Experiment 1

Aim- To perform case study of artificial intelligence.

Introduction

AI is a broad field of computer science focused on creating machines that can perform tasks that typically require human intelligence. It involves equipping machines with the ability to learn from experience, adapt to new inputs, and perform tasks that previously only humans could do. AI systems utilize various techniques, including machine learning, deep learning, and natural language processing, to achieve these capabilities.

Artificial Intelligence training models

1.Supervised learning is a machine learning model that maps a specific input to an output using labelled training data (structured data). In simple terms, to train the algorithm to recognize pictures of cats, feed it pictures labelled as cats.

2.Unsupervised learning is a machine learning model that learns patterns based on unlabelled data (unstructured data). Unlike supervised learning, the end result is not known ahead of time. Rather, the algorithm learns from the data, categorizing it into groups based on attributes. For instance, unsupervised learning is good at pattern matching and descriptive modelling.

In addition to supervised and unsupervised learning, a mixed approach called semi-supervised learning is often employed, where only some of the data is labeled. In semi-supervised learning, an end result is known, but the algorithm must figure out how to organize and structure the data to achieve the desired results.

3.Reinforcement learning is a machine learning model that can be broadly described as "learn by doing." An "agent" learns to perform a defined task by trial and error (a feedback loop) until its performance is within a desirable range. The agent receives positive reinforcement when it performs the task well and negative reinforcement when it performs poorly. An example of reinforcement learning would be teaching a robotic hand to pick up a ball.

Examples of AI in Action:

- Automated customer service (Chatbots): AI-powered chatbots can handle customer inquiries and provide support 24/7.
- Personalized recommendations: Platforms like Netflix and Spotify use AI to suggest content based on user preferences.
- Self-driving cars: AI algorithms control the navigation and operation of autonomous vehicles.
- Medical diagnosis: AI can analyze medical images and patient data to assist in the diagnosis of diseases.
- Fraud detection: AI algorithms can identify fraudulent transactions and activities.

Need of AI

1. **Efficiency and Automation:** Automating repetitive tasks can boost efficiency and productivity, freeing up organizations to concentrate on more intricate and strategic activities.
2. **Insights and Decision Making**: AI can analyze large datasets to uncover patterns, trends, and insights that humans might miss. This can lead to better decision-making and strategic planning.
3. **Personalization**: AI can be used to personalize experiences for customers, such as personalized recommendations in e-commerce or personalized healthcare treatments.
4. **Cost Savings**: By automating tasks and improving efficiency, AI can help organizations save costs in various areas of their operations.
5. **Innovation**: AI is driving innovation in various industries, from healthcare to finance to transportation. It is enabling the development of new products, services, and business models.
6. **Competitive Advantage**: Organizations that leverage AI effectively can gain a competitive advantage by being more agile, innovative, and customer-focused.
7. **Addressing Complex Problems**: AI can be used to address complex problems that are difficult for humans to solve, such as climate change, healthcare challenges, and cybersecurity threats.

Difference between AI, ML and DL

Artificial Intelligence	Machine Learning	Deep Learning
AI stands for Artificial Intelligence, and is basically the study/process which enables machines to mimic human behaviour through particular algorithm.	ML stands for Machine Learning, and is the study that uses statistical methods enabling machines to improve with experience.	DL stands for Deep Learning, and is the study that makes use of Neural Networks(similar to neurons present in human brain) to imitate functionality just like a human brain.
AI is a computer algorithm which exhibits intelligence through decision making.	ML is an AI algorithm which allows system to learn from data.	DL is a ML algorithm that uses deep(more than one layer) neural networks to analyze data and provide output accordingly.

Artificial Intelligence	Machine Learning	Deep Learning
Search Trees and much complex math is involved in AI.	If you have a clear idea about the logic(math) involved in behind and you can visualize the complex functionalities like K-Mean, Support Vector Machines, etc., then it defines the ML aspect.	If you are clear about the math involved in it but don't have idea about the features, so you break the complex functionalities into linear/lower dimension features by adding more layers, then it defines the DL aspect.
The aim is to basically increase chances of success and not accuracy.	The aim is to increase accuracy not caring much about the success ratio.	It attains the highest rank in terms of accuracy when it is trained with large amount of data.
Three broad categories/types Of AI are: Artificial Narrow Intelligence (ANI), Artificial General Intelligence (AGI) and Artificial Super Intelligence (ASI)	Three broad categories/types Of ML are: Supervised Learning, Unsupervised Learning and Reinforcement Learning	DL can be considered as neural networks with a large number of parameters layers lying in one of the four fundamental network architectures: Unsupervised Pre-trained Networks, Convolutional Neural Networks, Recurrent Neural Networks and Recursive Neural Networks
The efficiency Of AI is basically the efficiency provided by ML and DL respectively.	Less efficient than DL as it can't work for longer dimensions or higher amount of data.	More powerful than ML as it can easily work for larger sets of data.
Examples of AI applications include: Google's AI-Powered Predictions, Ridesharing Apps Like Uber and Lyft, Commercial Flights Use an AI Autopilot, etc.	Examples of ML applications include: Virtual Personal Assistants: Siri, Alexa, Google, etc., Email Spam and Malware Filtering.	Examples of DL applications include: Sentiment based news aggregation, Image analysis and caption generation, etc.

Goals of AI

- **Automating Repetitive Tasks:**

AI systems can automate tasks that are tedious, time-consuming, or require high precision, freeing up human workers for more complex or creative roles.

- **Enhancing Decision-Making:**

AI algorithms can analyze vast amounts of data, identify patterns, and provide insights to support better and faster decision-making.

- **Enabling Learning and Adaptation:**

Machine learning and deep learning allows AI systems to learn from data, improve their performance over time, and adapt to changing circumstances.

- **Facilitating Human-AI Collaboration:**

AI can be designed to work alongside humans, augmenting their capabilities and enabling new forms of collaboration.

- **Solving Complex Problems:**

AI can be applied to solve complex problems in various fields, including scientific research, engineering, and social sciences.

- **Understanding and Generating Human Language:**

Natural Language Processing (NLP) enables AI to understand, interpret, and generate human language, leading to more intuitive interactions with machines.

- **Advancing Robotics:**

AI is used to create robots that can perform physical tasks, often in dangerous or inaccessible environments.

Applications of AI

AI in business intelligence:

- **Data collection**: Collecting data from a variety of sources, including structured data (for example, databases) and unstructured data (for example, text documents, images, and videos)
- **Data analysis**: To analyze data and identify patterns, trends, and relationships
- **Data visualization**: AI can help create visualizations that make it easier to understand data
- **Decision-making**: Insights and recommendations generated by AI models can help drive data-driven decision-making for businesses

AI in healthcare

- **Disease diagnosis**: AI can be used to analyze patient data and identify patterns that may indicate a disease. This can help doctors diagnose diseases earlier and more accurately.
- **Treatment development**: By analyzing large datasets of patient data, AI can identify new patterns and relationships that can be used to develop new drugs and therapies.
- **Personalized care**: By analyzing a patient's data, AI can help doctors develop treatment plans that are tailored to the patient's specific needs.

AI in education

- **Personalized learning**: AI can be used to create personalized learning experiences for students. By tracking each student's progress, AI can identify areas where the student needs additional support and provide targeted instruction.
- **Improved student engagement**: AI can be used to improve student engagement by providing interactive and engaging learning experiences. For example, AI-powered applications can provide students with real-time feedback and support.
- **Automated administrative tasks**: Administrative tasks, such as grading papers and scheduling classes can be assisted by AI models, which will help free up teachers' time to focus on teaching.

AI in finance

- **Risk and fraud detection**: Detect suspicious, potential money laundering activity faster and more precisely with AI.
- **Personalized recommendations**: Deliver highly personalized recommendations for financial products and services, such as investment advice or banking offers, based on customer journeys, peer interactions, risk preferences, and financial goals.
- **Document processing**: Extract structured and unstructured data from documents and analyze, search and store this data for document-extensive processes, such as loan servicing, and investment opportunity discovery.

AI in manufacturing

- **Improved efficiency**: Automating tasks, such as assembly and inspection
- **Increased productivity**: Optimizing production processes
- **Improved quality**: AI can be used to detect defects and improve quality control

Experiment 2

Aim- To perform case study of artificial intelligence.

Problem Statement-

A Water Jug Problem: You are given two jugs, a 4-liter one and a 3-liter one, a pump that has unlimited water which you can use to fill the jug, and the ground on which water may be poured. Neither jug has any measuring markings on it. How can you get exactly 2 liters of water in the 4-liters jug?

Sets of Rules-

1.(x,y)-> (4,y) If x<4

2.(x,y)-> (x,3) If x<3

3.(x,y)-> (0,y) If x>0

4.(x,y)-> (x,0) If y>0

5.(x,y)-> (4,y-(4-x)) If 0<x+y>=4 & y>0

6.(x,y)->(x-(3-y),3) If 0<x+y>=3 & x>0

7.(x,y)->(x+y,0) If 0<x+y<=4 & y>=0

8.(x,y)->(0,x+y) If 0<x+y<=3 & x>=0

- Fill 4-liter jug.
- Fill 3-liter jug.
- Empty a 4-liter jug on the ground.
- Empty a 3-liter jug on the ground.
- Pour water from a 3-liter jug to fill a 4-liter jug.
- Pour water from a 4-liter jug to fill a 3-liter jug.
- Pour all water from the 3-liter jug into the 4-liter jug.
- Pour all water from the 4-liter jug into the 3-liter jug.

Code-

```
x=0

y=0

m=4

n=3

print("Initial state=(0,0)")

print("Capacities=(4,3)")

print("Goal state=(2,y)")

while x!=2:
```

```
r= int(input("Enter rule"))
if(r==1):
    x=m
    print(x,y)
elif(r==2):
    y=n
    print(x,y)
elif(r==3):
    x=0
    print(x,y)
elif(r==4):
    y=0
    print(x,y)
elif(r==5):
    t=n-y
    y=n
    x=t
    print(x,y)
elif(r==6):
    t=m-x
    x=m
    y-=t
    print(x,y)
elif(r==7):
    y+=x
    x=0
    print(x,y)
elif(r==8):
    x+=y
    y=0
```

print(x,y)

X	Y	RULE
0	0	-
0	3	2
3	0	8
3	3	2
4	2	6
0	2	3
2	0	8

Output-