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CLASS	9TH	CHAPTER	05
SUBJECT	COMPUTER	BOARD	FEDERAL

CHAPTER 5: APPLICATIONS OF COMPUTER SCIENCE

Q1. Select the best answer for the following MCQs.

i. The process of taking a known data set as input to train the algorithm to create a model for prediction is known as:

a. Natural Language Processing b. Expert system c. Supervised Machine Learning d. Unsupervised Machine Learning

Answer: **c. Supervised Machine Learning**

ii. The AI technology that enables computer systems to obtain meaningful information from digital images or videos is called:

a. Image Recognition b. Speech Recognition c. Scanner d. Computer Vision

Answer: **d. Computer Vision**

iii. Instant answers to website visitors' questions through text or voice interaction are provided by:

a. Robot b. Chatbot c. Cloud Computing d. Expert System

Answer: **b. Chatbot**

iv. Cloud computing model in which resources are owned by and used inside a single organization is called:

a. Private Cloud b. Public Cloud c. Hybrid Cloud d. Remote Cloud

Answer: **a. Private Cloud**

v. The AI tool used for correcting spelling and grammar mistakes is:

a. ChatGPT b. Lovo AI c. Grammarly d. Virtual Assistant

Answer: **c. Grammarly**

vi. Virtual assistant that belongs to Apple Inc. is:

a. Siri b. Alexa c. Google Assistant d. Cortana

Answer: **a. Siri**

vii. The AI tool that converts text to speech is:

a. ChatGPT b. Grammarly c. Alexa d. Lovo AI

Answer: **d. Lovo AI**

viii. The technology used in self-driving cars is called:

a. Natural Language Processing b. Chatbot c. Computer Vision d. Virtual Assistant

Answer: **c. Computer Vision**

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ix. The technology concerned with training the computer to understand spoken and written words and to take action is known as:

a. Virtual Assistant b. Natural Language Processing c. Language analysis d. Virtual training

Answer: **b. Natural Language Processing**

x. The technology concerned with performing specific tasks with little or no human intervention using computer controlled machine is called:

a. Computer vision b. Computer intelligence c. Robotics d. Virtual technology

Answer: **c. Robotics**

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Q2. Short Response Questions

1) Briefly describe the positive impact of AI in our daily life.

Artificial Intelligence automates routine tasks, providing personal assistance through smart virtual assistants like Siri and Alexa.

It enhances productivity through smart recommendation systems, real-time language translation, and intelligent navigation tools.

Additionally, AI improves safety and convenience across daily operations via automated fraud detection and smart home automation.

2) Differentiate between supervised and unsupervised machine learning.

Supervised machine learning trains algorithms using labeled datasets where both input features and target outputs are explicitly provided.

Unsupervised machine learning analyzes unlabeled data to independently identify inherent patterns, structures, and clusters without guidance.

While supervised learning focuses on classification and regression tasks, unsupervised learning focuses on feature grouping and anomaly detection.

3) Describe how computer vision applications help in automation of tasks.

Computer vision enables automated systems to process and interpret visual data from camera sensors in real time.

It powers autonomous vehicle navigation, automated visual quality inspection in manufacturing assembly lines, and facial recognition access.

By replacing manual visual checks, computer vision increases operational processing speeds, eliminates human fatigue, and minimizes error rates.

4) Compare the use of Natural Language Processing (NLP) with computer languages for interaction with computer.

NLP allows humans to communicate with computers using unstructured everyday human languages like English or Urdu via voice or text.

In contrast, computer languages require strict syntax rules and exact command structures to execute program logic.

Thus, NLP democratizes computing accessibility for non-technical users, whereas programming languages remain designed for software development.

5) What is a robot? Mention four areas where robots can replace humans that are not mentioned in this unit.

A robot is a programmable electromechanical machine capable of carrying out complex tasks automatically with precision and autonomy.

Four unexplored areas include deep-sea underwater exploration, nuclear waste decontamination, space exploration missions, and agricultural harvesting.

In these domains, robots protect human lives by taking over hazardous environments while performing high-precision operations.

6) Is the use of Grammarly AI tool a perfect replacement of manual proofreading?

Grammarly AI effectively identifies objective grammatical errors, typos, and sentence structure issues using automated pattern matching algorithms.
However, it cannot fully grasp deep contextual nuance, emotional intent, cultural sensitivity, or creative literary tone like human proofreaders.
Therefore, while it functions as an efficient preliminary editing assistant, it does not serve as a complete replacement for human review.

7) What harm can be caused to people due to wrong identifications of AI-based facial recognition system during criminal investigation?

Erroneous facial recognition matches lead to wrongful arrests, unjust detentions, and psychological trauma for innocent individuals during investigations.
It causes severe reputational damage, financial stress due to legal battles, and potential violation of personal civil liberties.
Furthermore, systemic false identifications erode public trust in law enforcement agencies and automated judicial processes.

8) Describe the social implications that can arise due to misuse of personal information about people stored in computer systems who use Virtual Assistants.

Unauthorized extraction of personal assistant voice logs and behavioral data leads to severe privacy violations and identity theft.
Malicious entities can exploit location histories and private conversations to launch targeted phishing scams, blackmail, or stalking.
Systemic data misuse diminishes personal autonomy and erodes public trust in ubiquitous consumer smart technologies.

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Q3. Extended Response Questions

1) Relate how AI can be beneficial in education and business.

Artificial Intelligence serves as a transformative force across both educational institutions and commercial enterprises:

- **Education:**
  - **Adaptive Learning Platforms:** AI algorithms analyze individual student progress to deliver customized study materials suited to their learning speed.
  - **Automated Grading:** Intelligent software grades objective assessments and essay submissions, freeing up educator time for direct mentorship.
  - **24/7 Tutoring Assistants:** AI chatbots provide round-the-clock academic clarification and homework support to students globally.
- **Business:**
  - **Operational Automation:** AI streamlines supply chain management, customer relationship management (CRM), and automated inventory tracking.
  - **Predictive Analytics:** Companies utilize predictive AI models to forecast sales trends, track consumer demand shifts, and allocate resources efficiently.
  - **Customer Service:** AI-powered conversational bots handle large volumes of consumer queries simultaneously, drastically reducing support desk overhead.

2) Articulate how AI-based technology can improve healthcare and assist farmers increase crop production.

AI integration delivers high-impact solutions to essential real-world sectors:

- **Healthcare Improvement:**
  - **Diagnostic Imaging:** AI-driven computer vision algorithms examine X-rays, MRIs, and CT scans to detect tumors, fractures, and early-stage diseases with high precision.
  - **Drug Discovery:** Machine learning models process molecular structures rapidly, reducing the time and cost required to discover life-saving medications.
  - **Remote Monitoring:** Wearable smart devices monitor patient vital signs continuously, alerting doctors before emergency medical events occur.
- **Agricultural Production:**
  - **Precision Farming:** Drones equipped with computer vision scan fields to monitor crop health, spot soil nutrient deficiencies, and assess hydration needs.
  - **Pest and Disease Detection:** AI mobile applications inspect leaf imagery to identify crop infestations early, enabling targeted pesticide application.
  - **Yield Forecasting:** Predictive models analyze weather forecasts, soil parameters, and historical data to optimize planting schedules and harvest yields.

3) Describe the benefits of cloud computing. Differentiate between public and private clouds.

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Cloud computing delivers on-demand computing services—including servers, storage, databases, networking, and software—over the internet.

- **Key Benefits:**
  - **Cost Efficiency:** Eliminates the need for upfront capital investment in physical servers, maintenance teams, and data centers.
  - **Scalability:** Enables organizations to scale IT resources up or down dynamically based on user demand.
  - **Accessibility and Reliability:** Facilitates secure global access to shared files and robust automated data backups for disaster recovery.
- **Comparison: Public Cloud vs. Private Cloud**

Feature	Public Cloud	Private Cloud
Ownership	Owned and operated by third-party cloud service providers.	Dedicated exclusively to a single organization.
Accessibility	Accessible to the general public or multiple tenants over the internet.	Accessible over a secure private network or dedicated infrastructure.
Cost	Pay-as-you-go pricing model with low entry costs.	Higher initial infrastructure and maintenance costs.
Security	Standard multi-tenant security architecture managed by provider.	Maximum security control tailored to internal compliance needs.

4) Compare traditional algorithms with AI-based algorithms that use machine learning. Criticize AI-based algorithms for producing wrong results, at times.

- **Comparison:**
  - **Traditional Algorithms:** Follow explicit, step-by-step rules programmed directly by human engineers. They process inputs deterministically and produce fixed outputs without adapting to unseen data structures.
  - **AI-Based Algorithms (Machine Learning):** Learn patterns directly from training data to generate statistical inference models. They adapt dynamically and improve their performance as more data becomes available.
- **Critique of AI Algorithm Errors:**
  - **Garbage In, Garbage Out:** AI models rely heavily on data quality. If training datasets contain historical biases, missing fields, or incorrect labels, the model perpetuates flawed outputs.
  - **Black Box Problem:** Complex neural networks lack interpretability, making it difficult for engineers to explain *why* a wrong decision was generated.

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- **Hallucinations and Overfitting:** AI models can overfit noise in training data or generate false responses ("hallucinations"), which poses risks when deployed in critical environments like automated surgery or aviation.

5) Describe the ethical issues in using the following AI tools:

a) **ChatGPT:** Generates potential issues regarding plagiarism, spread of misinformation, bias in generated text, unauthorized copyright usage of online text during model training, and academic dishonesty among students.

b) **Lovo AI:** Creates voice-cloning risks, including unauthorized deepfake voice generation used for financial fraud, impersonation of public figures without consent, and potential job displacement for human voice actors.

c) **Virtual Assistants:** Collects continuous ambient audio recordings, leading to user privacy concerns, unintended data sharing with third-party advertisers, and potential unauthorized surveillance within private homes.

6) Describe the social implications that AI algorithms may create in the society.

The widespread deployment of AI technology presents several significant societal impacts:

- **Job Displacement and Automation:** Rapid automation of routine manual and cognitive tasks threatens traditional employment in manufacturing, customer service, and transportation.
- **Algorithmic Bias and Discrimination:** AI systems used in hiring, credit scoring, and law enforcement can reinforce social inequalities if trained on biased datasets.
- **Deepfakes and Misinformation:** Real-time AI generation of fake video and audio undermines digital truth, threatening electoral security and personal reputations.
- **Digital Divide:** Societies and individuals lacking access to advanced AI infrastructure face widening economic and educational inequality.

7) What are expert systems? Describe the steps required in the development of expert systems.

An **Expert System** is an AI computer application that emulates the decision-making ability of a human expert in a specialized domain (e.g., medical diagnosis, geological prospecting). It typically consists of a knowledge base, an inference engine, and a user interface.

- **Steps Required in Development:**
    1. **Problem Identification:** Define the specific domain and problem scope that requires expert-level reasoning.
    2. **Knowledge Acquisition:** Extract domain expertise, operational rules, and heuristics from human experts through interviews and observation.
    3. **Knowledge Representation:** Convert human expert knowledge into formal computer-readable rules (IF-THEN statements) and facts stored in the Knowledge Base.
    4. **Engine System Design:** Build the **Inference Engine** (the reasoning mechanism that applies rules to user queries) and the **User Interface**.

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5. **Testing and Validation:** Test the system against real-world test cases to compare its recommendations with those of human experts, refining the rules until high accuracy is achieved.

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