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Artificial Intelligence

Discussion Pointers (Week 01-02)

1. Estimation
   - Effort → pm (person month) — unit
   - cost
   - Risk

2. Linear Regression
   - Regression
     - quadratic
     - ~~exponential~~
     - log

3. Artifical Intelligence
   - AI
     - ~~classical AI~~
     - ~~Machine learning~~ (ML)
     - ~~DNN (Deep NN)~~ → Advance AI
       Deep Neural Networks

ESTIMATION (PREDICTIVE ANALYSIS)

The objective of this work is to estimate/predict the analysis of the effort before the project development life cycle, using a linear regression model.

Estimation Technique:-

1) dependent variable : acceleration
2) independent variable : time

eg: PSL event is independent
Traffic jam is dependent on PSL event

Regression:- retreat

Regression is predictive analysis to measure strength of continuous dependent variable w.r.t other independent variables

We use two algorithms to predict software effort through regression

1) Linear Regression Model
2) KNN Regression (K-Nearest Neighbour)

Domain :- the person who is best at that thing/parts
Artificial Intelligence :- Computers
Human Intelligence :- Human

Give some examples of human intelligence. HI

- Reading
- Cooking
- Writing
- Dancing
- Hiking
- Applying logic
- singing
- calligraphy
- assembling
- packaging
- repairing things
- knitting
- painting
- drawing

cognitive

*The simplest form of AI (decision making) or a program is IF/else

* Programming is a medium for teaching computer AI (decision making

* What are KLOC?
* What is the size of small project in KLOC?
(KLOC - 1000 Line of Codes) medium/complex

Types of project (LOC) :-
1) Small
2) Medium
3) Complex

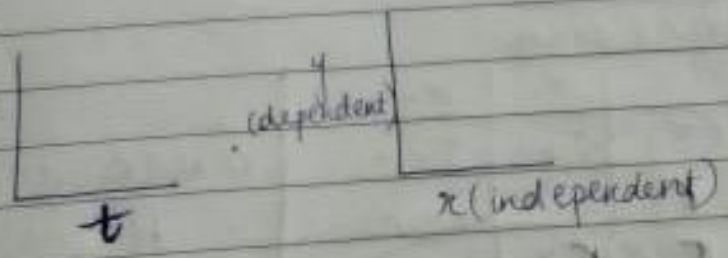
AI is a real time system because it is complex. Its line of code is complex (KLOC ↑↑↑)

- make FYP on voice over ip project.

example:
1) Voice Recognition
2) speech synthesis
3) Visualization

→ Neurons in Human Brain 10^9
→ Brain learns from environment.

Draw linear relationship:-



linear regression:-

• maths:

$y = mx + c$ (equation of straight line)

dependent independent

* computer
  input / output

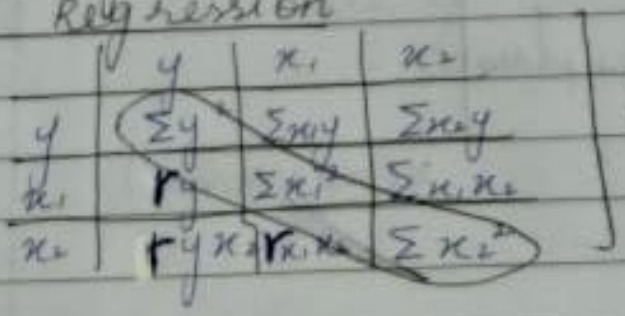
→ choose any dataset from kaggle and save its reference

Feature :- the attribute in AI is called feature

1) Feature selection
2) Feature ranking
3) feature engineering
4) feature extraction
5) Embedding
6) feature vectors

→ A row is an entity in matrix

Lab assignment:
KNN Regression



Correlation Table
b/w variable

→ Diagonal reflect close relationship

* Make a correlation table and solve it.

- Print the derivation of linear regression, understand and explain it on board.

Practice Numerical and derivation

Lecture # 02

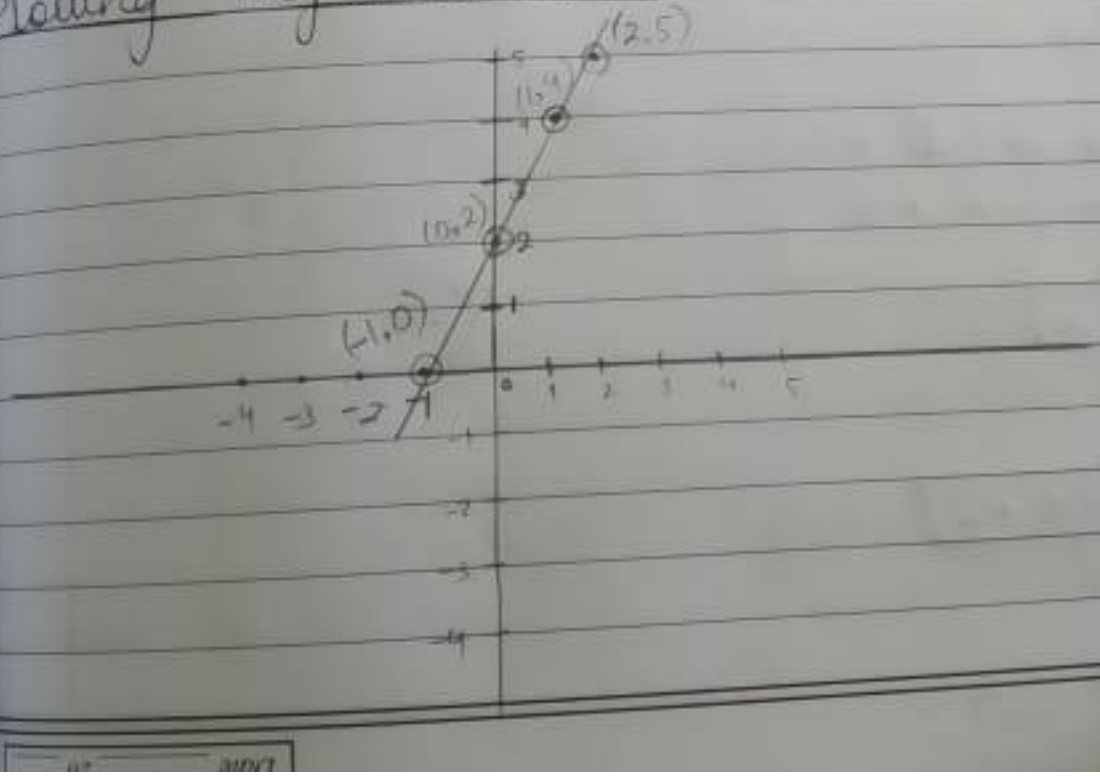
week 01 - week 02

1 SIL

2 LR → Examples
→ Derivation

Linear Regression

Plotting Regression Line :-



(-1, 0)

$(x_1, y_1) = (-1, 0)$
$(x_2, y_2) = (0, 2)$

$$m_1 = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{2 - 0}{0 - (-1)}$$

$$= \frac{2}{1}$$

$$\boxed{m_1 = 2}$$

m, C

$$y = mx + c$$
$$y = 2x + c \quad \text{— (A)}$$

To find :-

$$0 = 2(-1) + c$$
$$0 = -2 + c$$
$$2 = c$$
$$\boxed{c = 2}$$

So,

$$\boxed{y = 2x + 2} \quad -(1)$$

Put x and y in eq (1),

when (-1, 0)

$0 = 2(-1) + 2$

$0 = -2 + 2$

$0 = 0$

on line

when (0, 2)

$2 = 2(0) + 2$

$2 = 0 + 2$

$2 = 2$

on line

when (1, 4)

$4 = 2(1) + 2$

$4 = 2 + 2$

$4 = 4$

on line

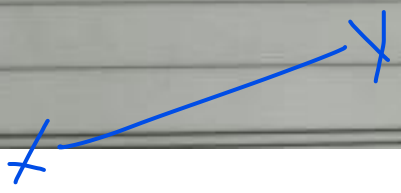
when (2, 5)

$5 = 2(2) + 2$

$5 = 4 + 2$

$5 = 6$

not on line



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Data sets: sets of points

e.g. {(-1, 0), (0, 2), (1, 4), (2, 5)}
x_1, y_1 x_2, y_2 x_3, y_3 x_4, y_4

N = no. of observations = 4

We have to prepare data set. Before preparing we need to collect data

Temperature can be in minus in a data set

first dimension = first variable
second dimension = second variable

⋮

Two dimensional = 2 axis

Q- suppose we have the data set with points {(-1, 0), (0, 2), (1, 4), (2, 5)} For finding least square regression line from the following data, first transform the data into table form

x	y	xy	x^2
-1	0	0	1
0	2	0	0
1	4	4	1
2	5	10	4
$\Sigma x = 2$	$\Sigma y = 11$	$\Sigma xy = 14$	$\Sigma x^2 = 6$

Now, finding the values of a and b using linear regression

$$a = \frac{(n\Sigma xy - \Sigma x \Sigma y)}{(n\Sigma x^2 - (\Sigma x)^2)} = \frac{4(14) - 2(11)}{4(6) - (2)^2} = 1.7$$

and $b = \frac{1}{n}(\Sigma y - a\Sigma x) = \frac{1}{4}(11 - (1.7)(2)) = 1.9$

For verification:

$$y = ax + b$$

Graph is in previous pages.

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Q Prepare a dummy 3D dataset in your copy Try to make your points meaningful

Include x, y, z dimensions.

① (number of patients, no of doctors and no of rooms) in a hospital

② (1, 20000, 2), (2, 30,000, 5), (5, 100000, 6)
(employee id, salary, ~~productivity~~ promotions)

③ (population, resources,)

→ coordinates of a data is attributes of an entity in Database

Software Engr
time it Experience : E

1D, 2D, 3D, 4D, n-tuple / row in matrix
(pair) (Triplet) (quad-tuplet)

(emp. id, exp, promotions) = (1, 2, 1), (2, 1, 0), (3, 5, 4)

Date / /20

• All ~~intelligent~~ softwares need data in the form of vector and matrix.

convert your data set in the form of

1) vectors

$(x_1, y_1 + z_1) = (1, 2, 1)$, $(x_2, y_2 + z_2) = (2, 1, 0)$, $(x_3, y_3 + z_3) = (3, 5, 4)$

$\vec{v}_1 = \begin{bmatrix} 1 \\ 2 \\ 3 \end{bmatrix}$ (emp. id), $\vec{v}_2 = \begin{bmatrix} 2 \\ 1 \\ 5 \end{bmatrix}$ (exp), $\vec{v}_3 = \begin{bmatrix} 1 \\ 0 \\ 4 \end{bmatrix}$ (promotions)

2) matrices → object / Entity / table

	emp. id	exp	promotions
emp - 1	1	2	1
emp - 2	2	1	0
emp - 3	3	5	4

✓ models → equations

✓ we use data sets to make equations

→ All equations are models for generating data

✓ → A pattern is hidden in a data set

• we represent pattern in the form of vectors

Q. Represent Karachi University in a matrix

Departments = 50

KU = (no. of departments . students/Employees, canteens

Attributes:-
students
Teachers
other staff

- Take average of number of students in a department if it is not same

Q. Write an algorithm for the example done in class and demonstrate equation in pseudocode.

Calculator

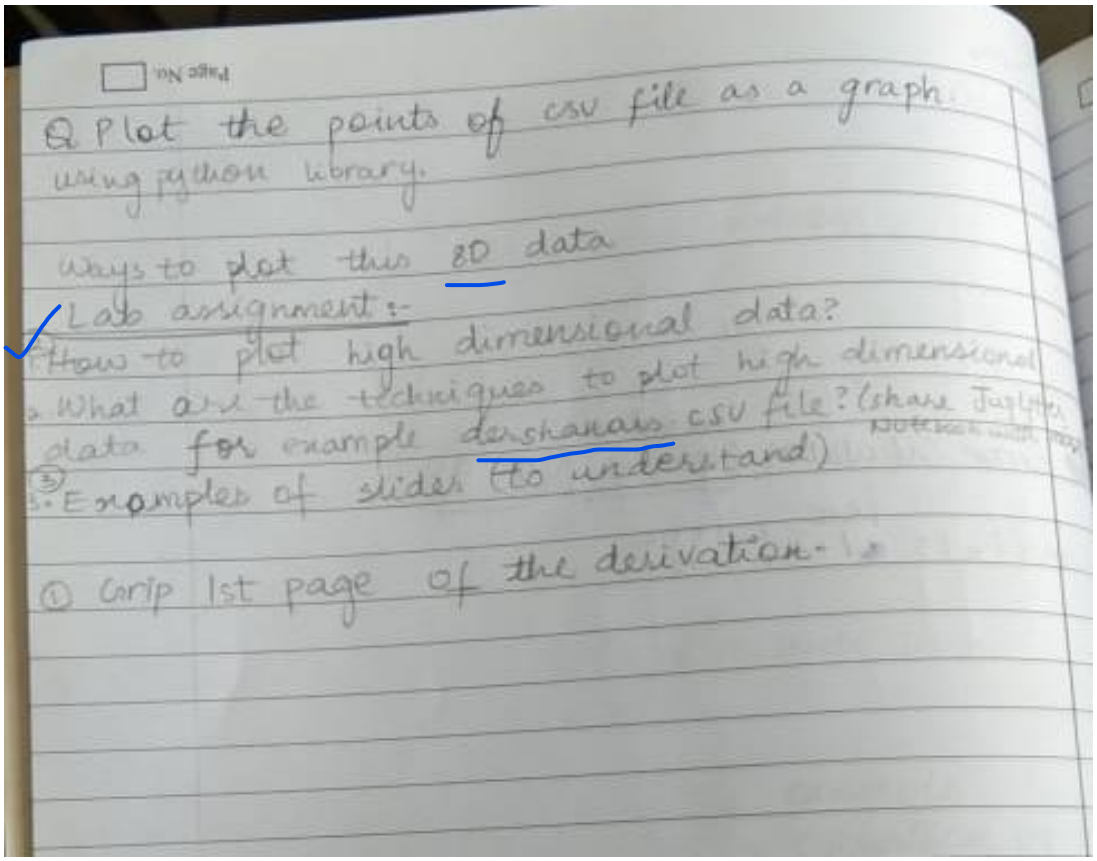
Error Detection Class:-

① Take input of data points from user
② Calculate Σx, Σy, Σxy, Σx^2
③ Use these calculated values to find a and b constants by using formula of least square regression

Error Calculator (yi , y) | (Y , 9)
for vectors matrix

```
{ for (i=1; i<n ; i++)

    return Q
}
```



Q Plot the points of csv file as a graph using python library.

Ways to plot this 8D data

Lab assignment :-

1. How to plot high dimensional data?
2. What are the techniques to plot high dimensional data for example dashavars csv file? (share Jupyter notebook with me)
3. Examples of slider (to understand)

① Crip 1st page of the derivation.