Research Paper 1

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This assignment has two parts:

Part 1 is a study and research on benefits associated with Artificial Intelligence and Part 2 is about listing Tools available in market using AI.

Part 1 Artificial Intelligence

1. Describe what is AI – How does it work? (5 marks)

Ans. Artificial intelligence (AI) is a branch of computer science that focuses on developing systems or machines that can do activities that normally require human intelligence. AI systems are built to emulate human cognitive processes such as learning, reasoning, problem solving, perception, and language comprehension. These systems are roughly classified into two types:

- Narrow or Weak AI: Narrow AI refers to AI systems that are meant to execute a single job or a collection of activities that are closely linked. These systems are highly specialized and excel at the tasks for which they were designed. Virtual personal assistants like Siri or Alexa, recommendation algorithms on sites like Netflix, and self-driving cars are all examples.

- General AI, often known as "strong AI" or "artificial general intelligence (AGI)," depicts AI systems with human-level intellect. These systems would be able to comprehend, learn, and adapt to a wide range of activities and domains, much like humans. General AI is still a theoretical idea that has yet to be realized.

The operating principles of AI systems differ depending on the technology and technique utilized, however many AI systems, particularly those based on machine learning, follow a consistent pattern:

1) Data Collection: In order to learn, AI systems require massive volumes of data. This information can come from a variety of sources, such as sensors, text, photos, audio, or structured databases.

2) Data Preprocessing: Raw data is frequently sloppy and must be cleaned, processed, and organized before it can be analyzed. Data cleansing, normalization, and feature engineering are all part of this process.

3) Feature Extraction: Relevant features (or qualities) are extracted from preprocessed data in machine learning. These attributes describe the data properties that are most useful to the AI system.

4) Model Construction: Using the processed data, AI models such as neural networks, decision trees, and support vector machines are developed and trained. The model learns patterns, correlations, and associations in the data during training.

5) Learning and Optimization: The AI model updates its internal parameters repeatedly to decrease mistakes and increase task performance. Typically, optimization techniques such as gradient descent are used in this procedure.

6) Inference or prediction: After being trained, the AI model may make predictions, judgements, or classifications based on fresh, previously unknown data. This is known as inference, and it is when the AI system applies what it has learnt.

7) Feedback Loop: AI systems can develop over time by getting feedback and fresh data on a constant basis. The feedback loop allows the system to adapt to changing conditions and perform better.

2. List the benefits associated with Artificial Intelligence (5 marks)

Ans.

1) Automation: Artificial intelligence systems may automate repetitive and tedious jobs, freeing up people to focus on more creative, strategic, or complicated activities. This increases production and efficiency in a variety of sectors.

2) Accuracy: AI systems can accomplish jobs with great precision and consistency, decreasing the possibility of human mistake. This is especially useful in activities such as data processing, quality control, and medical diagnosis.

3) 24/7 Availability: AI-powered apps may run without pauses or sleep, assuring continuous service availability and support.

4) Data Analysis: AI can swiftly analyze large volumes of data, detecting patterns, trends, and insights that people may miss. This is particularly useful in data-driven decision-making.

5) Cost Savings: By decreasing the need for human labour, avoiding mistakes, and improving resource allocation, automation with AI can result in considerable cost savings.

6) AI algorithms can optimize resource allocation in domains such as logistics, supply chain management, and energy distribution, resulting in less waste and better resource usage.

7) AI may help healthcare practitioners with illness diagnosis, treatment suggestions, medication development, and medical image analysis, eventually improving patient outcomes.

8) Improved Customer Service: AI-powered chatbots and virtual assistants may provide consistent and immediate customer service, increasing customer satisfaction and decreasing response times.

9) AI assists researchers in domains such as genetics, materials science, and climate modelling by processing and analyzing massive databases and executing simulations.

10) Environmental Advantages: Artificial intelligence (AI) may be used to monitor and manage environmental conditions, forecast natural disasters, and optimize energy use to lessen environmental effect.

11) Financial Services: AI is used to identify fraud, perform algorithmic trading, assess risk, and profile customers, enhancing the efficiency and security of financial transactions.

12) Education: AI-powered adaptive learning systems can modify instructional content to the requirements of individual students, allowing for more personalized and efficient learning experiences.

3. Human Intelligence v/s Artificial Intelligence (5 marks)

Ans.

- Place of Origin:

Human intelligence is the consequence of complicated biological processes that occur in the human brain. Consciousness, self-awareness, emotions, creativity, and the ability to learn, reason, and adapt are all required.

Artificial Intelligence (AI): AI is developed by programming and teaching computers and computer systems. It performs certain tasks by simulating human-like cognitive capabilities.

- Empathy & Emotions:

Human Intelligence: Humans have a wide spectrum of emotions and empathy, which allows them to comprehend and emotionally connect with others. Emotions have an impact on decision-making and social relationships.

Artificial Intelligence: AI systems lack emotion and empathy. While they may mimic emotional reactions, they can not genuinely experience or comprehend human emotions.

- Morality and ethics:

Human Intelligence: Humans have a moral and ethical framework that governs their actions and decisions. They are capable of making ethical decisions and comprehending the repercussions of their actions.

Artificial Intelligence: AI systems are morally and ethically deficient. Their behaviours are purely determined by the algorithms and data on which they were taught, which might raise ethical problems if not properly created and controlled.

- Adaptation and Learning:

Human Intelligence: The ability of humans to learn from experience, generalize information to new circumstances, and adapt to a wide range of tasks and surroundings is known as intelligence. Human learning is adaptable and may occur with few instances.

Artificial Intelligence (AI): To learn and make predictions or choices, AI systems require lengthy training with enormous datasets. They have poor generalization skills and frequently require a large amount of data for each new job for which they are taught.

Part 2 Tools supporting AI

1. List the tools available as of today using AI technology in any domain (5 marks)

Ans.

1) Google Cloud Natural Language API, IBM Watson NLP, and spaCy are examples of Natural Language Processing (NLP) technologies.
2) OpenCV, TensorFlow Object Detection API, and YOLO are examples of computer vision tools.
3) Google Cloud Speech-to-Text, Amazon Transcribe, and Microsoft Azure Speech Services are examples of speech recognition software.
4) Tools for chatbots and virtual assistants, such as Dialogflow, IBM Watson Assistant, and Amazon Lex.
5) Amazon Personalize, Google Recommendations AI, and IBM Watson Discovery are examples of recommendation systems.
6) H2O.ai, DataRobot, and RapidMiner are examples of predictive analytics tools.
7) NVIDIA Jetson, ROS, and TensorFlow Lite for Microcontrollers are examples of autonomous cars and robotics technologies.
8) Transfer Learning: Transfer learning is a machine learning approach that entails applying previously learned models to address new problems. It is utilized in image and audio recognition, natural language processing, and anomaly detection applications.
9) Object detection is a computer vision technique that detects and locates items in an image or video. It's utilized in things like self-driving cars, surveillance systems, and robots.
10) Reinforcement learning is a sort of machine learning in which an agent learns to make decisions by interacting with its surroundings. It is utilized in applications like as gaming, robotics, and self-driving cars.
11) E-commerce: Amazon Personalize: AI-powered product suggestions. Personalization and user experience improvement for e-commerce websites with Dynamic Yield. Shopify AI: Integrates artificial intelligence (AI) into the Shopify e-commerce platform for marketing and sales improvement.

2. Describe in detail any one of them (5 marks)

Ans. E-commerce, which stands for electronic commerce, is the purchasing and selling of products and services through the internet. It has become an essential component of the modern economy, transforming how firms function and consumers purchase. Here's a more in-depth explanation of e-commerce:
Key E-commerce Components:

1) E-commerce is based on online storefronts or websites where businesses display their products or services. Customers may explore, choose, and purchase things from the comfort of their own homes using these internet shops.

2) Shopping cart software allows users to add things to a virtual cart while continuing to browse. When consumers are ready to make a purchase, it calculates the total cost, including taxes and shipping expenses, and allows them to go to checkout.

3) Payment Processing: E-commerce systems interact with a variety of payment gateways, allowing for safe transactions with credit/debit cards, digital wallets (such as PayPal), and other payment methods.

4) inventories Management: Tools are required for businesses to track and manage their product inventories. Inventory management capabilities are frequently provided by e-commerce platforms to guarantee that items are in stock and accessible for purchase.
5) E-commerce enterprises must handle order fulfillment, which includes packaging, shipping, and delivery logistics. To make this procedure easier, certain e-commerce systems interface with shipping providers.

E-commerce is evolving in tandem with technological breakthroughs, such as mobile shopping applications, augmented reality for virtual try-ons, and AI-powered chatbots for customer service. E-commerce is projected to remain a vibrant and fast rising sector of the economy as online purchasing becomes more incorporated into our everyday lives.

3. Successful AI Tools in Education domain (5 marks)

Ans. AI has made considerable advances into the education industry, providing a variety of tools and apps that improve learning, automate administrative work, and deliver tailored educational experiences. Here are some examples of effective AI tools and applications in education:

Platforms for Adaptive Learning:

- Knewton: The adaptive learning platform of Knewton personalizes educational content and tests for students, allowing them to master topics at their own speed.
- DreamBox is an AI-driven adaptive math tool for K-8 pupils that provides personalized math courses depending on individual development.

Tutoring Systems that are Intelligent:

- Carnegie Learning: Provides AI-powered math teaching tools that give students with real-time feedback and coaching.
- Duolingo: The AI-powered language learning program Duolingo modifies courses based on the user's competence level and learning speed.

Chatbots for Student Assistance:

- IBM Watson Assistant for Education: Provides virtual chatbots to help students with course, timetable, and campus service problems.
- Ada from Adaface: An AI chatbot that assists students with course, assignment, and enrollment information.

Education Data Analytics:

- Blackboard Predict: Uses AI analytics to predict student achievement and identify at-risk pupils.
- Civitas Learning: Uses artificial intelligence to evaluate data from numerous sources in order to enhance student results and retention rates.

Improving Speech Recognition and Pronunciation:

- LingoAce is an artificial intelligence-powered language learning tool that provides real-time pronunciation feedback and speaking practice.
- Speechify: Uses artificial intelligence to transform text to speech and provides tools for language learning and accessibility.

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