

Instructional Scenario

Understanding AI Decision-Making



Course/Duty Area: Artificial Intelligence Fundamentals/Identifying the Decision-Making Foundations of AI

Scenario: Artificial intelligence is increasingly being used to make predictions and inform decisions in various fields, from music recommendations to medical diagnostics. As a data scientist working on an AI-powered recommendation system, your task is to analyze how AI makes decisions based on patterns in data. You will explore different methods AI uses to analyze and predict outcomes, examine how data variations impact AI predictions, and assess how AI evaluates uncertainty. By the end of this scenario, you will have a clear understanding of AI models' operation, limitations, and effectiveness.

Big Question: How does AI make decisions, and what factors affect its accuracy and reliability?

Focused Questions:

- What statistical concepts are fundamental to AI decision-making?
- How does AI use patterns in data to make predictions?
- What methods can be used to visualize AI decision-making?
- How does AI assess similarity and uncertainty in predictions?
- How do changes in input data impact AI predictions?
- How can AI performance be measured and evaluated?
- What common errors occur in AI models, and how do they affect usability?

Student Project or Outcome: Students will collect and analyze datasets to identify patterns that AI might use for decision-making. They will create visual representations (graphs and charts) to illustrate these patterns and conduct experiments to test how AI predictions change with different inputs. Finally, students will compare the effectiveness of AI models in real-world applications, such as recommendation systems or weather forecasts.

Project-Based Assessment: Students will prepare a report and presentation summarizing their findings. The presentation should include

- an overview of key statistical concepts used in AI
- examples of AI pattern recognition in everyday applications
- a demonstration of data visualization techniques
- a case study on AI decision-making with variable data inputs
- a critique of AI model outputs, including discussion on probability, correlation vs. causation, and sources of error.

Teacher Resources:

- Online datasets for AI pattern analysis
- Visualization tools (Excel, Python, Google Sheets)
- AI simulation tools for hands-on experimentation
- Case studies on AI in different industries

Example of AI Pattern Analysis

Scenario submitted by David Vogel, King George High School, King George County Public Schools 2025

Scenario: Music Streaming Recommendations

Description:

Students analyze how a music streaming service (like Spotify or Apple Music) predicts song recommendations based on user listening habits.

Steps:

1. **Collect Data:** Students gather a dataset of music preferences (e.g., favorite genres, artists, songs played most often).
2. **Identify Patterns:** They look for trends—do users who listen to pop music also listen to electronic music? Are certain artists frequently played together?
3. **Visualize Data:** Using tools like Excel or Python, students create graphs showing correlations between listening habits.
4. **Predict Outcomes:** Based on their findings, they make recommendations for a "new user" using probability and similarity analysis.
5. **Compare with Real AI Systems:** They examine how platforms like Spotify use machine learning (e.g., collaborative filtering and deep learning) to improve predictions.

Key Learning Outcome: Understanding how AI finds patterns in data and makes predictions based on similarity.

Example of AI Simulation

Scenario: AI Weather Forecasting Model

Description:

Students explore how AI predicts weather changes by analyzing past weather data and using probability-based decision-making.

Steps:

1. **Choose a Dataset:** Obtain historical weather data (e.g., temperature, humidity, wind speed) from public sources like NOAA or Kaggle.
2. **Build a Simple AI Model:** Use a basic machine learning algorithm (such as linear regression) to predict future temperatures based on past trends.
3. **Experiment with Inputs:** Modify data points (e.g., increase humidity, change wind speed) to see how AI predictions shift.
4. **Evaluate Accuracy:** Compare AI-predicted temperatures with actual recorded temperatures to assess model effectiveness.
5. **Discuss Errors and Uncertainty:** Identify causes of incorrect predictions, such as incomplete data or unusual weather events.

Key Learning Outcome: Understanding how AI simulations predict real-world events and how uncertainty affects decision-making.

Note: This instructional scenario was created with the help of AI.