

MODULE 3

Machine Learning Game

1.introduction

Machine Learning Classification Game is an interactive educational activity designed to help students understand different types of machine learning through real-world scenarios. Instead of only learning theory, students actively analyze practical situations such as medical diagnosis, recommendation systems, self-driving cars, and customer segmentation.

In this game, students are divided into small groups and given mixed scenario cards. Each group must quickly determine:

- The type of machine learning used
- The nature of the problem (classification, regression, clustering, etc.)
- The key input features
- The most suitable algorithms

This activity bridges the gap between theoretical knowledge and real-world applications. It strengthens conceptual clarity by encouraging students to apply definitions and reasoning in a competitive and collaborative environment.

The game focuses mainly on three major types of machine learning:

- Supervised Learning
- Unsupervised Learning
- Reinforcement Learning

Each scenario card helps students understand where and how these learning types are used in practical systems.

1. Medical Diagnosis Scenario

In the medical diagnosis scenario, a hospital wants to predict whether a patient has a disease such as diabetes or heart disease based on medical data. The dataset includes patient records with known outcomes.

This is classified as Supervised Learning because the model is trained using labeled data. Each patient record includes input features (such as age, blood pressure, glucose level) and a known output label (disease or no disease).

The problem type is Classification, since the output is categorical (Yes/No).

Common algorithms used include:

- Logistic Regression
- Decision Tree
- Random Forest
- Naïve Bayes

Logistic Regression predicts the probability of disease using a sigmoid function:

This probability-based prediction allows doctors to make informed decisions.

Through this scenario, students understand:

What labeled data means

How features and outputs are connected

Why classification algorithms are suitable

This reinforces their understanding of supervised learning in healthcare applications.

2. Recommendation System and Self-Driving Car Scenarios

Recommendation System

In this scenario, an e-commerce platform recommends products based on user behavior.

The system may predict product ratings or suggest items similar to those previously viewed.

This scenario can involve:

- Supervised Learning (predicting ratings)
- Unsupervised Learning (grouping similar users or products)
- If predicting ratings, it becomes a regression or classification problem. If grouping similar users, it becomes clustering.

Common algorithms include:

- K-Nearest Neighbors (KNN)
- Collaborative Filtering
- Matrix Factorization
- Neural Networks

Similarity between users can be calculated using distance measures:

This formula helps measure how close two users are based on their behavior.

Through this scenario, students learn how data such as browsing history, ratings, and purchase records are used to personalize recommendations.

Self-Driving Car

In the self-driving car scenario, the system must detect objects and decide actions like stopping, turning, or accelerating.

This involves:

- Supervised Learning (image classification and object detection)
- Reinforcement Learning (decision-making)
- Reinforcement learning works by maximizing rewards over time. The agent (car) receives positive rewards for safe driving and penalties for mistakes.
- Students understand how AI systems learn from feedback and improve decisions through continuous interaction with the environment.

3. Segmentation and Overall Learning Outcome

Customer Segmentation

In this scenario, a company wants to group customers based on purchasing behavior. There are no predefined labels, so the system must discover patterns on its own.

This is classified as Unsupervised Learning because there is no labeled output.

The problem type is Clustering.

- Common algorithms include:
- K-Means Clustering
- Hierarchical Clustering

The goal of K-Means is to minimize the distance between data points and their cluster center. Through this scenario, students understand how businesses use machine learning to identify target groups for marketing strategies.

Overall Educational Value

The Machine Learning Classification Game provides several benefits:

- Improves quick decision-making skills
- Strengthens understanding of ML types
- Connects theory with practical examples
- Encourages teamwork and discussion

Makes complex concepts easier to understand by analyzing multiple real-world scenarios, students gain a deeper understanding of how machine learning is applied in healthcare, e-commerce, transportation, and marketing.

Conclusion

The Machine Learning Scenario Classification Game is an effective teaching method that transforms theoretical concepts into interactive learning. By identifying learning types, problem categories, key features, and appropriate algorithms, students develop a structured understanding of machine learning applications.

This activity not only enhances academic knowledge but also prepares students to think critically about real-world AI systems. It demonstrates that machine learning is not just a theoretical subject but a practical tool widely used in everyday technology.

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