Basic Theory related to Machine learning

Machine Learning

Machine learning (ML) is a subdomain of artificial intelligence (AI) that focuses on developing systems that learn—or improve performance—based on the data they ingest.

Types of machine learning

Type 1

Supervised

- Types
  - Regression — output column is numerical type data
  - classification — output column is categorical type data
- Identification — You have input and output
- Function — understand the relation b/w input and out put and predict the output on new input

unsupervised

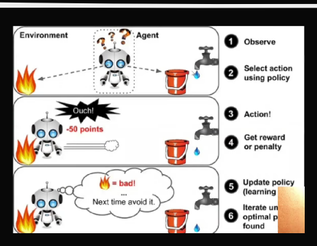
- Identification — You have input only
- Types
  - Clustering
  - Dimensionlity Reduction
  - Anomoly Detection — Finding outlier
  - Assosiation rule learning — Example- looking past data of the mall and deciding putting bear with dipers beacuse used to both at the same time

semi supervised

Half supervised and half unsupervised

Example -> you mention one photo of dad in google lense and it will make a collection of dad related photo's

Reinforiencement



self learning , no data, based on the rules you set

-> self driving car

Type 2

Batch/offline learning

Offline Learning	Features	Online Learning
Less complex as model is constant	Complexity	Dynamic complexity as the model keeps evolving over time
Fewer computations, single time batch-based training	Computational Power	Continuous data ingestions result in consequent model refinement computations
Easier to implement	Use in Production	Difficult to implement and manage
Image Classification or anything related to Machine learning - where data patterns remains constant without sudden concept drifts	Applications	Used in finance, economics, heath where new data patterns are constantly emerging
Industry proven tools. E.g. Scikit, Tensorflow, Pytorch, Keras, Spark MLlib	Tools	Active research/New project tools: E.g. MOA, SAMOA, scikit-multiflow, streamDM

Instance based learning VS model-based learning

Machine learning development life cycle

1 Frame the problem
2 Gathering the data
3 Data Processing
4 Exploratory data analysis
5 Feature Engineering and selection
6 Model training evalation and selection
7 model deployment
8 testing
9 optimize

Tensors

A Data structure

A container for number(also can store -> string.etc)

Rank=number of axis =number of dimension

- Types
  - 0D Tensor/Scalar
    - store a single number
    - EX-> a= np.array(4)
a.ndim // 0
  - 1D Tensor/Vector
    - store a single array of number
    - EX-> a= np.array([1,2,3])
a.ndim // 1
  - 2D Tensor/matries
    - Combination of multiple 1D tensors
    - EX-> a= np.array([[1,2,3] , [1,2,3] , [1,2,3]])
a.ndim // 2
  - 3D Tensor
    - Combination of multiple 2D tensors
    - Used in NLP , time series data
    - EX-> a= np.array([[[1,2,3] , [1,2,3]] , [[1,2,3] , [1,2,3]]])
a.ndim // 3
    - Shape=(2,2,3)
  - 4D Tensor — Used in image processing
  - 5D Tensor — Used in videos processing

Think i skiped

- PCA -> video 47, 48, 49
- gradient decent -> 51,52,52 part2