

Unit-1ML

2021-22

- Q. List down at least 5 applications of ML
- Q. Explain the term ML.
- Q. Explain various stages involved in designing a learning system.
- Q. How is Candidate Elimination algo different from find-S algo? Explain with example.
- Q. Explain the List then eliminate algo with example.

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- Q. Discuss any four examples of ML application.
- Q. Draw the block diagram of ML cycle and the role of its components.
- Q. Explain the Concept Learning task with example.
- Q. How is Candidate elimination algo different from find-S algo? explain.
- Q. write & explain various issues in ML.



## Steps in designing a learning system

designing a learning system involves a systematic approach to developing a ML model that can effectively learn from data and make accurate predictions.

### ① Problem definition

- Define the task: objective of learning system.
- Identify the Performance measure.

### ② Data Collection & Preparation

- Data gathering
- Data cleaning
- Data transformation
- feature extraction
- Data splitting: training, validation, testing.

### ③ training the model

- Algo implementation:

### ④ Training Process

### ⑤ Choosing the model

- model selection: choose an appropriate algo

### ⑥ model Evaluation

- Performance metrics.
- Cross-validation.

### ⑦ model Tuning

- Error analysis.
- model refinement
- Re-training

### ⑧ Deployment

- model integration: integrate the trained model into a production environment



- Scalability: Ensure the model can handle the expected load & scale efficiently.
- monitoring & maintenance:
- ⑧ ~~Model~~ Documentation & Communication
- ⑨ Ethical Consideration:
  - Bias & fairness
  - Transparency
  - Privacy

## Machine Learning

- ML is an application of AI that provides systems the ability to automatically learn and improve from experience without being explicitly programmed.
- ML focus on the development of computer programs that can access data.
- ML enables analysis of massive quantities of data.
- It generally delivers faster and more accurate results in order to identify profitable opportunities or dangerous risk.

## Application of ML

- ① Image recognition: - testis autopilot, airport security, visual search
- ② Speech recognition: google assistant, T9 system, google translate
- ③ medical diagnosis: breast cancer detection, skin cancer classification
- ④ Statistical arbitrage: trading algo
- ⑤ Information Extraction



## Advantages

- ① Easily identifies trends & patterns.
- ② No human intervention needed (automation).
- ③ Continuous improvement.
- ④ handle multi-dimensional & multi-variety data.

## Disadvantages

- ① Data acquisition:-  
ML requires massive data sets to train on, and these should be inclusive/unbiased and of good quality.
- ② Time & resource:-
  - ML needs enough time to let the algo learn and develop enough to fulfill their purpose with a considerable amount of accuracy and relevancy.
  - It also needs massive resources to run.
- ③ Interpretation of results:-
- ④ High error-susceptibility:-
  - ML is autonomous but highly susceptible to errors.
  - It takes time to recognize the error source and even longer to correct it.

## Issues related to ML

- ① Data quantity & quality:- Ensuring high quality, sufficient data for training models.
- ② Overfitting & underfitting:- Balancing model complexity to achieve good generalization.
- ③ Interpretability & Transparency:- making models understandable & transparent.



- ④ Bias & Fairness:- identifying and mitigating biases to ensure fair outcomes.
- ⑤ Privacy & Security:- Protecting user data & securing models against attacks.
- ⑥ Computational Resources:- managing the Computational demands of training models.
- ⑦ Generalization & transferability:- Developing models that work well across different scenarios.

## ML Lifecycle

### ① Data Collection:-

- Collect data from various sources for training & testing the ML model.

### ② Data Preprocessing:-

- Clean & Prepare the data for analysis. This step is crucial to ensure the quality & consistency of data.
- Handle missing values, Remove duplicate & outliers, Normalize.

### ③ Feature Engineering:-

- Transform raw data into meaningful features that can be used by the ML model.
- Creating new features from existing data.
- selecting the most relevant features.
- Reduce dimensionality of data.

### ④ Model Selection:-

- choose the appropriate ML algo for the task.

### ⑤ Model Training:-

- train the selected model using the prepared data.
- This involves feeding the data into the algo and allowing



it to learn patterns & relationships.

- Splitting the data into training & validation sets.

### ⑤ Model Evaluation

- measuring performance using metrics
- Performing error analysis to identify & understand model weakness.

### ⑥ Model Deployment

- integrating model into a application or service
- Deploy the trained model into a production environment where it can start making predictions on new data

### ⑦ Model Monitoring & Maintenance

- Tracking model performance & identifying any degradation
- updating the model with new data as needed
- Handling model versioning and maintaining documentation