1. Introduction to AI

Content:

- **Definition:** Artificial Intelligence (AI) refers to the simulation of human intelligence processes by machines, especially computer systems. These processes include learning, reasoning, problem-solving, perception, and language understanding.

- **History:**

    - **1950s:** Alan Turing introduces the Turing Test to assess machine intelligence.

    - **1956:** The term "Artificial Intelligence" is coined at the Dartmouth Conference.

    - **1970s-1980s:** Emergence of expert systems.

    - **1997:** IBM's Deep Blue defeats world chess champion Garry Kasparov.

    - **2011:** IBM's Watson wins Jeopardy!

    - **2016:** Google's AlphaGo defeats Go champion Lee Sedol.

- **Real-World Applications:**

    - Healthcare: Diagnostic systems, personalized medicine.

    - Finance: Fraud detection, algorithmic trading.

    - Transportation: Autonomous vehicles, traffic prediction.

    - Customer Service: Chatbots, virtual assistants.

Interactive Elements:

- **Timeline Slider:** An interactive slider showcasing key milestones in AI development. Users can navigate through different years to learn about significant events and breakthroughs.

  Implementation Suggestion: Utilize the Timeline Slider Module by Growmeda to create an engaging and responsive timeline.(HubSpot Marketplace)

- **Quiz:** Multiple-choice questions to test understanding of AI history and applications.

  Example Questions:

  - Who coined the term "Artificial Intelligence"?
  - In which year did IBM's Deep Blue defeat Garry Kasparov?

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2. Deep Learning Fundamentals

Content:

- **Neural Networks:** Explain the structure of neural networks, including input, hidden, and output layers. Discuss how neurons are interconnected and how data flows through the network.
- **Activation Functions:** Introduce functions like sigmoid, tanh, and ReLU that determine the output of a neuron given an input or set of inputs.
- **Training Processes:** Discuss how neural networks learn from data using forward propagation, loss calculation, backpropagation, and optimization algorithms like gradient descent.

Interactive Elements:

- **Neural Network Playground:** An interactive tool allowing users to visualize and manipulate a simple neural network. Users can adjust parameters like the number of layers, neurons per layer, learning rate, and observe how these changes affect the network's performance.

  Implementation Suggestion: Integrate TensorFlow's Neural Network Playground (Tensorflow — Neural Network Playground) to provide hands-on experience with neural network configurations.

- **Drag-and-Drop Puzzle:** An activity where users assemble components of a neural network (e.g., layers, neurons, activation functions) in the correct order to reinforce understanding of network architecture.

- **Quiz:** Questions focusing on the functions of different layers, the purpose of activation functions, and the steps involved in training a neural network.

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3. Black Box Problem

Content:

- **Definition:** The "black box" problem refers to the lack of transparency in AI systems, particularly deep learning models, where the decision-making process is not easily interpretable by humans.(umdearborn.edu)

- **Challenges:**

    - Difficulty in understanding how inputs are transformed into outputs.

    - Challenges in debugging and improving models.

    - Ethical concerns regarding accountability and bias.

- **Importance of Explainability:** Emphasize the need for explainable AI (XAI) to build trust, ensure compliance with regulations, and facilitate better decision-making.

Interactive Elements:

- **Prediction Without Explanation:** Present users with inputs and the AI model's outputs without revealing the reasoning. Users attempt to infer the logic behind the predictions, highlighting the opacity of black-box models.

- **Case Study Simulation:** Simulate a real-world scenario (e.g., loan approval) where users input data, receive a decision from the AI model, and then explore potential reasons behind that decision.

    Implementation Suggestion: Use interactive charts and decision trees to visualize possible pathways the model might have taken.

- **Quiz:** Assess understanding of the black box problem, its implications, and the importance of model interpretability.