Generating audio from text prompts
    4. Generating video content from audio

Task 14. COMMUNICATE. Work with your partner. Discuss the questions below.

1. In what ways has generative AI impacted the creative process, whether it's in writing, art, music composition, or other forms of expression?
2. What ethical considerations arise when using generative AI, especially in contexts where it can produce realistic yet fabricated content, such as deepfakes or automated news articles?
3. How can we make sure that generative AI models don't keep unintentionally repeating biases that exist in the data they learn from?
4. What are the potential uses of generative AI in enhancing personalized user experiences, such as generating tailored product recommendations, educational content, or even health-related guidance?
5. How can generative AI be leveraged for educational purposes? Can it contribute to language learning, content creation for e-learning platforms, or generating realistic simulations for training?
6. What are the challenges and opportunities of using generative AI in creative industries like fashion, architecture, and interior design? How does it impact the concept of originality and innovation?
7. How do you envision the future of generative AI? What advancements, breakthroughs, or ethical considerations might shape its development and adoption in the coming years?

PROJECT WORK

Task 15. SEARCH THE WEB. You are going to use the Internet to research and compare different generative AI models. Work in teams and follow the project steps.

Comparative Analysis of Generative AI Models

1. Research and Selection
Choose a few prominent generative AI models, such as GPT-4, BERT, DALL-E, and others. Research their features, strengths, weaknesses, and the industries they are commonly used in.

2. Use Case Identification
Identify specific use cases for which each generative AI model is suitable. For example, GPT-3 might excel in generating human-like text, while DALL-E is designed for image generation.

3. Model Comparison
Assess their performance and suitability of different models in terms of quality, relevance, coherence, and accuracy. Use the following criteria:

Generative AI Model	Quality of output	Diversity and creativity	Ease of use	Speed and efficiency	Training data and bias	Customizability	Availability and accessibility
GPT-4							
DALL-E							
…							
…							

4. Ethical Considerations
Discuss and analyze ethical considerations related to the use of each generative AI model. Address concerns such as potential bias, misuse, and credibility of AI-generated content.

5. Presentation
Present your findings through a report or a presentation to your classmates.

LANGUAGE FOCUS 1

Task 16. STUDY AND ANALYZE. Look at the information about cause and effect.

Cause and Effect

Many texts in information security are concerned with establishing cause and effect or the relationship that exists between events, objects or variables.
We can mention the cause before the effect:
(cause) (effect)
Inadequate data preprocessing **leads to** inaccurate AI predictions.
We can mention the effect before the cause:
(effect) (cause)
Facial recognition technology has become controversial **due to** concerns about privacy and potential biases in algorithms.

Ways of expressing cause and effect

Verbs linking cause and effect:

result	cause
produce	result in
allow	result from
prevent	bring about
enable	

AI-generated art **results from** the collaboration between artists and machine learning algorithms. (effect ⟵ cause)
Utilizing advanced neural networks **enables** AI models to comprehend complex patterns in image data. (cause ⟶ effect)
The growth of AI-driven automation within factories can **cause** a decrease in the human workforce. (cause ⟶ effect)

Connectives introducing cause:

due to	since
as the /a result of	because of
in response to	as

Driven by the growing demand for automated customer support, many businesses are implementing AI-powered chatbots **in response to** evolving consumer preferences. (effect ⟵ cause)

Due to its inability to comprehend complex patterns, the AI model failed to accurately predict future stock market trends. (cause ⟶ effect)

Since AI algorithms rely on vast amounts of data for training, the accuracy of their predictions largely depends on the quality and diversity of the input data. (cause ⟶ effect)

Connectives introducing result:

with the result that	so that
therefore	thus
consequently	hence
for this reason	thereby

By analyzing user preferences and behavior, AI-driven recommendation systems can suggest relevant products, **thereby** enhancing customer engagement and sales conversion rates.. (cause ⟶ effect)

The lack of a standardized regulatory framework for AI technologies has led to ethical concerns and potential misuse, **consequently** prompting organizations to address these issues with increased urgency. (cause ⟶ effect)

Causal relationship with:

if

If AI systems lack access to diverse and representative training data, their ability to make accurate predictions and classifications may be compromised. (cause ⟶ effect)

Even **if** an AI model produces highly convincing text, images, or videos, its output might still carry ethical and legal risks. (cause ⟶ effect)

The application of AI algorithms can greatly enhance cybersecurity, especially **if** they can rapidly detect and mitigate abnormal activities that may signify a security threat. (effect ⟵ cause)

Task 17. ANALYZE. Read the following sentences and underline the part that expresses the cause.

1. AI's ability to make accurate medical diagnoses can greatly improve patient care, especially if it is integrated into healthcare systems effectively.
2. The integration of AI algorithms into medical devices causes faster and more precise diagnosis of medical conditions.
3. AI technologies are being integrated into education systems to personalize learning experiences, thereby enhancing student engagement and knowledge retention.
4. The combination of AI and renewable energy sources results in more efficient power distribution and consumption.
5. AI-powered language translation tools produce more accurate and coherent translations across multiple languages.

6. AI-driven automation in industries has increased production efficiency, hence reducing operational costs and leading to higher profit margins.

Task 18. ANALYZE. Read the following sentences and underline the part that expresses the effect /result.

1. The potential of AI to change transportation lies in its capability to create autonomous vehicles that can navigate without human intervention, particularly if these vehicles can seamlessly interact with their surroundings.
2. The use of AI-driven surveillance systems prevents security breaches and unauthorized access in sensitive areas.
3. AI technologies enable robots to perform complex tasks that were previously beyond their capabilities.
4. The application of machine learning algorithms in self-driving cars can result in safer roads and reduced accidents.
5. With the result that AI-powered chatbots have become a staple in customer service, businesses can handle a higher volume of inquiries efficiently and with reduced wait times.
6. AI's capability to identify patterns in financial transactions has strengthened fraud detection efforts, thereby safeguarding financial institutions and customer assets.

Task 19. PRACTICE. Match the beginning of each sentence with the most appropriate ending.

1. The creation of lifelike deep fake videos results	a) result in more accurate disease diagnosis and personalized treatment plans.
2. The integration of AI in financial analysis can bring	b) the creation of sophisticated virtual assistants, with the result that daily tasks are becoming more streamlined and convenient.
3. The collaboration between medical professionals and AI algorithms can	c) from the application of AI-driven image synthesis techniques.
4. Businesses are embracing AI for data analytics,	d) the need for effective global communication.
5. The continuous advancements in AI have led to	e) a result of the incorporation of AI algorithms in threat detection and prevention.
6. In response to the need for optimized energy consumption,	f) consequently enabling them to gain valuable insights into consumer behavior and market trends.
7. Enhanced cybersecurity measures are	g) about more accurate predictions in stock market trends.
8. The expansion of AI-driven language translation tools is in response to	h) smart homes are equipped with AI-controlled energy management systems.

Task 20. PRACTICE. Choose the correct word in bold to complete the sentences.

enabled	hence	if	result in	caused
	resulted from		due to	

1. The development of autonomous vehicles _____ the combination of AI algorithms and advanced sensor technologies.
2. Increased productivity in content creation is _____the collaboration between writers and AI-powered text generation tools.
3. The advancements in natural language processing have _____AI chatbots to engage in human-like conversations, hence enhancing customer interactions.

4. The continuous development of AI in autonomous vehicles has improved safety features, _____ making transportation more secure.
5. _____ AI-powered medical diagnostics can detect subtle patterns in medical images, early disease detection and treatment are becoming more effective.
6. _____ AI-powered predictive analytics are implemented effectively, businesses can make data-driven decisions and optimize their operations.
7. The utilization of AI-driven image recognition in security systems can _____ quicker identification of potential threats and enhanced public safety.
8. The integration of AI in financial services has _____ transformations in investment strategies and risk assessment.

WATCHING

Task 21. WATCH FOR MAIN IDEAS. Scan the QR code and watch the video "The 7 stages of AI". Put the stages in the order they appear in the video.

- Artificial Super Intelligence, ASI
- Rule-Based AI Systems
- Domain-specific mastery systems.
- Context Awareness and Retention Systems
- Thinking and Reasoning AI Systems
- The AI Singularity
- The Birth of a New Mind. Artificial General Intelligence. AGI

Task 22. WATCH FOR DETAILS. Watch the video again and match the information with the corresponding stage.

Stage 1	a) These AI systems excel within a specific domain or field, analyzing data, identifying patterns, and making informed decisions.
Stage 2	b) These AI systems equal human intelligence in all aspects, performing a wide range of tasks and exhibiting self-awareness and consciousness.
Stage 3	c) These AI systems are at this stage mimic human thinking and reasoning, capable of understanding complex concepts and generating creative ideas.
Stage 4	d) These AI systems are at a hypothetical point where AI growth becomes uncontrollable and irreversible, potentially leading to unforeseeable changes in human civilization.
Stage 5	e) These AI systems operate based on pre-defined rules or algorithms given by programmers. They lack the ability to learn beyond these rules.
Stage 6	f) These AI systems are at a level of AI surpassing human intelligence, potentially solving complex global issues and raising ethical and safety concerns.
Stage 7	g) These AI systems understand and retain context, using past interactions to inform future responses. They offer a more personalized user experience.

Task 23. COMMUNICATE. Discuss the questions below.

1. What challenges do you foresee in achieving AGI?
2. What are the potential benefits and risks associated with ASI?
3. How might an ASI system contribute to solving global issues?
4. Do you believe that AI could reach a point where technological growth becomes uncontrollable and irreversible?
5. What ethical and safety concerns might arise as AI advances through the stages, particularly in the context of ASI and the AI Singularity?

6. What are some potential applications of AGI and ASI in fields such as healthcare, education, and research?

SPEAKING 2

Task 24. COMMUNICATE. Work in small groups. Discuss the questions below.

Bias in Algorithms

1. What are the potential consequences of deploying biased algorithms in real-world scenarios?
2. What steps should be taken to identify and mitigate bias in algorithms before they are deployed?
3. How can we strike a balance between AI's potential benefits and the risks associated with algorithmic bias, especially in critical domains like criminal justice and healthcare?
4. What strategies can organizations adopt to ensure transparency and fairness when deploying AI systems, particularly in situations where human lives are affected?
5. What responsibilities do tech companies and developers have when it comes to addressing and rectifying bias in their AI products?

Unintended Consequences

1. Can you provide examples of unintended consequences that have arisen from the deployment of AI and ML technologies?
2. How can we anticipate and mitigate potential negative impacts of AI on various aspects of society?
3. Are there scenarios where over-reliance on AI and automation might lead to neglect of human judgment and oversight, resulting in unintended outcomes?
4. What lessons can be drawn from historical technological advancements to mitigate the unintended consequences of AI and ML?

Task 25. ROLE PLAY. Role play the situations below.

AI Technology Assessment Meeting

Student A: You are a representative from a government regulatory agency responsible for overseeing AI technologies. Your task is to evaluate the AI system developed by the company for potential risks and ethical concerns. Your focus is on ensuring that the AI system adheres to legal standards and doesn't compromise user safety.

Student B: You are a software engineer presenting a newly developed AI-driven autonomous vehicle system. The system is designed to navigate city streets without human intervention. You are confident in the system's capabilities and safety measures, but you're also aware of concerns related to accidents and unforeseen circumstances.

AI Job Interview

Student A: You are a hiring manager at a technology company. You're conducting an interview for a position involving the development of AI-driven customer service chatbots. Your goal is to assess the candidate's technical skills, ethical awareness, and their ability to create responsible AI systems.

Student B: You are a job candidate with a strong technical background in AI and natural language processing. You're passionate about creating AI systems that provide value but are also concerned about potential biases and customer privacy. You want to showcase your skills while highlighting your commitment to ethical AI.

Task 26. ANALYZE. Read the case studies, identify a problem and provide solutions.

Fake News Generation

A news organization integrated a generative AI tool to automate news article creation. However, the AI system started generating fake news articles that resembled authentic content, making it difficult for readers to distinguish between real and fabricated information.

The circulation of fake news articles eroded public trust in the news organization and undermined the credibility of journalism. Readers were misled by the false information, leading to confusion and misinformation on important topics.

Unintended Art Plagiarism

An art gallery curated an exhibition featuring AI-generated artwork. Some of the AI-generated pieces bore a striking resemblance to existing works of art by renowned artists, leading to accusations of plagiarism.

The art gallery faced legal and ethical challenges as accusations of copyright infringement and lack of originality emerged. The controversy overshadowed the intended purpose of showcasing innovative AI-generated art, leading to debates on the boundaries of creativity in the digital age.

READING AND VOCABULARY 2

Task 27. COMMUNICATE. You are going to read a text about AI-powered robots. Before you start reading discuss the questions below with your partner.

- What comes to your mind when you hear the term "AI-powered robots"?
- How do you think robots and artificial intelligence can work together?
- Can you think of any examples where robots are currently used in various industries?

The Rise of AI-Powered Robots

Step into a realm where science fiction meets reality, where machines aren't just gears and metal, but brilliant minds in their own right. Buckle up for an exhilarating dive into the wonderful world where AI and robotics shake hands, setting the stage for a tech revolution that's redefining the very essence of 'smart'. From robots that understand our words to those that see and learn from the world like we do, let’s have a look at AI-powered robots.

The fusion of AI with natural language processing has started an era of human-robot interaction that once existed only in the realm of science fiction. The intricacies of human language, previously enigmatic to robots, are now comprehended with remarkable accuracy. NLP algorithms, fueled by deep learning techniques, empower robots to interpret complex linguistic nuances, comprehend context, and create coherent responses. Conversational AI systems, such as chatbots and virtual assistants, exemplify this advancement. These systems not only understand and generate human language but also adapt their responses based on conversational context, opening a new era of personalized, dynamic interactions between humans and machines.

Advancements in computer vision have provided robots with the ability to perceive and interpret their surroundings similarly to the human visual system. Through neural networks and deep learning models, robots can detect objects, recognize faces, gauge depth, and interpret visual scenes. This has profound implications for industries like manufacturing, logistics, and healthcare. Robots equipped with advanced computer vision capabilities can perform intricate tasks like quality control on production lines, pick-and-place operations, and even conduct surgeries with unprecedented precision. The integration of AI-driven computer vision enables robots to navigate complex environments, avoiding obstacles and adapting to dynamic situations.

Machine learning algorithms have emerged as the bedrock of AI in robotics, enabling machines to learn from data and improve performance iteratively. Reinforcement learning, a subset of machine learning, facilitates robots in learning optimal actions through trial and error. In domains ranging from autonomous driving to robotics in agriculture, robots equipped with reinforcement learning algorithms learn to navigate challenging scenarios, adapt to varying terrains, and optimize their actions based on changing circumstances. Such machines are no longer mere automated tools; they are adaptable problem solvers, capable of making on-the-fly decisions in complex, unpredictable environments.

The synergy between AI and robotics has led to the development of robots that possess cognitive and perceptual capabilities, mirroring human-like behaviors. These advanced robots do not merely execute pre-programmed actions; they learn, reason, and adapt to novel situations. The impact spans across industries, from healthcare where robots assist surgeons with precision, to agriculture where autonomous drones monitor crop health. Additionally, the melding of AI and robotics has the potential to revolutionize disaster response, hazardous materials handling, and space exploration, areas previously full of risks for human involvement.

So, to wrap it all up, the big progress in AI and robots is bringing in a totally new era of cool ideas and changes. When we mix natural language understanding, computer vision, and machine learning, robots can do way more than before. They're not just stiff machines anymore; they're like clever friends that can change and adapt. This could change how things work in lots of areas, make people even better at what they do, and let us explore new things we didn't know about. The way AI and robots work together is like a rocket that's taking us to a future where machines and humans work together in a super cool way.

Task 28. READ FOR DETAILS. Read the text again and answer the questions.

1. What is the main focus of the article "The Rise of AI-Powered Robots"?
2. How has the fusion of AI with natural language processing transformed human-robot interaction?
3. What is the significance of advancements in computer vision for robots?
4. How do machine learning algorithms contribute to the capabilities of robots?
5. What is reinforcement learning, and how does it benefit robots?
6. In what ways do advanced robots with cognitive and perceptual capabilities differ from traditional robots?
7. Name a few industries that can benefit from the synergy between AI and robotics.
8. How does the seamless integration of AI and robotics shape the future of technology according to the article?

Task 29. WORK WITH WORDS. Read the text and choose the correct variants for missing words.

Collaborative Robots

Collaborative robots, often referred to as "cobots," represent a significant 1) _____ of traditional automation, where machines work in harmony with humans. Unlike their industrial 2) _____, cobots are designed to share the workspace with human counterparts, generating a productive and safe teleoperative environment. Equipped with an array of advanced sensors and sophisticated computer 3) _____, cobots can precisely perceive their surroundings, making real-time 4) _____ to avoid obstacles and ensure seamless interaction. This capability aligns with the principles of automation, where repetitive or 5) _____ tasks can be transferred from human workers to these collaborative partners, augmenting overall efficiency and safety.

Employing algorithms that ensure fairness and inclusivity, cobots 6) _____ potential biases and maintain a high standard of impartiality. Moreover, cobots 7) _____ to strict privacy protocols, safeguarding sensitive information and fostering an environment of trust.

Cobots, with their 8) _____ algorithms and rapid learning capabilities, learn from human guidance and adapt to dynamic situations. As they become skilled in specific tasks, they 9) _____ human capabilities by taking on routine aspects, freeing human workers to engage in more creative and value-added endeavors.

Industries ranging from manufacturing to healthcare are experiencing the positive impact of cobots. In manufacturing, cobots collaboratively 10) _____ sophisticated components, while in healthcare, they assist medical professionals by transporting equipment and performing repetitive tasks, thus improving patient care.

1.	A) attachment	B) add-on	C) augmentation	D) addition
2.	A) predecessors	B) folks	C) parents	D) olds
3.	A) eye	B) eyesight	C) vision	D) view
4.	A) modifications	B) changes	C) updates	D) adjustments
5.	A) toxic	B) hazardous	C) adventurous	D) unhealthy
6.	A) moderate	B) mitigate	C) depress	D) delay
7.	A) adhere	B) guard	C) follow	D) glue
8.	A) intricate	B) sensitive	C) blended	D) confused
9.	A) deepen	B) jeopardize	C) complement	D) enhance
10.	A) pack	B) gather	C) assemble	D) pick

SPEAKING 3

Task 30. COLLABORATE. Work in pairs. Look at the statistics about artificial intelligence. Discuss it with your partner. What data looks predictable, surprising or appalling?

- It is expected that 10% of vehicles will be driverless by 2030, as the global market of self-driving cars is forecasted to increase from 20.3 million in 2021 to 62.4 million.
- AI technology is one of the fastest-growing industries in the world with a forecasted annual average growth rate of 33.2% between 2020 and 2027.
- China leads in AI adoption, with 58% of companies deploying AI and 30% considering integration. In comparison, the United States has a lower adoption rate, with 25% of companies using AI and 43% exploring its potential applications.
- China is investing in AI the most for both personal and business use. Current artificial intelligence usage statistics show that by 2030 about 26.1% of China's total GDP will come from AI technology.
- 54% of company executives have said that implementing AI in their business has increased productivity significantly.
- As of 2021, there are about 4.2 billion devices with AI-powered assistants. By 2024 this number is expected to double with 8.4+ billion devices powered by AI assistants.
- Alexa controls 25% of the voice assistant market and Cortana holds about 19% of the total market.
- 70% of people use their smart speakers to check the weather daily. Only 5% said they use their smart speakers for more complex tasks such as ordering products online.
- As AI evolves, it could displace 400 million workers worldwide. A McKinsey report predicts that between 2016 and 2030, AI-related advancements may affect around 15% of the global workforce.
- According to World Economic Forum research, AI is projected to create around 97 million new jobs, potentially countering workforce displacement concerns.

- An Accenture report forecasts that the manufacturing sector will reap the greatest financial benefit from AI adoption, with a gain of $3.8 trillion expected by 2035. AI has the potential to drastically alter the sector's economic impact.
- Over half of respondents, 54%, believe that AI can improve written content, suggesting that AI-driven solutions such as ChatGPT have the potential to enhance text quality, creativity and efficiency in various content creation contexts.

Task 31. COMMUNICATE. Look at the statistical data on artificial intelligence again and answer the questions.

1. What statistical data do you consider the most important? Why?
2. How fast is the AI technology industry growing, and what are the factors contributing to this rapid growth? How might this growth influence other sectors?
3. Compare the adoption rates of AI technology in China and the United States. What might explain the differences in adoption rates between these two countries?
4. How is China investing in AI, and what potential economic implications could this investment have for the country's future?
5. How have AI implementations affected business productivity, and what are some examples of areas where AI has made a significant impact?
6. What are the potential implications of the widespread use of AI assistants?
7. Analyze the market share of voice assistants like Alexa and Cortana. How might this competition impact the development and functionality of these assistants?
8. What are the most common uses of smart speakers, and why do you think people primarily use them for certain tasks like checking the weather rather than more complex activities?
9. How might the financial benefits projected by the Accenture report affect the industry and its growth?
10. How do people perceive AI's ability to improve written content? What are the potential benefits and challenges of using AI-driven solutions like ChatGPT for content creation?

WATCHING

Task 32. WATCH FOR MAIN IDEAS. Scan the QR code and watch the video "AI Humanoid Robots". Tick the idea that was mentioned in the video.

A. This AI robot can interact with individuals using microphones, cameras, and facial recognition software, just like a human.
B. Both Ameka and NEO possess the capability to create drawings, showcasing their intelligence and creativity.
C. Ameka boasts impressive fine motor skills, enabling it to perform tasks requiring precision, such as playing the piano, typing, or drawing.
D. The physical robot NEO is designed to resemble a futuristic astronaut, equipped with arms, legs, cameras, speakers, microphones, and sensors.

Task 33. WATCH FOR DETAILS. Watch to the video again, then choose the correct answer A, B, C, or D for the questions below.

1. What is the name of the groundbreaking robot from Engineered Arts that can mimic human expressions and movements?
   A. NEO
   B. ChatGPT
   C. Ameka

D. DALL-E

2. What recent announcement was made by OpenAI and OneX?
   A. Launching a new smartphone
   B. Unveiling a futuristic building
   C. Developing a self-driving car
   D. Introducing their first physical robot named NEO
3. How does Ameka demonstrate its ability to communicate in various languages and accents?
   A. It uses hand gestures
   B. It utilizes pre-recorded audio
   C. It plays rock-paper-scissors
   D. It uses text-to-speech synthesis
4. What enables Ameka to perform tasks requiring precision and coordination?
   A. Its ability to mimic human expressions
   B. Its collaboration with other robots
   C. Its advanced knowledge of different languages
   D. Its high degree of dexterity and fine motor skills
5. What is the ultimate goal of creating Artificial General Intelligence (AGI)?
   A. To perform any human task
   B. To draw realistic images
   C. To write functional code
   D. To communicate with humans
6. What is the purpose of using GAN (Generative Adversarial Networks) in Ameka's drawing ability?
   A. To generate music
   B. To create realistic images from text
   C. To calculate joint angles
   D. To control motors
7. What is one potential downside of AI robots like Ameka and NEO?
   A. They can't learn new tasks
   B. They only perform boring jobs
   C. They might take over some people's jobs
   D. They are too expensive
8. What sets NEO apart in terms of its design and features?
   A. It can swap its arms for legs
   B. It has a fixed and unchangeable design
   C. Its parts can be customized based on the task
   D. It lacks wireless communication capabilities
9. How does NEO utilize OpenAI's AI systems for various tasks?
   A. It relies solely on its internal computer
   B. It creates code from text prompts using its own algorithms
   C. It can identify objects and faces using physical sensors
   D. It responds to spoken commands and generates images from text
10. What kind of tasks can NEO perform with its abilities?
    A. Emotional expression and mimicry
    B. Solving complex mathematical equations
    C. Playing a variety of musical instruments
    D. Drawing, playing games, and solving puzzles

LANGUAGE FOCUS 2

Task 34. STUDY AND ANALYZE. Look at the rule about participles, study in what situations they are used.

Participles

Present Participles end in –ing. E.g. **predicting**
Past participles end in –ed, although there are many irregular verbs. E.g. **predicted**
Perfect participles are formed using having+past participle. E.g. **having predicted**

They are used:

To replace a relative clause	The data carefully **analyzed** by AI revealed intricate patterns and correlations that were previously unnoticed.. (which was analyzed) AI systems **predicting** market trends with remarkable accuracy have become invaluable tools for investors and businesses. (which are predicting)
With prepositions and conjunctions	After **enhancing** its processing power, the AI device performed complex tasks. After **having developed** sophisticated algorithms, the AI company gained a competitive edge.
To explain the reason for something	AI-powered image recognition is becoming increasingly accessible, **making** it highly favored among tech enthusiasts.
To talk about actions happening at the same time	**Examining** various AI applications, they reached a consensus to work together.
To talk about actions happening in sequence	**Having employed** advanced algorithms, the AI system achieved accurate predictions.
As an alternative passive form	**Provided** with extensive data sets, the AI model generated insightful insights into market trends. (because it was provided)
As an alternative conditional form	**Granted** the opportunity to analyze potential risks, AI would enhance its understanding of emerging cyber threats. (if it was given the opportunity)

Task 35. ANALYZE. Read the statements, underline the participles, identify the forms and explain the reason of using them.

1. Developing advanced algorithms, the AI researcher aimed to optimize data analysis and achieve groundbreaking results.
2. Processing vast amounts of information, the AI system successfully identified patterns and trends in the dataset.
3. Being concerned about AI ethics, researchers are striving to establish comprehensive guidelines for responsible AI development.
4. The chatbot responding inaccurately should be fine-tuned immediately.
5. Having undergone extensive training, the neural network was ready to tackle complex tasks.
6. While fine-tuning the model, an unexpected convergence issue emerged.
7. Machine learning, used strategically, can elevate predictive accuracy beyond traditional statistical methods.

Task 36. PRACTICE. Read the sentences. Form the correct participle from the verbs in brackets. Sometimes more than one variant is possible.

1. The AI _____for data analysis is highly efficient. (implement)
2. Neural networks _____fraudulent transactions with remarkable accuracy have enhanced financial institutions' fraud prevention measures. (detect)
3. The code, _____ by AI programmers, runs smoothly. (design)
4. _____ different AI platforms, companies recognized the potential of cooperation to drive innovation. (evaluate)
5. Artificial intelligence algorithms _____ supply chain logistics with remarkable accuracy have streamlined operations for global enterprises. (optimize)
6. The AI system, _____on massive datasets, made accurate predictions. (train)
7. _____ the AI robot with sophisticated algorithms, it demonstrated exceptional performance. (program)
8. _____ different AI models, researchers determined that pooling resources was the most effective strategy. (analyze)
9. The data, _____ from various sources, forms the basis of our analysis. (collect)
10. Machine learning models _____ disease outbreaks with remarkable accuracy have revolutionized public health responses. (predict)

WRITING

Task 34. WRITE. Write a proposal for an AI startup. Study the Writing Template at the end of the textbook.

AI Startup Proposal

Imagine you are part of a team that is planning to launch an AI startup. Your goal is to create a detailed proposal that outlines the key elements of your startup venture. Your proposal should be well-researched, innovative, and persuasive, showcasing a clear understanding of AI/ML technologies and their potential applications in the chosen domain. Follow the plan:

1. Problem Statement
   Define the specific problem your AI startup aims to solve.
2. AI Solution
   Describe the AI-powered product or service that addresses the problem.
3. Target Market
   Identify the primary audience or customer segment.
4. Business Model
   Outline the revenue model and potential monetization strategies.
5. Implementation Plan
   Provide a brief timeline and key steps for startup development.

Task 35. WRITE. Write a market trend analysis. Study the Writing Template at the end of the textbook.

Analyzing Emerging Trends in AI/ML Technologies

You will conduct a comprehensive market trend analysis for emerging AI and ML technologies. Identify and evaluate the current and future trends in the AI/ML sector, focusing on technological advancements, market demand, industry applications, and potential growth opportunities. Follow the plan:

1. Select AI/ML Technologies
   Choose specific AI and ML technologies, such as natural language processing, computer vision, predictive analytics, or reinforcement learning, that are currently driving innovation and growth.

2. Collect Market Data
   Gather relevant market data, including market size, growth rates, investment trends, and regulatory developments in the AI/ML industry.
3. Analyze Technological Advancements
   Explore recent technological breakthroughs in the chosen AI/ML technologies. Assess their impact on various industries, including healthcare, finance, manufacturing, and more.
4. Evaluate Industry Applications
   Examine real-world applications of AI/ML technologies across different sectors. Analyze how these technologies are enhancing efficiency, decision-making, and customer experiences.
5. Identify Market Demand
   Assess the demand for AI/ML technologies, considering factors such as business automation, data-driven insights, and competitive advantages.
6. Competitive Landscape
   Analyze the competitive landscape by identifying key players, startups, and established companies that are driving innovation in AI/ML technologies.
7. Future Growth Opportunities
   Based on the analysis, identify emerging opportunities and challenges for businesses and stakeholders interested in leveraging AI/ML technologies.
8. Recommendations
   Provide strategic recommendations for organizations looking to integrate AI/ML technologies, including considerations for implementation, partnerships, and skill development.