

Day-2

Batch Vs Online Learning And Instance Vs Model based Learning

Batch Learning:

1. **Collect Data:** Gather a large dataset.
2. **Train Model:** Use the entire dataset to train the model all at once.
3. **Evaluate Model:** Test the model's performance on a separate test set.
4. **Update Model:** To incorporate new data, retrain the model from scratch with the updated dataset. This is done periodically.

Example: Training a machine learning model for image recognition using a large set of labelled images.

Online Learning:

1. **Collect Data:** Receive data incrementally or in small batches.
2. **Train Model:** Update the model incrementally as new data arrives.
3. **Evaluate Model:** Continuously assess the model's performance on new data.
4. **Update Model:** Continuously refine the model with each new data point or batch.

Example: Updating a recommendation system in real-time as users interact with the platform and provide new preferences. Like YouTube recommender system.

Batch Vs Online Learning

Aspect	Batch Learning	Online Learning
Data Handling	Trains on the entire dataset at once	Updates the model incrementally with small chunks of data or individual samples
Training Frequency	Requires retraining from scratch with new data	Continuously updates the model as new data arrives
Resource Usage	Can be resource-intensive, requiring significant memory and computation	More resource-efficient, processes data in smaller increments
Adaptability	Less adaptable to new or changing data once training is complete	Highly adaptable, adjusts to new data dynamically
Implementation Complexity	Generally simpler to implement with a single training phase	More complex due to continuous updates and managing stability

Instance-Based Learning Vs Model-Based Learning

Aspect	Instance-Based Learning	Model-Based Learning
Learning method	Try to memorise the data like a 10th student.	Try to generalise the data like a 12th JEE student.
Training Process	Stores and uses the entire training dataset to make predictions	Trains a model with the dataset and uses the learned model for predictions
Prediction Approach	Makes predictions by comparing new instances to stored instances	Makes predictions based on the learned model parameters
Adaptability	Can quickly adapt to changes by adding new instances	Requires retraining to adapt to new data
Computation at Prediction	significant computation at prediction time as it references the entire dataset	Prediction is typically faster as it uses the trained model
Memory Usage	High, as it stores the entire dataset or significant portions	Lower, as only the model parameters need to be stored
Example	KNN	Linear Regression