



GURU NANAK DEV ENGINEERING COLLEGE, LUDHIANA

(AN AUTONOMOUS COLLEGE U/S 2(F) & 12(B) OF UGC ACT - 1956)
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Dated 28-3-22 Class D3IT Sec A2

Class Roll No. 1921036 Subject IML

University Roll. No. 1905334
Signature of Invigilator

Q. No.	1	2	3	4	5	6	7	Total Marks	Sig. of Examiner
Marks	2	2	4	4	4	7		23	MN

Ans. 1. Sukit - Learn library is the library in which all the ~~too~~ efficient tools required for machine learning in Python are given.

→ It consists of all the codes and functions required in classification, clustering, regression problems.

⇒ It makes it easier for the user to find the required tool for their project, with their explanations.

Ans. 2. Machine learning Traditional Programming

(A) It is a subset of Artificial intelligence in which we find suitable models for our problems. (1) Traditional programming is the normal coding we do to make a program which gives us output.

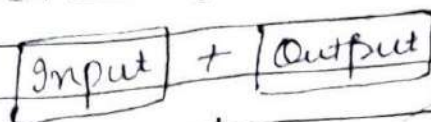
(2) In Machine learning, we use various algorithms like classification, regression etc. (2) In this, we just build code using ~~languages~~ like Java, ~~software~~ HTML, CSS, C++ etc.

(3) It is a probabilistic approach. (3) It is a deterministic approach.

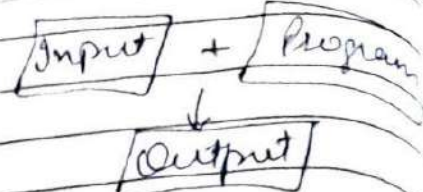
(4) For Example:- ML is used for making predictions, ~~assess~~ assumptions & make analysis of problems like Fraud detection, (4) For Example:- It is used for making websites and working softwares, both on front end & back end. It ~~have~~ ^{has} some functions

disease prediction etc. & non-functional req.

(vi) Depiction of Working :-



(v) Working definition



Ans 4. Machine learning is the subset of AI which uses algorithms to test find results like predictions, analysis etc. Machine learning is very useful in every aspect of life. It gives accurate results and helps saving time of human beings. Now it has various applications, some of which are as follows :-

(i) Social Media :- ML is very much trending in every field & social media is one of them. Posting pictures, making comments, adding friends, making part of social media, all are a recommendation of ML. ML gives us a list of posts which our mutual friends have liked on our activities on such platform. The biggest examples are Facebook and Instagram.

(2) Speech Recognition :- Machine learning helps in recognizing voices & gives suitable results. Google and Alexa are ~~have~~ using such features for searching or even for calling someone. ~~like for example~~ if you want to search ~~information~~ for latest news we just have to say on the google voice and we'll get results.

- (3.) Spam filtering:- This is done using machine learning. we get alerts from google ~~if~~ when we get a spam mail and we also get a true caller notification with red colored marked as spam which helps us ~~know~~, what decision to ~~avoids~~ us beforehand.
- (4.) Online Recommendations:- ML gives us recommendations based on our search history, like if we have searched about stationary items, it will start giving us ads of online shopping of that item. ~~and if we search~~ The biggest example nowadays is Netflix giving its ~~auto~~ viewers movie/show recommendations.
- (5.) Medical Diagnosis:- ML helps in predicting diseases. The various parameters are given and on the basis of those parameters, we get our predictions of whether this person is suffering from that disease or not. It can also tell disease on basis of symptoms.
- (6.) Inventory Management:- ML helps in predicting sales of products. Like we give all our previous data and ML helps in knowing which product ~~to~~ is least and most ~~or~~ purchased. Based on this the owner can know which product ~~we~~ should stock and in what ~~what~~ quantity.

(7.) Self driving Cars:- Companies like Tesla, Waymo, Honda are into self driving cars which are based on ML technology. The cars have sensors in them to sense their path and traffic.

(8.) Stock Market Predictions:- It helps in the prediction of stocks like how much will be the rise and fall of stocks based on the previous data.

Thus: Performance of the two machine learning models are evaluated on the basis of their accuracy and errors. The most common method used for models evaluation is R^2 method.

R^2 method is the method used for predicting which model is more suitable among all models. It is found with the help of the formula:-

$$R^2 = 1 - \frac{SS_{res}}{SS_{total}}$$

$$SS_{total} = \sum (y_i - y_{avg})^2$$

$$SS_{res} = \sum (y_i - \hat{y}_i)^2$$

The SS_{total} remains constant and is not much affected by the increase in variables. But R^2 value

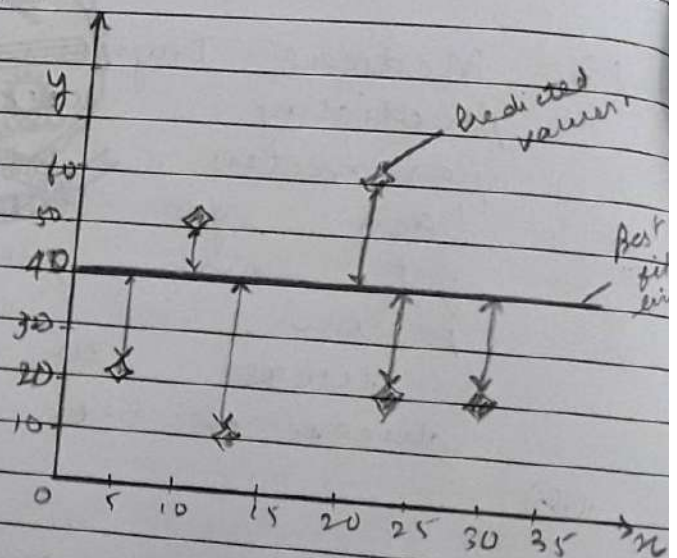


Fig. Graph showing R^2 .

Dated 28-3-22 Class D3JT Sec A2

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Marks							

varies on increase of variables.

The value of R^2 will decrease if the more no. of variables added gives us improves the accuracy but not very much if variables are added & not improving the accuracy.

The limitation of R^2 is solved using adjusted R^2 values. It is found using the formula:-

$$\text{Adjusted } R^2 = 1 - \frac{(1 - R^2)(n - 1)}{(n - k - 1)}$$

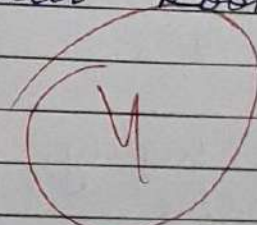
where k is the no. of regressors and n is the no. of variables.

The above formula shows that the value of adjusted R^2 is dependent on both n and k .

The more the value of n & k , less will be the adjusted R^2 .

⇒ The performance of 2 models can also be checked by finding their Root Mean Square Error.

$$RMSE = \sqrt{\frac{\sum_{i=1}^n (p_i - y_i)^2}{n}}$$



The more the value of RMSE lies closer to 0, the more will be the model's accuracy. Suppose, linear regression model gives $RMSE = 0.12$ & multiple linear model gives $RMSE = 0.22$ so here linear regression model is more accurate & gives better performance.

Ans 6:

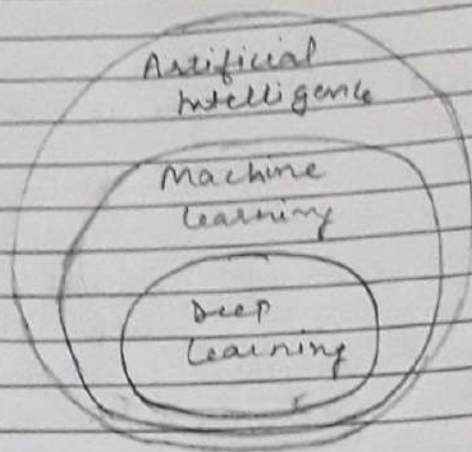


Fig:- ML/AI/DL

Artificial Intelligence	Machine Learning	Deep Learning
(1) Artificial Intelligence is basically solving & doing problems of human beings on computers.	(1) Machine Learning is the part subset of Artificial Intelligence.	(1) Deep Learning is the subset of machine learning.
(2) It uses many algorithms, and models and whole software to solve a problem.	(2) It generates algorithms to solve problems.	(2) It is based on neural networks.
(3) It was termed in 1956.	(3) It was termed in 1980's.	(3) It was termed in 2000's.
(4) It is highly complex.	(4) It is less complex than AI.	(4) It is less complex than AI & ML.
(5) ML and Deep Learning are parts of AI or you can say branches.	(5) ML consists of supervised, unsupervised, reinforcement & semi-supervised.	(5) Deep Learning consists of 2 types:- (i) CNN

Example:-

(b) For example:-

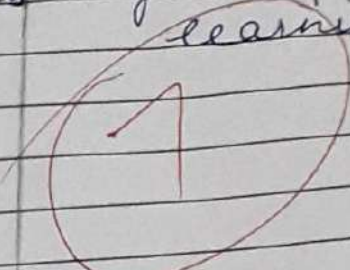
(c) For example:-

Robotics is an emerging application of artificial intelligence.

are even used in full automation in hotel of Japan.

Fraud Detection, Medical diagnosis, Spam filtration, online recommendations, etc are applications of machine learning.

Image Detection, Traffic light sensors, gender detection, etc are applications of deep learning.



Simple Linear Regression

It is used to predict outputs with one dependent & one independent variable.

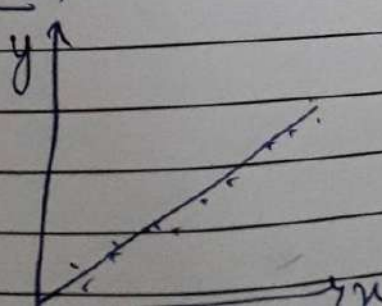
$$y = b_0 + b_1x$$

⇒ Works well with different dataset sizes.

⇒ Doesn't work for problems other than linear.

Example ⇒ Salary = $a_0 + a_1 * \text{Experience}$

Visualisation ⇒



Multiple Linear Regression

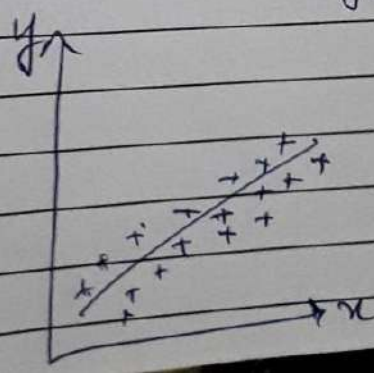
It consists of one dependent and 2 or more independent variables.

$$y = b_0 + b_1x_1 + b_2x_2 + \dots + b_nx_n$$

⇒ Works with non-linear problems.

⇒ Can lead to overfitting.

Car Price = $a_0 + a_1 * \text{Brand} + a_2 * \text{Mileage}$



Polynomial Regression

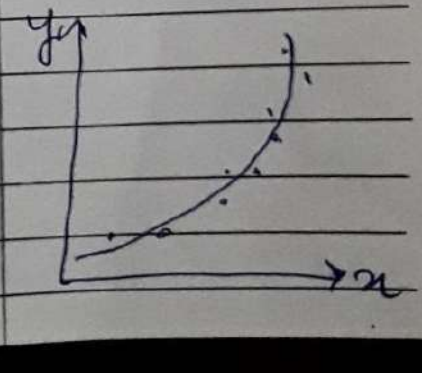
It consists of one dependent & one independent variable with n as polynomial degree.

$$y = b_0 + b_1x_1 + b_2x_1^2 + \dots + b_nx_1^n$$

⇒ Works with both linear & non linear prob.

⇒ Good degree is need to be chosen for carefully.

⇒ Fraud detection.



Decision Tree:- It consists of tree like structure. It is organised.

It may lead to overfitting.

It is very interpretable.

For example:- choice b/w item A & B.

Random Forest:- Made of many decision trees.

It may lead to overfitting.

