

A statistical approach to establish the functional relationship is termed as Simple Regression.

Dependent variable is also known as Response / Predicted variable, regress variable / output variable and is generally denoted as y .

Independent variable is also known as predictor variable / explanatory variables / regressor variable / input variable denoted by x .

Ex: For a plant growth, if we apply fertilizers

Plant growth - dependent variable (y)

fertilizers - independent variable (x)

Classification of Regression Analysis:

1. Univariate Variable - prev example: One dependent
One I.D var
2. Multivariate Variable - many DV
many IDV

Ex:

Linear regression:

- > Relationship is linear b/w D and IDV, ~~non~~

Non linear regression:

- > Relationship is not linear b/w D and IDV.

relationship

dependent variable
usually denoted

independent variable

variable

1 DV and 1 DV is simple linear (SISO)

1 DV and many DVs is (MISO)

Simple linear regression

Multiple regression

Logistic regression

Ridge regression

PCA

LDA

Partial least squares

Lasso regression

Conditions	Examples
$y_i = \beta_0 + \beta_1 x_i + \epsilon_i$	①

where y_i is value of
ith obs of the
D.V in the sample

~~Scatter~~

Sample consists of
Set of data points
with n observations
 (x_i, y_i) where $i = 1, 2, 3, \dots, n$

And the functional
form is written as
eqn ①

x_i is the value of i th observation of the independent
variable of the sample.

ϵ_i is random error which is called residuals.

β_0, β_1 are regression parameters or regression coefficients.

$$y_i = \beta_0 + \beta_1 x_i + \epsilon_i \quad \text{--- ①}$$

$$y_i = \beta_0 + \beta_1 \ln(x_i) + \epsilon_i \quad \text{--- ②}$$

$$y_i = \beta_0 + \frac{1}{1 + \beta_1} x_i + \epsilon_i \quad \text{--- ③}$$

$$y_i = \beta_0 + e^{\beta_1} x_i + \epsilon_i \quad \text{--- ④}$$

Eqn ① & ② are linear regression models although relationship between x and y are not linear.

Eqn ③ & ④ are examples of non linear regression since the relationship between dependent variable y and regression coefficient β_1 is non linear.

Evolution of regression:

Galton's theory of regression:

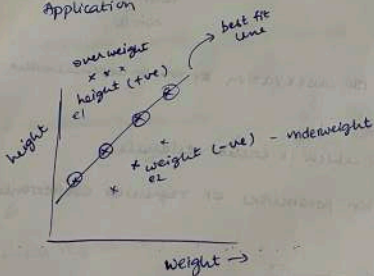
905 adults } avg ht of parent
205 families } mean value of gen (gen) children's shoes

Theoretical view

Geometric

Mathematical

Application



Error = Actual value - predicted value

$$e_1 = y_1 - \hat{y}_1$$

$$e_2 = y_2 - \hat{y}_2 \quad (\text{based on slope \& geometry})$$

$$e_3 = 0$$

$$y = mx + c \quad (x, y) \quad \text{--- (1)}$$

LSM : $\rightarrow \min \sum_{i=1}^n (y_i - \hat{y}_i)^2$

$$\rightarrow (y_1 - \hat{y}_1)^2 + (y_2 - \hat{y}_2)^2 + \dots + (y_n - \hat{y}_n)^2 \quad \text{--- (2)}$$

now $\hat{y}_1 = mx_1 + b$

$\hat{y}_n = mx_n + b$

substitute the value of \hat{y}_1, \hat{y}_2 in eqn (2) we get,

$$= (y_1 - (mx_1 + b))^2 + (y_2 - (mx_2 + b))^2 + \dots + (y_n - (mx_n + b))^2 \quad \text{--- (3)}$$

$$(a-b)^2 = a^2 + b^2 - 2ab$$

$$= (y_1^2 - 2y_1(mx_1 + b) + (mx_1 + b)^2) + \dots + (y_n^2 - 2y_n(mx_n + b) + (mx_n + b)^2)$$

now expand $(mx_1 + b)^2 \quad (a+b)^2 = a^2 + b^2 + 2ab$

$$= (y_1^2 - 2y_1(mx_1 + b) + (mx_1)^2 + b^2 + 2mx_1b) +$$

$$(y_2^2 - 2y_2(mx_2 + b) + (mx_2)^2 + b^2 + 2mx_2b) + \dots$$

$$(y_n^2 - 2y_n(mx_n + b))$$

$$= (y_1^2 + y_2^2 + \dots + y_n^2 - 2my_1x_1 - 2my_2x_2 \dots - 2my_nx_n - 2by_1 - 2by_2 \dots - 2by_n)$$

$$= (y_1^2 + y_2^2 + \dots + y_n^2) - 2m(y_1x_1 + y_2x_2 + \dots + y_nx_n) - 2b(y_1 + y_2 + \dots + y_n) + m^2(x_1^2 + x_2^2 + \dots + x_n^2) + 2mb(x_1 + x_2 + \dots + x_n) + (b^2 + b^2 + \dots + b^2)$$

Acc to least squares theory:

$$\bar{x} = \frac{x_1 + x_2 + x_3 + \dots + x_n}{n} \quad \text{--- (1)}$$

$$n\bar{x} = x_1 + x_2 + x_3 + \dots + x_n \quad \text{--- (1)}$$

similarly,

$$\bar{y} = \frac{y_1 + y_2 + \dots + y_n}{n}$$

$$n\bar{y} = y_1 + y_2 + \dots + y_n \quad \text{--- (2)}$$

$$\bar{x^2} = \frac{x_1^2 + x_2^2 + \dots + x_n^2}{n} \quad \text{--- (3)}$$

On substitution we get,

$$SE = n\bar{y^2} - 2mn(\bar{x}\bar{y}) - 2bn\bar{y} + m^2n\bar{x^2} + 2mbn\bar{x} + nb^2$$

on differentiation

$\therefore y = mx + b$, m, b are parameters

↓ apply
partial differentiation

$$\frac{\partial SE}{\partial m} \Rightarrow -2n\bar{x}\bar{y} + 2mn\bar{x^2} + 2bn\bar{x} = 0$$

$$\Rightarrow -\bar{x}\bar{y} + m\bar{x^2} + b\bar{x} = 0$$

$$\Rightarrow m\bar{x^2} + b\bar{x} = \bar{x}\bar{y}$$

$$\frac{\partial}{\partial x} (x^n) = nx^{n-1}$$

now divide by $\bar{x} \Rightarrow m \frac{\bar{x}^2}{\bar{x}} + b \left[\frac{\bar{x}}{\bar{x}} \right] = \frac{\bar{xy}}{\bar{x}}$

compare with $y = mx + b$

\therefore one point $\left(\frac{\bar{x}^2}{\bar{x}}, \frac{\bar{xy}}{\bar{x}} \right)$

$$\frac{\partial SE}{\partial b} = -2n\bar{y} + 2m\bar{x} + 2nb = 0$$

$$= -\bar{y} + m\bar{x} + b = 0$$

$$\bar{y} = m\bar{x} + b$$

$$(\bar{x}, \bar{y})$$

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$= \frac{\bar{y} - \frac{\bar{xy}}{\bar{x}}}{\bar{x} - \frac{\bar{x}^2}{\bar{x}}}$$

LCM

$$\frac{\bar{x} - \frac{\bar{x}^2}{\bar{x}}}{\bar{x} - \frac{\bar{x}^2}{\bar{x}}}$$

$$m = \frac{\bar{x}\bar{y} - \bar{xy}}{(\bar{x})^2 - (\bar{x}^2)} = \frac{\text{covariance}(x, y)}{\text{variance}(x)}$$

Note:

$$\text{COV}(x, y) = E(x - \bar{x})(y - \bar{y})$$

$$= E(xy - x\bar{y} + \bar{x}y + \bar{x}\bar{y})$$

$$\Rightarrow E(xy) = -\bar{y}\bar{x} - \bar{x}\bar{y}$$

$$\bar{xy} - \bar{x}\bar{y}$$

$$\begin{aligned} \text{var}(x) &= E(x - \bar{x})^2 \\ &= E(x^2 - 2x\bar{x} + \bar{x}^2) \\ &= E(x^2) - 2(\bar{x})^2 + \bar{x}^2 \\ &= \bar{x}^2 - (\bar{x})^2 \end{aligned}$$

Neuroscience:

Seizures / fits → jerks caused due to involuntary electrical impulses

Epilepsy - repeated seizures

juvenile
myoclonic

Absence
epilepsy

Photo
sensitive
epilepsy

Unit - 5

Perception:

fundamentals } of AI
Spectrum }

Perception - able to sense
assumptions
other views
how we understand.

Perception - It is how ~~we~~ an organism senses and
understands the happenings around.

+ve perception
-ve perception
optimal perception

Grammar \subset language

chomsky hierarchy

↓
Perceive

↓ * [sense organs]

feel see hear taste smell
↓ ↓ ↓ ↓
touch vision auditory olfactory

"Context Sense"

- Ex ① Sender - Akhil - chotu
(mistake of sender)
↳ -ve perception
- Ex ② : Akhil - person - temple - pooja
(mistake of receiver)

Robots	Non Human difference
Sensors Audio/Video input	

- Automation
- Survey Score Analysis

Super Robots
in space

Case Study

What is Design thinking

> to solve a complex problem in simple way

> ~~discovery~~ Empathy -
discovery phase

Survey was conducted

to test knowledge of D.T

not using D.T

50000 responses using D.T

Double diamond process

3 box thinking

divergent and convergent

Brainstorming

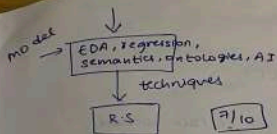
cheat storming



technique: em
D.T

22/9/23

Building
Interaction



technique: empirical + experimental \rightarrow how close to real.
 \downarrow
 D.T methods chosen. \rightarrow real time data

22/9/23

22/9/23
Building a Evolutionary model for Brain-computer
Interaction

Unit-4

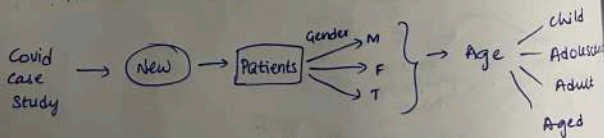
Central Limit theorem (CLT):

- > if you want find medicines for certain disease:
we need sampling.
for sample, if it works well
it works well for population.
- > focuses on problem stmt to find cause of prob stmt
in generalized manner.
- > Cause \rightarrow RNA (virus)
DNA \rightarrow responsible for mutation.

if a disease effects blood vessels,

if a " " DNA/RNA, it takes long time to
find medicine

Population \supset Sample



sample size of
when $n \geq 30$ for a population of 100, CLT is directly applicable.

$n \leq 25$, CLT can't be applied

• $25 < n < 30$, it is based on probability values

> There are limitations for CLT:

ex: Covid c

Theorem: Let x be an independent identically distributed random variable with finite population mean μ , finite population variance σ^2 then, a R.V converges in a distribution to the standard normal variables as $n \rightarrow \infty$ with mean μ , and variance (σ^2 / n) . Here, n is the size of sample from given distribution.

> No matter what is the shape of the population, is distributed of sampling, it works well when size of ~~n~~ population is large.

Limitations:

> It is not applicable for pareto distribution ($\mu = \infty$)
cauchy's distribution. ($\mu = x$)

Problem:

A population consists of 5 numbers: 2, 3, 6, 8, 11. Consider all possible samples of size 2 which can be drawn with replacement. From this data, find mean, standard deviation of the population.

- ② find mean of sampling distribution
- ③ find s.d of sampling distribution ^{about} of means

$$\rightarrow \text{① mean} = \frac{\sum x}{N} = \frac{2+3+6+8+11}{5} = 6$$

$$\begin{aligned} \text{s.d} &= \frac{\sum (x_i - \bar{x})^2}{N} \\ &= \frac{(2-6)^2 + (3-6)^2 + (6-6)^2 + (8-6)^2 + (11-6)^2}{5} \\ &= \sqrt{10.8} = 3.29 \end{aligned}$$

$$\text{② } n=2 \quad N=5 \quad \text{total} = 5^2 = 25$$

$\Rightarrow (2, 2) (2, 3) (2, 6) (2, 8) (2, 11)$
 $(3, 2) (3, 3) (3, 6) (3, 8) (3, 11)$
 $(6, 2) (6, 3) (6, 6) (6, 8) (6, 11)$
 $(8, 2) (8, 3) (8, 6) (8, 8) (8, 11)$
 $(11, 2) (11, 3) (11, 6) (11, 8) (11, 11)$

Corresponding samples:

\downarrow

2	2.5	4	5	6.5
2.5	3	4.5		11

$$\text{② } \frac{\sum (\text{all values})}{25} = 6 \rightarrow \mu_{\bar{x}} = \mu \quad (\text{where } \bar{x} \text{ is sample})$$

$$2\sigma_{\bar{x}} = \sigma$$

Problems

Solutions Applying

- ① Applying Evolution Interaction (18)
- ② children suffer
- ③ Patients suffer
- ④ Treating the
- ⑤ Human Bra
- ⑥ Recommended solving
- ⑦ Computer
- ⑧ Enhancer
- ⑨ reframing
- ⑩ Treating

Epilepsy ..

Absence ep

\downarrow
seizure

C/O \rightarrow
(Symptoms)

Problems

Solutions Applying cognitive science →

(Given problems, apply cognitive science for mid-2)

Unit-5

- ① Applying Evolutionary theory for Human Brain Interaction (BCI)
- ② children suffering with depression
- ③ Patients suffering with absence epilepsy [∵ broader family of epilepsies]
- ④ Treating the vision of blind.
- ⑤ Human Brain Robotic Interaction (HBR)
- ⑥ Recommending knowledge to enhance problem solving skills of a child/student
- ⑦ Computer Accessibility
- ⑧ Enhancing IQ, EA of a child
- ⑨ reframing the education / quality enhancement
- ⑩ Treating the disabled - Normal Interaction.

Epilepsy ...

Absence epilepsy:



seizures (jerks)

Q/O → Headache
(Symptoms) Nausea
Vomitings
Scared to sleep

Issues!

① Predicting Absence epilepsy is tough.
(symptoms / seizures are not seen on the outside)
only the person having fits feels inside .

② people suffering with severe anxiety also face suffocation. So, it is a medical complexity if it to identify if it is caused due to absence epilepsy / anxiety

③ Pressure bite / teeth biting

- anxiety
- winter (cold)
- Epilepsy.

④ Current existing diagnosis process:

Early	
1. CT Scan - o/p (Image)	5mins 2D img
2. MRI Scan - O/p (Image) (Fast)	45mins 3D img
3. EEG - Signals/graphs	1hr

Although reports show normal for brain abnormality we cannot say that the patient does not have epilepsy.

⑤ loss of memory and learning becomes slow.

Medication:

1. Heredity
2. behavior
3. Advanc

if (severe
(blood cl
d

}

→ bre

→ 40

→ fo

→

→

→

→

Medication:

1. Heredity (7th Gen - check if they have epilepsy)
2. behaviour of child and surroundings
3. Advance ~~MAI~~ EEG - 24-48hrs (50k-100k)
not advised at every level.

if (severe) }
(blood clots)

do:

surgery { Robotics
Human

}

- breathing exercises
- yoga (patient can't close eyes for too long)
- for nerves relaxing - tablet: clonazepam
- can't stay too long at night
- they can't climb heights
- they can't use mobile phones (max: 30-1hr)
WAKE
- loss of memory
- learning becomes slow

27/9/23

Cognitive Approach to treat children suffering with

Absence epilepsy [0-18 yrs]

[10-14] ← target audience
(hormonal changes)

Issues:

- (i) lack of memory
 - (ii) Attention
 - (iii) Diagnostic Issue.
- } goal is to enhance.

Prototype - implementation on a small.

Model - design / architecture

Bullying / Academic Pressure / Family Issues:

Anxiety

Other factors

① Financial

② Community

-ve Bullied person

levels

min on-screen time [25 55] max on-screen time

limitations:

- ① too much of animations causes dry eyes → Visual effects
- ② threshold for anxiety → ~~that~~ game should not cause anxiety.
- ③ Audio effects.

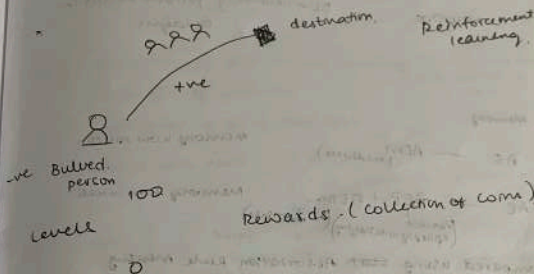
Game should be designed for:

biased*

M
F } because to serve
TG } the emotional need
better
All ← to overcome
legal issues

Mind-body problem → basing on thoughts how
we perceive others

{ mental-
representation }



collection of coins

Mango
(5pts)

Papaya

Pineapple
(5)

Orange
(5)

Papaya
(5)

Grapes
(5)

NLP

(Random Number
Generation)

After 25 points

MPOPQ

(starting letters of all names
displayed)

Audio/video → after a min → questions can be
asked.

29/9/23

Image processing → to capture facial expressions of a child so that psychiatrist, neurosurgeon can access the emotions of the child

(CNN)
(Inception
(to capture state of patient))

olp: Va state

Neurons

DL-neurons } perform inception on layers.

Memory

memory how much?

AE — AEM (medicines)

memory how much.

AE — AEP + AEM
(Absence epilepsy with playing) (with medicines)

Compared using ~~stat~~ Association Rule Mining.

Ram 4 → 8 (with medicines)

Shyam. 3 → 7/8 game doesn't work.

If > 8. game (feasible)

(with medicines + playing)

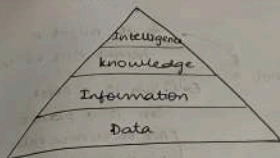
Next class

Perception evolved

Theory of Information processing

27/9/23

Fundamentals of AI



Pyramid of Data

Data - unorganized; raw; have meaning (unorganized form of raw fact is data)
collection of resources.

- unorganized form of raw data.

Problems with data:

1. Ambiguity
2. no uniqueness (Handling duplicate)
3. Inconsistency
4. Handling null values

Ex: AKW1 25 Suraj
CSBS
S2 CSE C Venkat
Srinanth
19 CPA MI
DSA Bhavana

* Data preprocessing steps: Adding miss values
Adding Null values

→ lack of clarity (what +)

Ex:

R-NO	Name	%	College	Branch name
20	Satwik	100	VNR	CSBS

Organized form of raw fact/data is information.

DB (RDBS)
SQL

can information be unstructured? Yes.

Knowledge:
(truth of a fact)

fact is a
universally accepted
stmts.

Truth might or
might not be true.

definitions: → not a
universally
accepted
stmt

Ex: ① Sun is a star
Sun is a planet
(Acc to science false)
(Acc to hinduism true)

→ belief system

② Earth is round
Earth is flat

Acc to flat theory, Earth is
flat

③ Does God exist

Why should we consider non factual stmts / belief
systems?

> ① we can't prove stmts that are non factual.

So, we use ontologies, metaphysics

① ~~find evidence~~ evidences to support facts.

② to prove non factual stmts

③ to find relationship b/w entities which are dependent on other
entities

mind / brain
Perception

Sensation (feel using sensory organs)

Imp

Perception of Sensation

Ex: ① video shared in grp

Sensation of perception

② child cries over dead body

(1st relation)

(no relation)

Ex: ~~Neem~~ around neem tree → your tongue starts to feel bitter

② Under coconut tree → you feel like the coconut falls

Vertigo: fluid.
Brain ↔ ear

if heavy fluid → causes vomiting.

Nomutings (non) → example for both.

Cognitivism Approach:

Game:

	Elephant	Camel
90°	+	X

8max moves

8max moves

biasness - when our perception is biased and not up to optimality, AI model will be biased.

① Framing the hypothesis :-

② Building computational model

③ Testing and Evaluation

④

4/10/28

Approach to Cognitivism:

① Hypothesis

② Computation

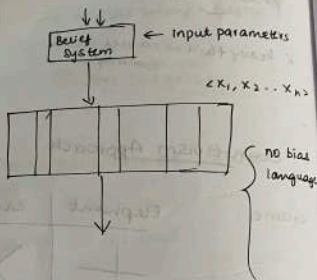
③ Implementation

Good.

*

→ Representation

→ Computation



1. Start and stop



so, finite automata

1. $\langle 0, 1, 90, 8, 9+ \rangle$

2. pattern recognition \rightarrow languages

$$L(n) = \{ a^n b^n \mid n \geq 0 \}$$

$\{ \epsilon, ab, aabb \dots \}$



Infinity cannot be considered.

→ For any hypothesis, having language is important and limit is important.

→ What is the connection of language to chemistry?

Monty Hall - problem of Cognitive Analytics [3 doors, 1 goat]

→ action to perform in a structured format, automata theory is applied.

→ Where FLAT is used in Real time?

→ All AI techniques are used in Automata theory

→ What is representation & models?

↓
diagrams

Symbolic representation

Pictorial representation

Semantic representation

Propositional representation

→ difference b/w database and knowledge base.

↓ facts / inferences

→ Aristotle - Father of Biology

classification / clustering (taxonomy)

believes in philosophy not in scientific study.

which 2 plants have same leaf and ~~food~~ segregated leaves

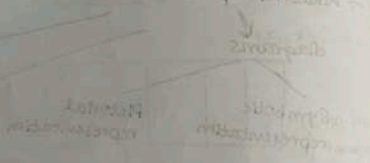
Knowledge base.

Reinforcement learning

- ① how knowledge Base is stored in human mind.
- ② how to diff ~~the~~ human mind & body.
- ③ how logical entities stored and represented.
- ④ how to represent these entities
- ⑤

Terminologies: (8m) *

- ① Structuralism
- ② Functionalism
- ③ Rationalism
- ④ Nativism
- ⑤ Empirism
- ⑥ Gestald Psychology



Problem: Suppose x is a discrete random variable with the following probability mass function $0 < \theta < 1$ is a parameter. Consider the following 10 independent observations

x	0	1	2	3
$P(x)$	$\frac{2\theta}{3}$	$\frac{\theta}{3}$	$\frac{2(1-\theta)}{3}$	$\frac{1-\theta}{3}$

(3, 0, 2, 1, 3, 2, 1, 0, 2, 1)

What is the θ value?

> Sample is $\langle 3, 0, 2, 1, 3, 2, 0, 0, 2, 1 \rangle$

$$L(\theta) = \prod_{i=1}^n P\left(\frac{x_i}{\theta}\right)$$

$$L(\theta) = P(X=3) P(X=0) P(X=2) \dots P(X=1)$$

$$= \left(\frac{1-\theta}{3}\right) \left(\frac{2\theta}{3}\right) \frac{2(1-\theta)}{3} \frac{\theta}{3} \frac{(1-\theta)}{3} \frac{2(1-\theta)}{3} \frac{\theta}{3} \frac{2\theta}{3} \frac{2(1-\theta)}{3} \frac{1-\theta}{3}$$

$$L(\theta) = \left(\frac{2\theta}{3}\right)^2 \left(\frac{\theta}{3}\right)^2 \left(\frac{2(1-\theta)}{3}\right)^3 \left(\frac{1-\theta}{3}\right)^2$$

$$\log(L(\theta)) = \log\left(\frac{2\theta}{3}\right)^2 \log\left(\frac{\theta}{3}\right)^2 \log\left(\frac{2(1-\theta)}{3}\right)^3 \log\left(\frac{1-\theta}{3}\right)^2$$

$$= 2 \log\left(\frac{2\theta}{3}\right) + 2 \log\left(\frac{\theta}{3}\right) + 3 \log\left(\frac{2(1-\theta)}{3}\right) + 2 \log\left(\frac{1-\theta}{3}\right)$$

$$= 2 \left[\log\left(\frac{2\theta}{3}\right) + \log\left(\frac{\theta}{3}\right) \right] + 3 \left[\log\left(\frac{1-\theta}{3}\right) + \log(1-\theta) \right]$$

$$l(\theta) = c + 5 \log \theta + 5 \log(1-\theta)$$

Applying differentiation:

$$\frac{d}{d\theta} (L(\theta)) \Rightarrow -\frac{5}{\theta} + \frac{5}{(1-\theta)} (-1)$$

$$\frac{5 - 5\theta + 5\theta}{\theta(1-\theta)} = \frac{5}{\theta(1-\theta)}$$

$$\Rightarrow 0 = \frac{5}{\theta} - \frac{5}{(1-\theta)}$$

$$= \frac{5(1-\theta) - 5\theta}{\theta(1-\theta)}$$

$$5\theta = 5(1-\theta)$$

$$2\theta = 1$$

$$\theta = 0.5$$

Markov chain Process:

Adv:

- > It'll not consider previous values, considers current values
- > No memory used since dynamicⁱⁿ nature.

Problem:

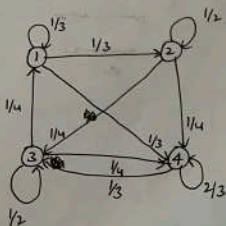
$$\begin{bmatrix} 1/3 & 1/3 & 0 & 1/3 \\ 0 & 1/2 & 1/4 & 1/4 \\ 1/4 & 0 & 1/2 & 1/4 \\ 0 & 0 & 1/3 & 2/3 \end{bmatrix}$$

Determine if the following transition matrix is

ergodic in nature (ergodic - time complexity of the process is minimal).

	1	2	3	4
1	$\frac{1}{3}$	$\frac{1}{3}$	0	$\frac{1}{3}$
2	0	$\frac{1}{2}$	$\frac{1}{4}$	$\frac{1}{4}$
3	$\frac{1}{4}$	0	$\frac{1}{2}$	$\frac{1}{4}$
4	0	0	$\frac{1}{3}$	$\frac{2}{3}$

<1, 2, 3, 4> are present states



Uniqueness:

① For all states, self loop is there i.e. it can travel any no. of times (no need to store memory for state)

② From any state, we can reach all other states.

③ T.C is less

> widely used in neuroscience and to develop games.

UNIT-4

1. classify to geometri
2. Derive least
3. Expla
4. Expla Sci
5. Dis
6. wa
7. Ex

UNI

1. w
- 2.

9/10/23

UNIT - 6 ~~DEE~~

Deep Learning :

Images

Patterns

Neural Networks

Memory

Neurons - millions (10×10^{10})

Hidden Layer *

> Difference between ML and Deep Learning :

'cat' 'dog' 'lion'

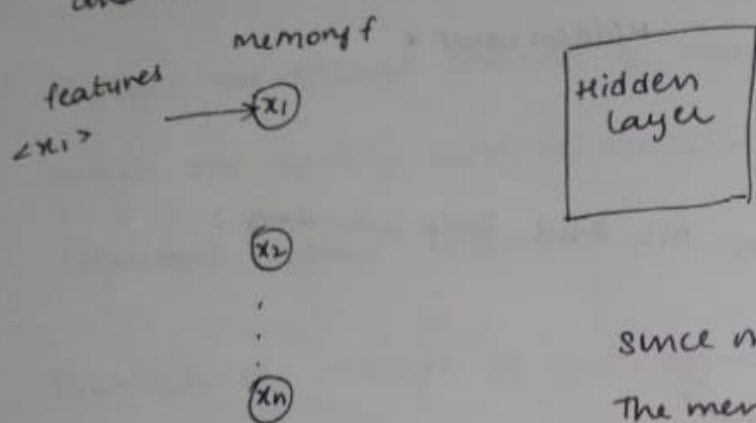
if you train 'tiger' for a D.L model, it automatically classifies cat lion into tiger family. Novelty of DL.

Deep learning majorly comprises of neural network layers to simulate the behaviour of human brain comprising of millions of neurons, allowing to learn from large amounts of data which are structured and unstructured.

Ex: Consider set of animals 'cat', 'dog', 'lion'. DL can determine which features are most important to distinguish each animal from another whereas M.L the hierarchy of features is established by human experts.

> Computational model can be expressed using an activation function generally represented by $f(x)$ which takes the input related to weights of the node.

Biased functions, neural structures, memory function and so on.



since mem i/p is in 1000

The memory associated with association function is high

preprocess data in unstructured form

Why do we use Bias functions?

↓
wt of node > size of node

classification of ~~Deep~~ ~~learn~~ Neural Network?

1. Biological Neural Network (BNN),

Artificial Neural Network (ANN),

Neural Network (NN)

Convolution Neural Network (CNN)

Recurrent Neural Network (RNN)

RN Architecture

Long short Term Memory (LSTM)

Bi-directional LSTM

Gated Recurrent Unit (GRU)

Continuous Time RNN (CTRNN)

Classification of CNN (w.r.t. application) ***

1. VGG16

2. Alex Net

3. Inception Net

4. ResNet

5. Google net

Classification of D.L object detection models

1. R-CNN

2. Fast R-CNN

3. Faster R-CNN

4. Cascade R-CNN

5. Mask R-CNN

6. Single shot Multi Box detector (SSD)

7. YOLO -- You Only Look Once

8. Single shot Refinement Neural Network

9. Refined Det

10. Retina Net

10

Auto

Autoencoders

1. ~~GAN~~ GAN

2. De-noising Autoencoders

3. Transformers

✓ BERT

GPT-3

GPT-2

XLNet

~~ROBERTA~~

ROBERTA

Auto-immune deficiency (ch-2) - AMP

> ~~the~~ their immunity attacks own immunity.

Problems: Skin allergy

dryness of eyes and mouth

asthma

breathing disabilities

~~some~~ rheumatoid Arthritis

Swelling in ~~knees~~ joints and kneepain

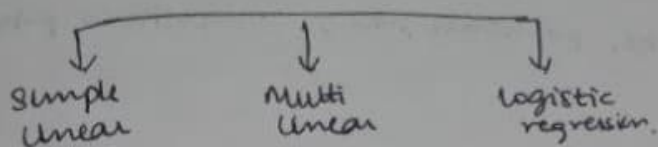
clenching of teeth

target audience
cause

1. 0
2. 0
3. 1
4. 1
5. 1

13/10/23

Regression.



Examples of Linear regression:

- ① A hospital may be interested in finding how the total treatment cost of a patient varies with the body's weight of the patient
- ② A business school may like to know the relationship between the salary offered to the graduating students by recruiting the companies during their placements and their CGPA
- ③ Ecommerce companies such as Amazon, Flipkart, Big basket would like to understand the number of customers visit to their portal and revenue.
- ④ Restaurants would like to know the relationships b/w the customer waiting time after placing the order and net promoter score (NPS)
- ⑤ Banks and other financial institutions would like to understand the impact of rate of unemployment on the percentage of non performing asset.

Examples of multi-linear regression:

- ① The treatment cost of cardiac patient may depend on the factors such as age, past medical history, weight of the body, blood pressure so on..

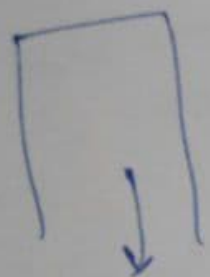
- ② market share of a brand may depend on various factors such as price, promotion price, competitors price

Logistic regression examples :

- ① A bank may like to classify the customers based on risk such as low, medium, high risk customers under loan portfolio. Here, the response variable y takes 3 variables. Ex: $y = 1$ (low risk)
 $y = 2$ (medium risk)
 $y = 3$ (high risk)
- ② Health service providers based on diagnostic tests may classify the patients as positive ($y = 1$, presence of disease) or ($y = 0$, in absence of disease)
- ③ Predict outcome of any sporting event. for example: in case of football, the outcome will be win, loose or drop.
- ④ Sentiment about a product or service in social media can be classified as positive, negative or neutral. which enables an organization to understand the sentiments about the product/ service. Organizations may also like to understand the reasons for negative sentiment if exist and take appropriate corrective actions.

1. survey → mindset
2. mid paper evaluation
- 3.

Survey



Survey
Responses

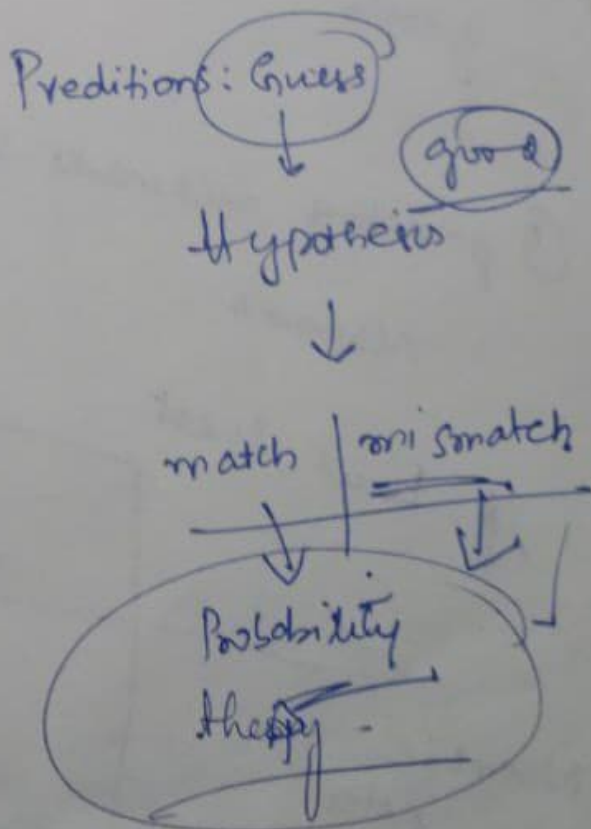
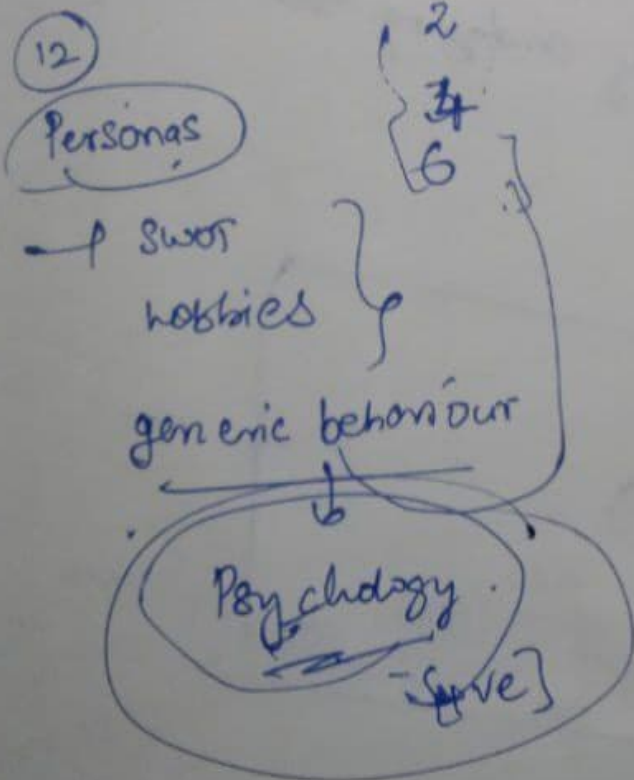


Answer
Sheets



Google
form.

Roll no. 12



mismatch

① child → time constraints

② Ambiguity for evaluator.
evaluator

Survey: Genuine

① Story: max pictures
↓

well

② Diagram

Exam

?

Time.

no google

next

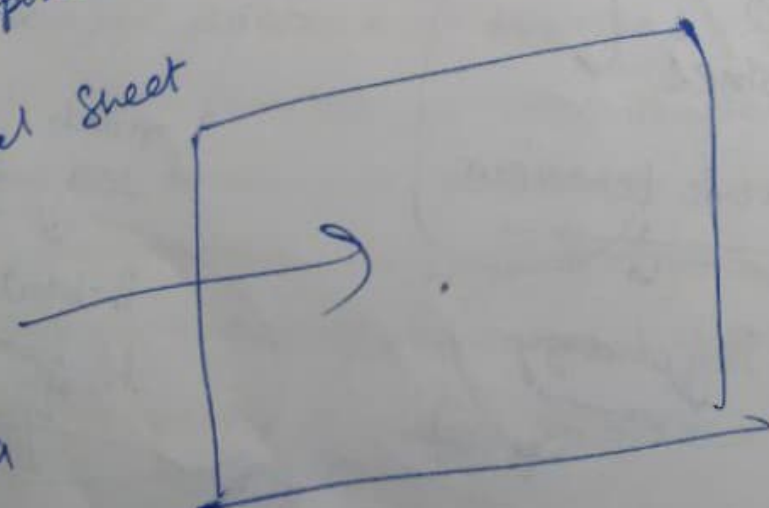
no time

google

① predicting midmarks by analyzing the Survey responses.

* Excel Sheet

Numeric data



25 m: 10

Survey Google form. Answer sheet VNR

10 m 10
8

23 1/2

if (S > 7 & A > 20) → 4.5 / 5 rating.

Rule based classifier

Score rank card

Data mining +
Association Rule
mining +
Apriori algorithm
FP growth

O/p. Exal.

Roll no.	3	Google form
1		

VNR (5)

Numeric

db Knowledge base
TRUTH
Array

5 x C

anchors

Propose data structure

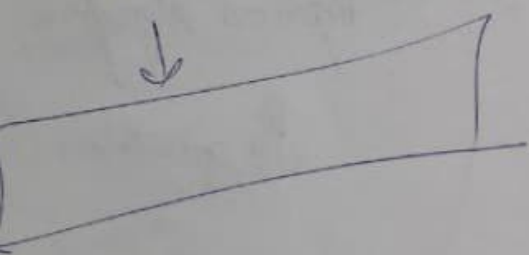
Analytics on Excel

* EDA

Attempted question
mostly.

Individual Summary,
group.

google forms 10 → 7.5



> 6 good

> 8 v. good ✓

10 Perfect

Tableau
↓
Data Visualization

↓
Data Science

Remarks :-

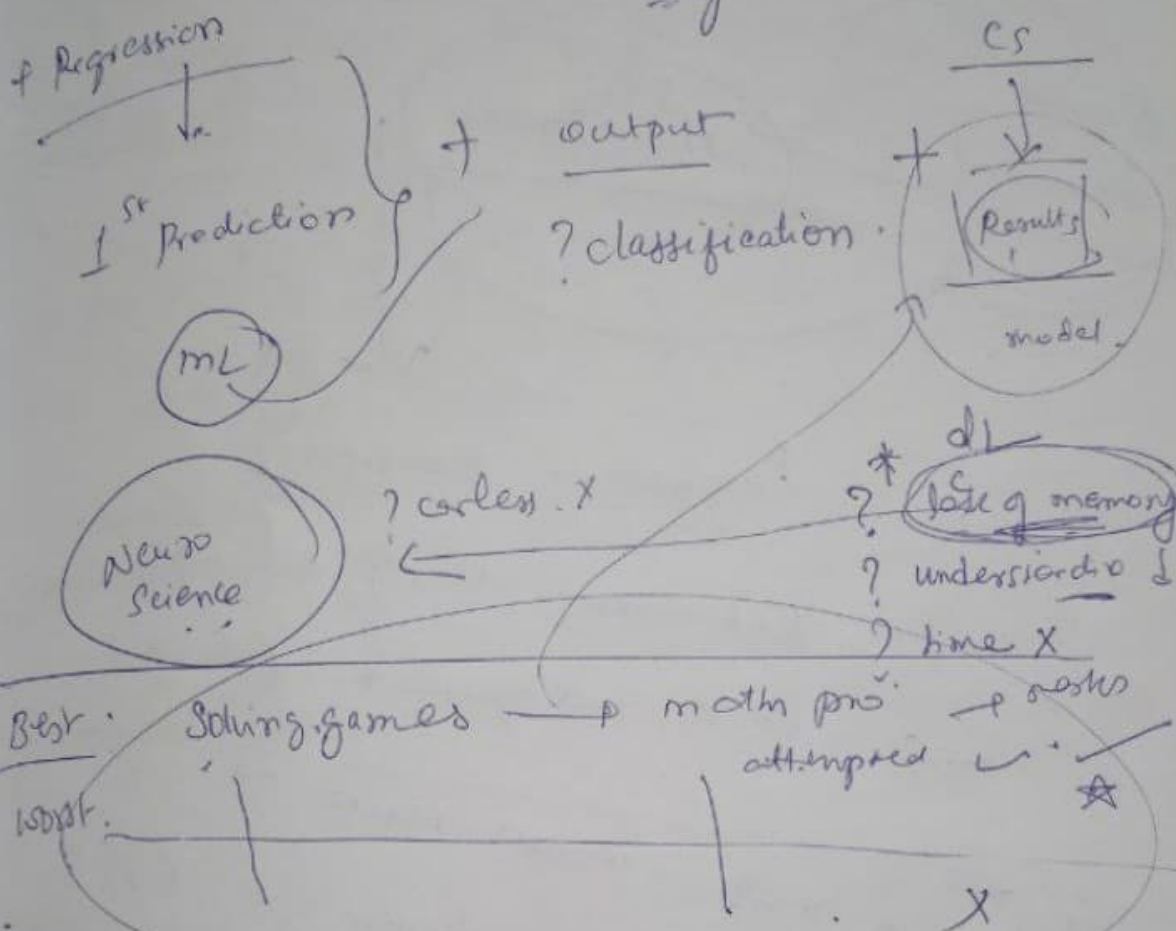
3D

outliers

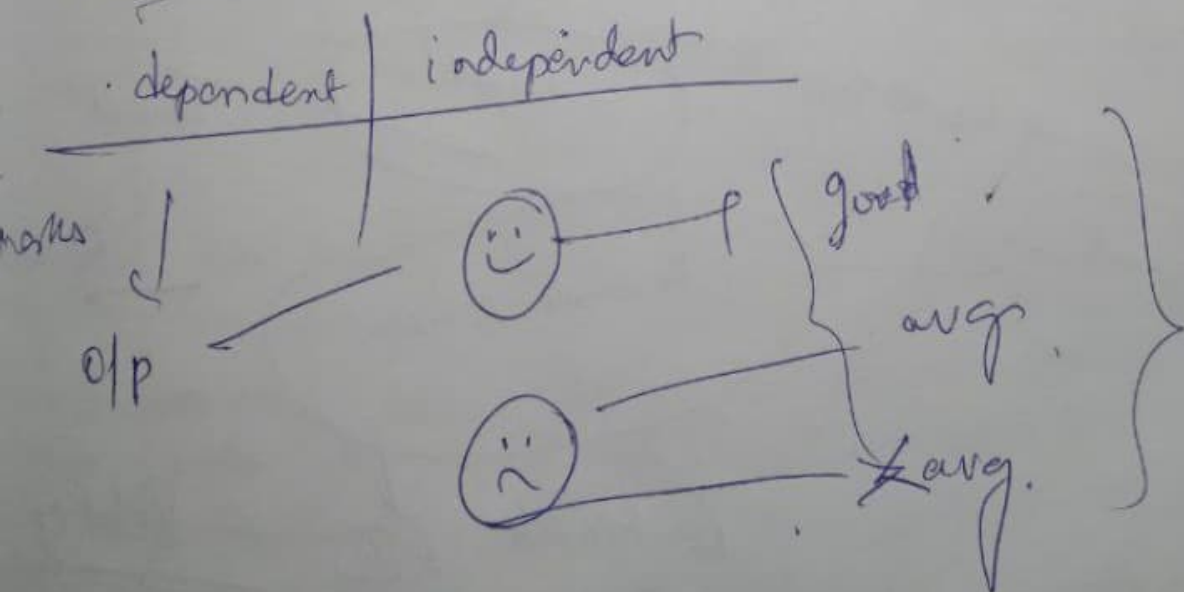
75 -

2.66

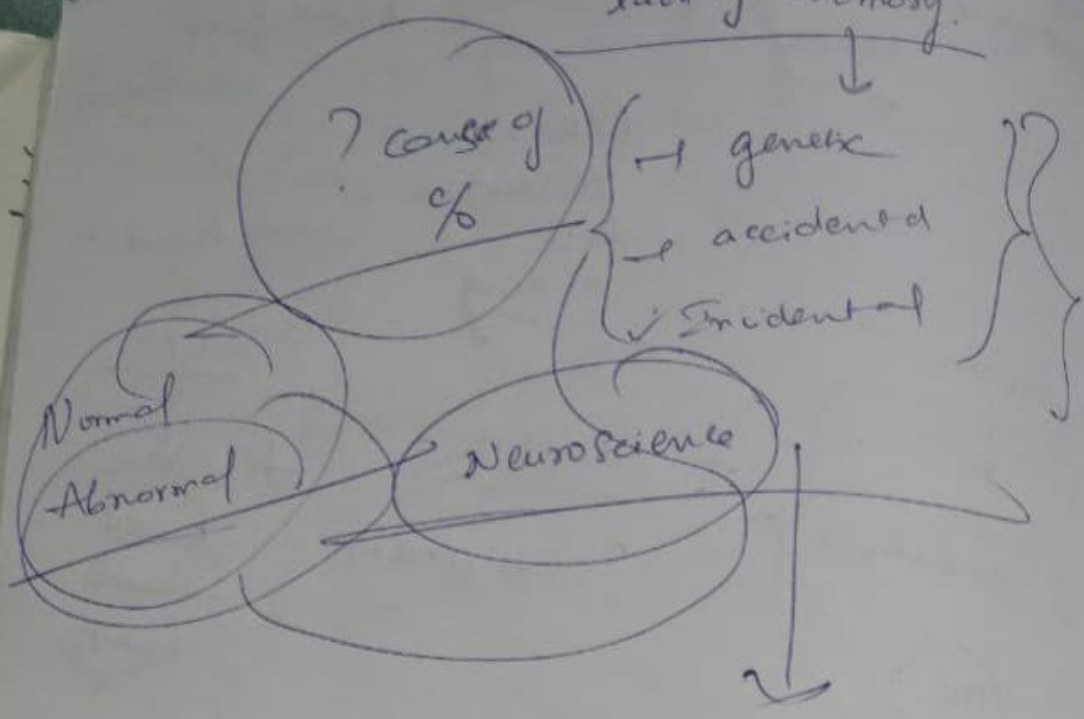
Psychology + Probability theory + Data mining + EDA + Data Visualization
 (ARM) Association Rule mining
 data science



Numeric data



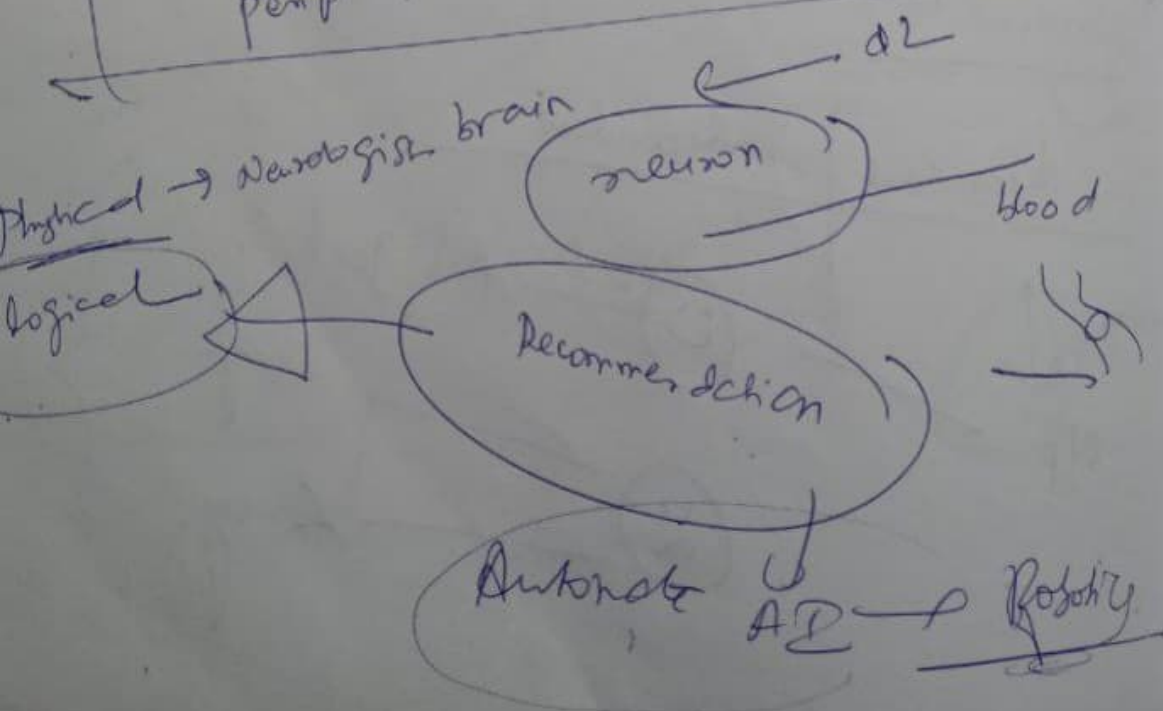
lack of memory.



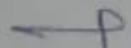
Suggestion Measures.

- Behavioural therapies (psychology)
- stress management (line 1)

defect in motor neurons neuro + peripheral Nervous system + CNS



Automate



Normal

Psychology +

Deficiency of brain
logic

Studies → SHRS
AS → 3
Mid → PS

Abnormal

Psychology

HBI

HCI

HR/

Robotics

Approach

IMPACT