

1.Introduction to Artificial Intelligence

- I. Artificial intelligence refers to the ability of a machine to learn patterns and make predictions. AI does not replace human decisions; instead, AI adds value to human judgment.
- II. AI performs tasks without human intervention and completes mundane and repetitive tasks, while augmented intelligence allows humans to make final decisions after analysing data, reports, and other types of data.
- III. The three levels of AI include: Narrow AI, Broad AI, and General AI. Narrow AI and Broad AI are available today. In fact, most enterprises use Broad AI. General AI won't come online until sometime in the future.
- IV. The history of AI has progressed across the Era of Tabulation, Era of Programming, and Era of AI.
- V. Data can be structured, unstructured, or semi-structured.
- VI. Structured data is quantitative and highly organized, such as a spreadsheet of data.
- VII. Unstructured data is qualitative data that doesn't have structure, such as medical records. It's becoming increasingly valuable to businesses.
- VIII. Semi-structured data combines features of both structured data and unstructured data. It uses metadata.
- IX. About 80% of all the data in today's world is unstructured.
- X. Machine learning has advantages compared to programmable computers. Machine learning can predict and machine learning learns!
- XI. Machine learning uses three methods.
- XII. Supervised learning requires enough examples to make accurate predictions.
- XIII. Unsupervised learning requires large amounts of information so the machine can ask a question, and then figure out how to answer the question by itself.
- XIV. Reinforcement learning requires the process of trial and error.
- XV. With AI everywhere, AI will move into all industries, from finance, to education, to healthcare.
- XVI. AI can increase productivity, create new opportunities, provide deeper insights, and enable personalization.

2.Natural Language Processing and Computer Vision

- I. Machines require systems called natural language processing (NLP) to understand human language. Human language is unstructured. In NLP, machines segment sentences into small chunks of information, called a token. Machines classify and sort tokens into a structure so NLP can work with them to extract meaning.
- II. With IBM Project Debater, the goal was to build an AI system that could help people make evidence-based, bias-free decisions on difficult topics where the answers aren't obvious.
- III. The four steps a debater AI system takes include:
Step 1: Learn and understand the topic
Step 2: Build a position
Step 3: Organize your proof
Step 4: Respond to your opponent
- IV. Emotion detection identifies distinct human emotion types. AI can be trained to classify emotions.
- V. Sentiment analysis is a measure of the strength of an emotion. It results in assessing if data is positive, negative, or neutral.
- VI. Chatbots are ready to answer your questions!
- VII. The frontend interacts with the person asking questions. It listens (or reads) and speaks (or presents text).
- VIII. The backend operates application logic and has enough memory to remember earlier parts of a conversation as dialog continues.
- IX. A chatbot identifies entities and intents, then uses what it has found to trigger a dialog.
- X. An intent is a purpose, or the reason why a user is contacting the chatbot. Think of it as a verb or action to take.
- XI. An entity is a person, place, or thing. Think of it as a noun.
- XII. A dialog is a flowchart that illustrates the chatbot replies to the user intents.
- XIII. With a convolutional neural network (CNN), an AI system can analyse images. With a generative adversarial network (GAN), an AI system can create new drawings and photos.
- XIV. NLP and computer vision can be useful ways to extend human expertise.

3. Machine Learning and Deep Learning

Machine Learning

- I. Machine Learning enables systems to learn from data and improve performance without being explicitly programmed.
- II. Supervised learning uses labelled data, while unsupervised learning identifies patterns in unlabelled data.
- III. Overfitting occurs when a model learns noise instead of the underlying pattern.
- IV. Cross-validation is used to assess the generalization ability of a model.
- V. The bias-variance trade-off is central to achieving optimal model performance.
- VI. Feature engineering can significantly improve model accuracy by making data more informative.
- VII. Model evaluation metrics like precision, recall, and F1-score help assess classification performance.

Deep Learning

- VIII. Deep Learning is a subfield of Machine Learning that uses neural networks with many layers to learn complex patterns.
- IX. Neural networks are inspired by the structure of the human brain and consist of interconnected neurons.
- X. Convolutional Neural Networks (CNNs) are effective for image-related tasks, while RNNs handle sequential data.
- XI. Backpropagation combined with gradient descent is used to train deep neural networks.
- XII. Activation functions like ReLU and softmax introduce non-linearity and enable learning complex relationships.
- XIII. Overfitting in deep learning is often addressed using dropout and regularization techniques.
- XIV. Frameworks like TensorFlow and PyTorch simplify building and training deep learning models.

4. AI Ethics

AI Ethics is a field of study and practice concerned with the moral implications, societal impacts, and responsible use of Artificial Intelligence technologies.

As AI systems become increasingly powerful and integrated into daily life through automation, recommendation engines, facial recognition, and more there is a growing need to ensure they are fair, transparent, accountable, and aligned with human values.

1.Fairness

- I. In AI, fairness is the equitable treatment of individuals or groups of individuals.
- II. Fairness is achieved when unwanted bias is mitigated.
- III. Protected attributes separate populations into groups.
- IV. Groups that traditionally receive more favorable outcomes are called privileged groups.
- V. Groups that traditionally receive less or no favorable outcomes are called unprivileged groups.
- VI. There isn't a defined set of protected attributes.
- VII. Bias is a systematic error that, intentionally or not, might generate unfair decisions.

2.Robustness

- VIII. A robust AI system can effectively handle exceptional conditions, like abnormalities in input or malicious attacks, without causing unintentional harm.
- IX. Adversarial attacks are intentionally carried out on AI systems to accomplish a malicious end goal by exploiting AI system vulnerabilities.
- X. Two types of adversarial attacks are poisoning and evasion.

3.Explainability

- XI. AI systems are explainable when everyday people, who do not have any special training in AI, can understand how and why the system came to a particular prediction or recommendation.
- XII. Interpretability is the degree to which an observer can understand the cause of a decision.
- XIII. Explainability looks at how the AI system arrived at the result.

4. Transparency

- XIV. Transparency is disclosing information related to the data used for building AI systems, design decisions made throughout the process, model creation, model evaluation, and model deployment.
- XV. Governance ensures the process followed during the creation and deployment follows the internal policies.

5. Privacy

- XVI. Personal and sensitive personal information can be used to train models, as long as privacy techniques are applied to the data to preserve the privacy of individuals whose data is included.
- XVII. Many privacy techniques that can be applied to fortify AI against potential breaches of personal or sensitive data. Two that occur during model training are model anonymization and differential privacy. One that occurs after model training is data minimization

Artificial Intelligence (AI) is transforming the way we live, work, and interact with technology. At its core, AI enables machines to perform tasks that typically require human intelligence—such as learning, reasoning, problem-solving, and decision-making. By exploring the fundamentals of AI, including machine learning, deep learning, natural language processing, and robotics, we gain a deeper understanding of how these systems function and their vast potential.

However, with great power comes great responsibility. As AI continues to evolve, it is crucial to develop and deploy it ethically, ensuring fairness, transparency, and accountability. A strong grasp of AI fundamentals not only opens the door to innovation but also prepares us to contribute thoughtfully to the future of technology in a rapidly changing world.

THANK YOU.