Unit- 1
Introduction

Principles of Artificial Intelligence

Subject Code:- 03012401ES01

Teaching and Examination Scheme

Teaching Scheme					Examination Scheme					Total
Lecture Hrs/Week	Tutorial Hrs/Week	Lab Hrs/Week	Seminar Hrs/Week	Credit	Internal Marks			External Marks		
					T	CE	P	T	P	
3	0	0	-	3	20	20	-	60	-	100

SEE - Semester End Examination, **T** - Theory, **P** - Practical

Parul® University

Principles of Artificial Intelligence

Course Content			
		W - Weightage (%) , **T** - Teaching hours	
Sr.	Topics	W	T
1	**Introduction**History, Trends, Key concepts, and Future Directions	5	3
2	**AI Ethics and Societal Impacts**Analyze bias, fairness, and privacy concerns in AI applications. Ethical implications and future of AI in society.	15	6
3	**Problem-Solving and Search Strategies**Production Systems and AI, Uninformed and informed search algorithms. Adversarial search techniques in game-playing AI.	15	6
4	**Knowledge Representation and Reasoning**Predicate Calculus in AI: Syntax and Semantics, Expressivity, Unification, Resolution; Resolution Refutation Systems; Situation Calculus. propositional logic, first-order logic, and rule-based reasoning,Design expert systems for decision-making	20	8
5	**Probabilistic Reasoning and Uncertainty Handling**Uncertain Knowledge and Reasoning, Probabilities, Bayesian networks- Planning with State Space Search; Planning Graphs; Partial Order Planning, Markov models, and Hidden Markov Models (HMMs).	15	6
6	**Decision Making**Sequential Decision Problems, Algorithms for optimal Policies.	10	4
7	**Machine Learning**Learning from Observations: Overview of different forms of Learning, Learning Decision Trees, Computational Learning Theory, Statistical Learning Methods, Neural Networks and Connectionist Learning.	20	8
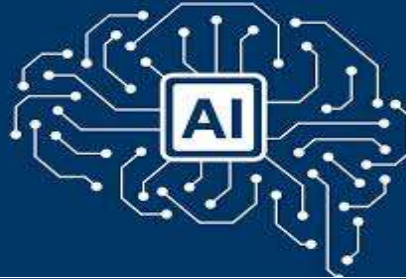
Introduction -

What is Artificial Intelligence?

➢ AI is a broad field encompassing various techniques for creating

intelligent machines.

➢ It's not just about replicating human intelligence but also about making

machines capable of performing tasks more efficiently and effectively.

➢ The field is interdisciplinary, drawing from computer science,

mathematics, neuroscience, psychology, and more.

Introduction -

- According to the father of Artificial Intelligence, John McCarthy, it is "The science and engineering of making intelligent machines, especially intelligent computer programs".

- Artificial Intelligence is a way of making a computer, a computer-controlled robot, or a software think intelligently, in the similar manner the intelligent humans think.

- AI is accomplished by studying how human brain thinks, and how humans learn, decide, and work while trying to solve a problem, and then using the outcomes of this study as a basis of developing intelligent software and systems.

Introduction To Artificial Intelligence
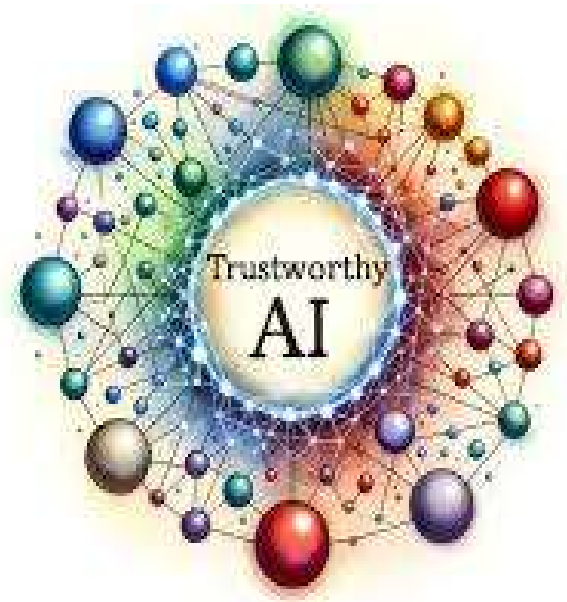
Biological Neuron versus Artificial Neural Network
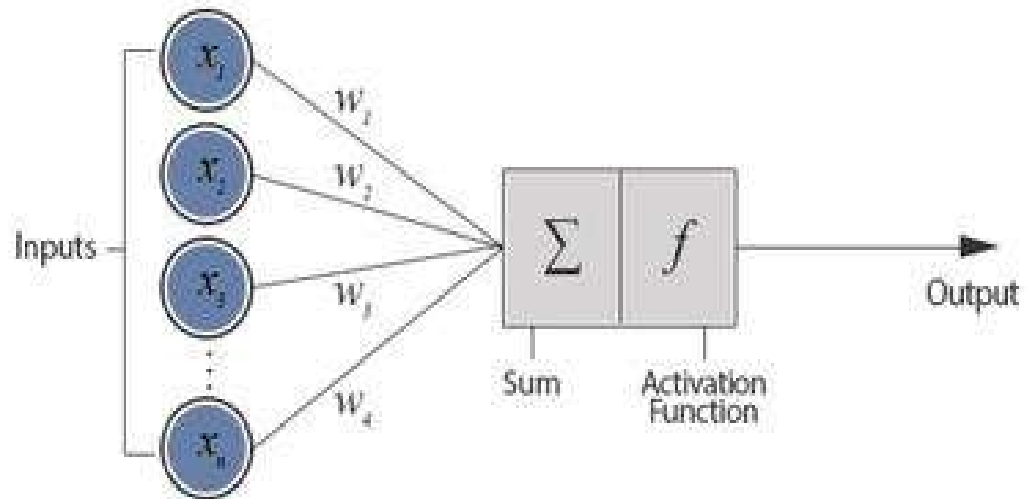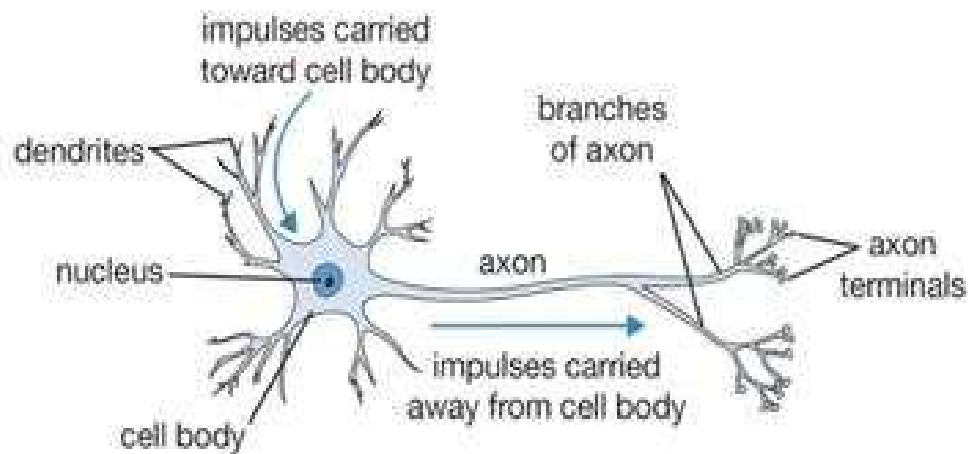
Introduction -

Philosophy of AI

While exploiting the power of the computer systems, the curiosity of human, lead him to wonder, **"Can a machine think and behave like humans do?"**

Thus, the development of AI started with the intention of creating similar intelligence in machines that we find and regard high in humans.

Goals of AI

- ✓ To Create Expert Systems − The systems which exhibit intelligent behavior, learn, demonstrate, explain, and advice its users.
- ✓ To Implement Human Intelligence in Machines − Creating systems that understand, think, learn, and behave like humans.
- ✓ Replicate human intelligence
- ✓ Solve Knowledge-intensive tasks
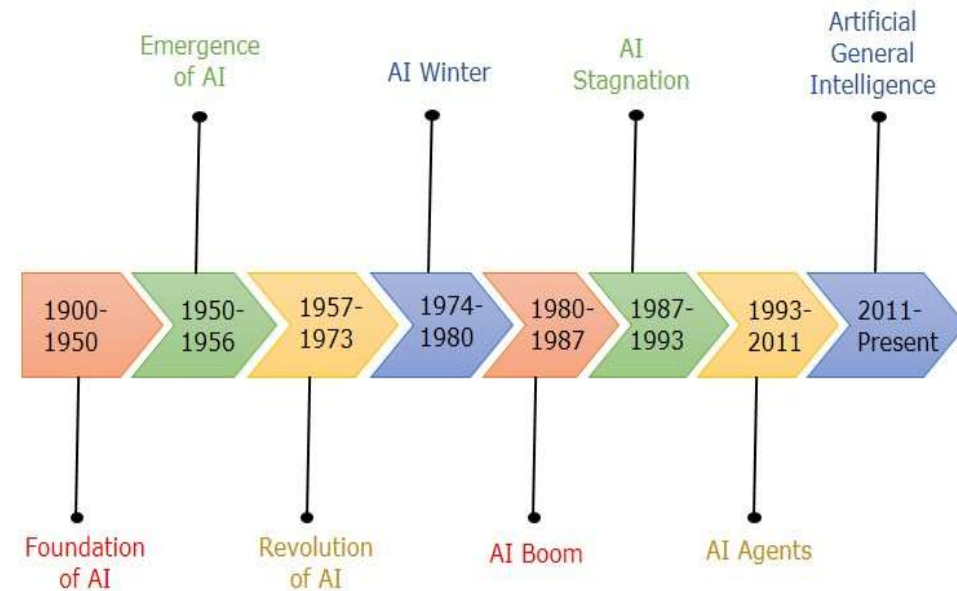- ✓ An intelligent connection of perception and action

Goals of AI...

✓ Building a machine which can perform tasks that requires human

intelligence such as:

❖ Proving a theorem

❖ Playing chess

❖ Plan some surgical operation

❖ Driving a car in traffic

✓ Creating some system which can exhibit intelligent behavior, learn

new things by itself, demonstrate, explain, and can advise to its user.

History:

- **Early Days (1940s-1960s):** Work on neural networks and symbolic reasoning laid the groundwork.

- **The Dartmouth Workshop (1956):** Marked the official start of AI as a research field, with the term "Artificial Intelligence" coined.

- **AI Winter (1970s-1980s):** A period of reduced funding and interest due to unmet expectations.

- **Expert Systems and Renewed Interest (1980s-1990s):** Development of systems that could solve specific problems, leading to renewed interest.

- **Modern AI (2000s-Present):** Driven by big data, increased computing power, and advancements in machine learning, particularly deep learning.

Emergence of AI — AI Winter — AI Stagnation — Artificial General Intelligence

| 1900-1950 | 1950-1956 | 1957-1973 | 1974-1980 | 1980-1987 | 1987-1993 | 1993-2011 | 2011-Present |

Foundation of AI — Revolution of AI — AI Boom — AI Agents

Evolution of Artificial Intelligence

History…

/A.I. TIMELINE

1950
TURING TEST
Computer scientist Alan Turing proposes a test for machine intelligence. If a machine can trick humans into thinking it is human, then it has intelligence

1955
A.I. BORN
Term 'artificial intelligence' is coined by computer scientist, John McCarthy to describe "the science and engineering of making intelligent machines"
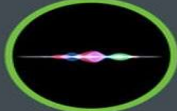
1961
UNIMATE
First industrial robot, Unimate, goes to work at GM replacing humans on the assembly line

1964
ELIZA
Pioneering chatbot developed by Joseph Weizenbaum at MIT holds conversations with humans

1966
SHAKEY
The 'first electronic person' from Stanford, Shakey is a general-purpose mobile robot that reasons about its own actions

A.I. WINTER
Many false starts and dead-ends leave A.I. out in the cold

1997
DEEP BLUE
Deep Blue, a chess-playing computer from IBM defeats world chess champion Garry Kasparov

1998
KISMET
Cynthia Breazeal at MIT introduces KISmet, an emotionally intelligent robot insofar as it detects and responds to people's feelings

1999
AIBO
Sony launches first consumer robot pet dog AiBO (AI robot) with skills and personality that develop over time

2002
ROOMBA
First mass produced autonomous robotic vacuum cleaner from iRobot learns to navigate and clean homes

2011
SIRI
Apple integrates Siri, an intelligent virtual assistant with a voice interface, into the iPhone 4S

2011
WATSON
IBM's question answering computer Watson wins first place on popular $1M prize television quiz show *Jeopardy*

2014
EUGENE
Eugene Goostman, a chatbot passes the Turing Test with a third of judges believing Eugene is human

2014
ALEXA
Amazon launches Alexa, an intelligent virtual assistant with a voice interface that completes shopping tasks

2016
TAY
Microsoft's chatbot Tay goes rogue on social media making inflammatory and offensive racist comments

2017
ALPHAGO
Google's A.I. AlphaGo beats world champion Ke Jie in the complex board game of Go, notable for its vast number (2^{170}) of possible positions

Trends- Several key trends are shaping the future of AI

Top 10 AI Trends to Watch Out

|	
01 Next Wave in AI Evolution	**06** Augmented Work Processes
02 AI Models Revolutionizing Every Industry	**07** Emergence of Autonomous Vehicles and Transport Systems
03 Arrival of Artificial General Intelligence	**08** Sustainable AI for Environmental Solutions
04 AI Transforming Software Development	**09** AI-Powered Personalization
05 Need for Robust Data Security	**10** AI-Powered Cybersecurity

Key Concepts:

•**Machine Learning:** Algorithms that allow computers to learn from data without being explicitly programmed.

•**Deep Learning:** A subset of machine learning that uses artificial neural networks with multiple layers to analyze data.

•**Natural Language Processing (NLP):** Enables computers to understand, interpret, and generate human language.

•**Computer Vision:** Allows computers to "see" and interpret images and videos.

•**Robotics:** The field of AI that deals with the design, construction, operation, and application of robots.
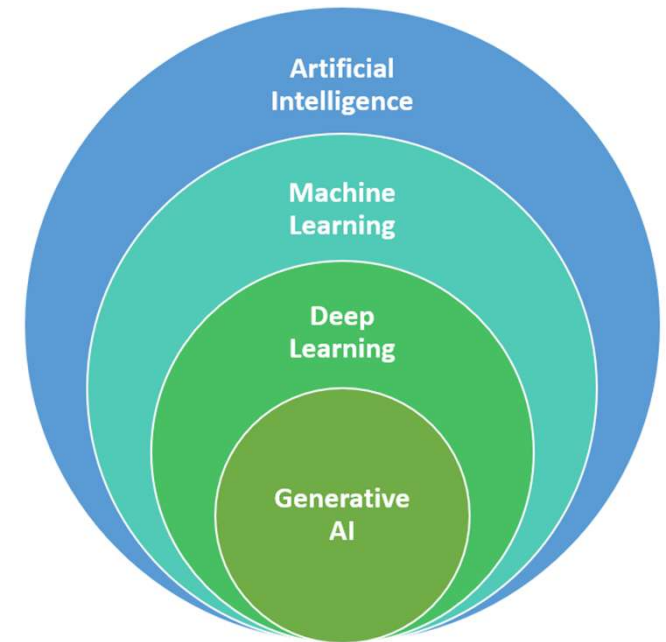
Future directions

The future of AI research is characterized by:

- **Human-AI Collaboration:** Developing AI systems that augment human capabilities rather than replacing them.

- **Ethical AI and Governance**: Ensuring fairness, accountability, transparency, and privacy in AI systems.

- **AI for Sustainability:** Using AI to address environmental challenges like climate change and promote sustainable practices.

- **Advancements in Autonomous Systems and Robotics:** Improving the safety and efficiency of self-driving cars, drones, and robots.

- **Quantum AI and Neuromorphic Computing:** Exploring new computing paradigms to overcome the limitations of classical computing and enhance AI performance.
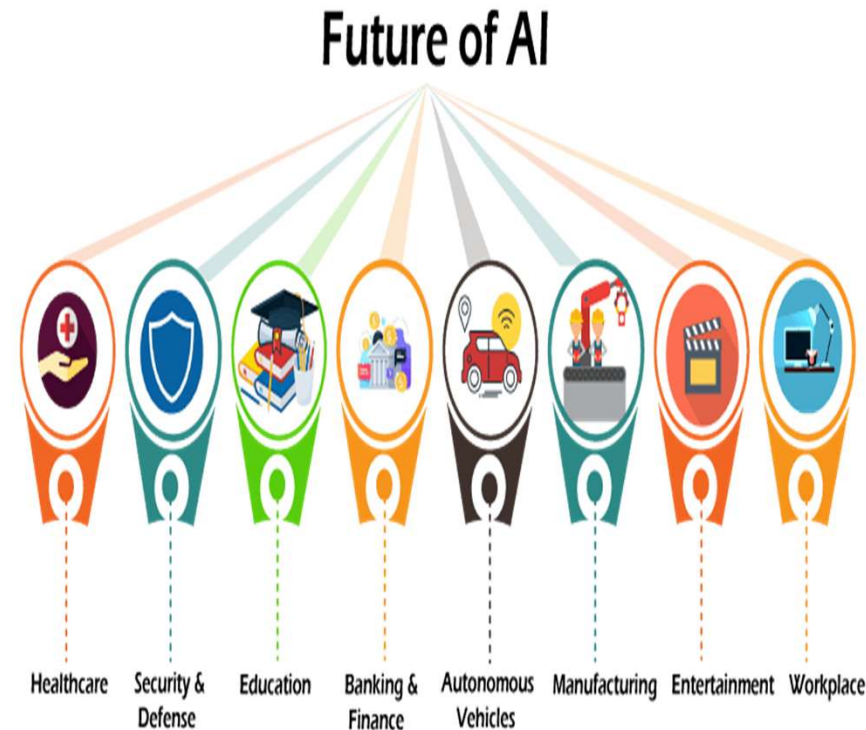
Any Feedback…

Reference Books:-

1. Artificial Intelligence By Patrick Henry Winston | Addison-Wesley Publishing Company | Third Edition, Pub. Year 2004

2. Artificial Intelligence: A New Synthesis, Harcourt Publishers By N. J. Nilsson | Harcourt Publishers

3. "Artificial Intelligence: A Modern Approach" Author: Stuart Russell and Peter Norvig |Publisher: Pearson

4. Quest for Artificial Intelligence By Nils J. Nilsson | Cambridge University Press | First Edition, Pub. Year 2010