

Internet of Things

Assignment-5

① Data Analysis :-

Data Analysis is the process of examining the data, pre-processing the collected data, cleaning it, exploring, and finally modelling with it. The end goal of data analysis is extracting valuable insights from the data. It is step-by-step process, but all steps are not mandatory.

Process :-

Each individual step is elaborated here and in a project all these are followed.

Inspection of data involves initial process of overseeing the data and identifying the Schema.

Streaming data → Processed → cleaned
data

Removing
incomplete
data

Modeling → Exploratory
analysis, Design, & planning

Schema is important because when data
flows in its definition is required.

Details like where data is coming from,
what will be its type and range are
identified. Based on findings, this

phase, any required solutions is designed
& implemented.

First patterns like type, range,
frequency are defined. Then when new
data flows in, it is checked. If data
is in the line with the definition.
Thus, inspection involves identification
of structure of data & then inspecting

of compliance with the definition.

In pre-processing, data is transformed & stored in completely structural schemas.

Once solution is devised, we start with implementation of analytical solution. cleansing step involves detection and removal of inconsistent, incorrect and inaccurate values. Once inconsistent data is removed, remaining data will be similar and compliant with the definition and suitable for analysis.

Exploratory data analysis (EDA) is performed on the cleaned data. EDA is process of discovering insights from data. After EDA Modeling is the final step. This is the core step in data analytics. Here mathematical techniques are applied to extract maximum out of data which has been well processed. It identifies relationship b/w fields / variable.

in the data.

Data Analysis tools:-

- Excel, Python, R
- Looker
- RapidMiner
- Microsoft Power BI.

② Machine learning:-

It is a field of Computer Science which gives the Computer System the ability to use Statistical techniques for learning.

Progressively from data. It is closely associated to Computational Statistics focussed on prediction making use of the data.

Algorithm methods:-

1. Supervised Learning:-

In this type of ML, Data Scientist supply algorithm with labelled training data & define the variables. They want to the algorithm to assess for correlations.

Both the inputs and outputs of the algorithms is specified.

2. Unsupervised learning:-

This involves algorithms that train on unlabelled data. The algorithm scan through data sets looking for any meaningful connection in the data that algorithms pair up as well as the predictions or recommendations they output are predicted.

3. Semi-supervised learning:-

This approach is a mix of two proceeding types. Data scientists may feed labelled training data, but model is the best own understanding of data set.

4. Reinforcement learning:-

It is to teach a machine to complete a multi-step process for

which they are clearly defined rule
data scientists programme an algorithm
to complete a task & give it
or -ve we as it most part.

Modelling Algorithms:-

Decision Tree:-

It is a classification algorithm. It takes
in a set of features and predict
the value of output dependent
variable. The input features may
be categorical or continuous, but
the output variable will always be
categorical.

Linear Regression:-

It takes in continuous valued
features & computer dependent variable.
It can be visualised as straight
line fit across the data points.

Logistic Regression:-

It is transformed version of linear regression which is used for classification.

$$y = \frac{e^{w_0 + w_1 x_1 + w_2 x_2}}{1 + e^{(w_0 + w_1 x_1 + w_2 x_2)}}$$

K-means :-

It is Clustering algorithm i.e. k is whole number greater than 0. Its goal is to create k distinct clusters.

Applications :-

1. Image recognition
2. Speech recognition
3. Traffic prediction
4. Product recommendation
5. Self driving cars
6. email spam & malware filtering
7. Virtual personal assistant
8. Online /raud detection
9. Stock marketing trading
10. Medical diagnosis.

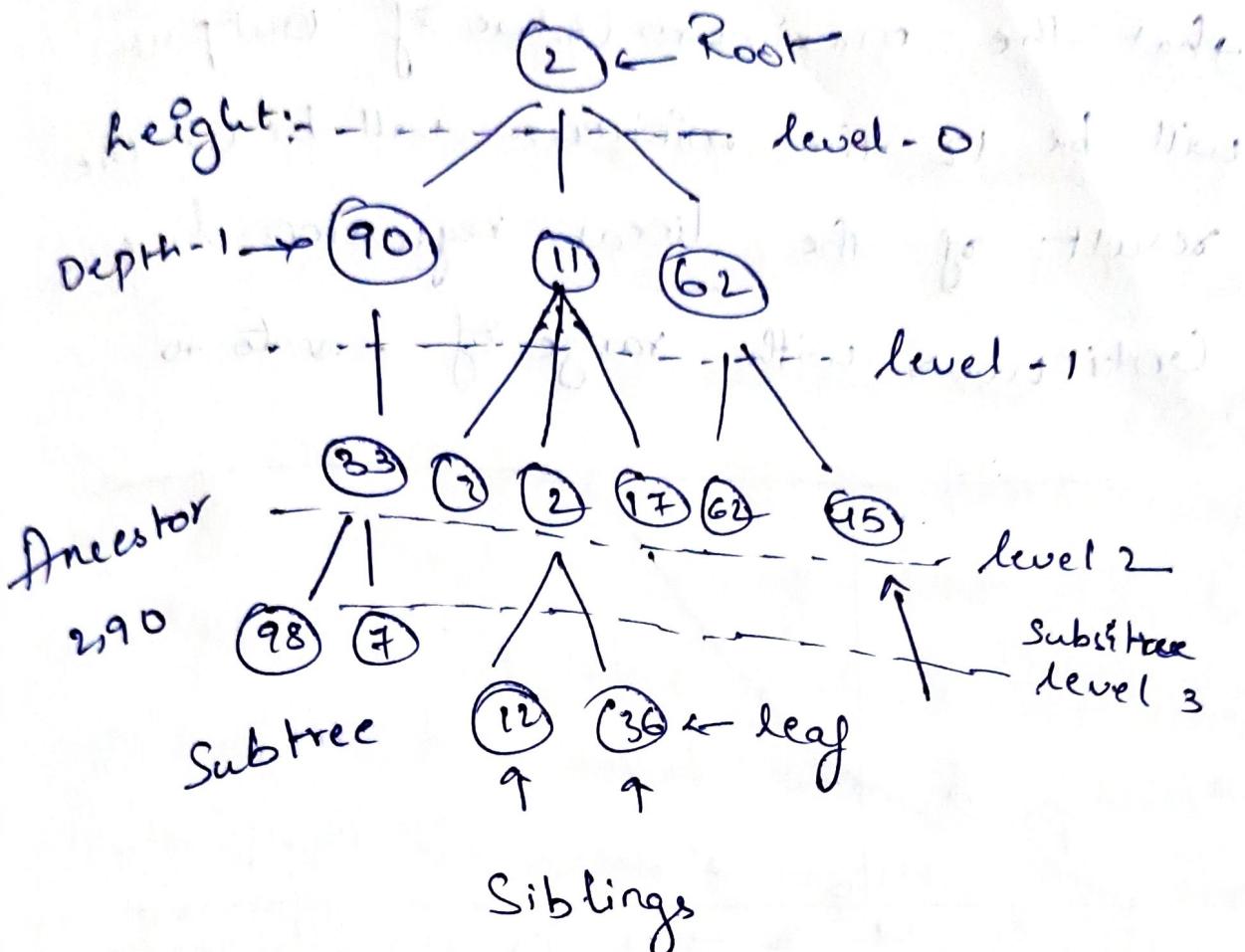
③

(a) decision

It is a classification algorithm. It takes in set of features and predict the value of the output / dependent variable. The input features may be categorised (or) in continuous but output variable will always be categorised & replicates the data structure.

d

Single root node. further nodes, branch downward from the root node by they all descendants. Every node can have any number of children the lowest node in the tree is leaf. The degree of the node is its number of children.



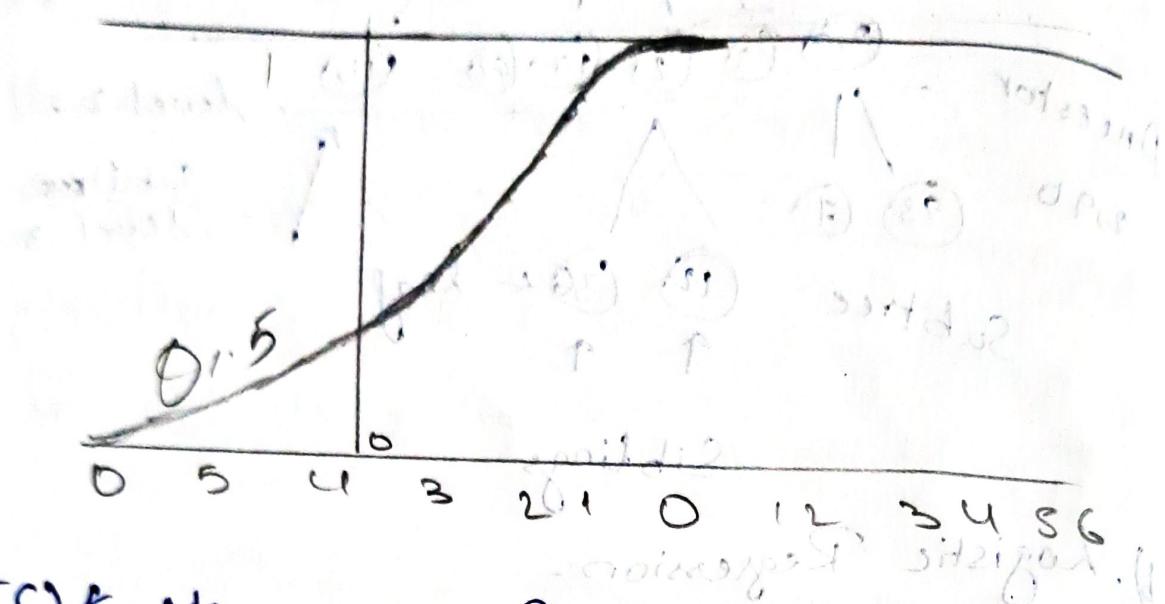
(b). Logistic Regression:-

It is Specific type of regression. It is transformed Version of linear regression.
 It can be either Simple linear regression
 (or) multi-linear regression. The equation of

$$y = \frac{1}{1 + e^{-(w_0 + w_1 k_1 + w_2 k_2)}}$$

Now eq (6-k) has an exponential term
 e is base of natural algorithms which
 is approx 2.718. By using reciprocal of
 inverse exponentiation, the equation ensues,

that the maximum value of output will be 12 the minimum will be 0. The result of the linear regression line is continuous with range of $-\infty$ to $+\infty$



(C) K-Means Clustering:

The K-Means is clustering algorithm, where k is any whole number greater than 0. The goal of algorithm is creating k distinct clusters. It is an iterative process. Every cluster will have a mean value & every data point is placed in the cluster which has the nearest value. Thus, the algorithm is aptly named k-means.

Initially k random elements are selected and placed in individual clusters and the process of segregation is initiated. Now, every cluster has one data point and that will be the centroid / mean of the clusters. Every data point is compared with each centroid and placed in the cluster which had the closest centroid. The absolute difference distance formula is

$$\sqrt{(x_2 - x_1)^2}$$

- ④ Smart retail:-
The role of IoT is important in two aspects,
1. Making entire retail infrastructure Smart.
2. Making Customer relationship Smart.
With ever increasing competition in ever-growing market, it finds challenging to retain old customers while focus is given to attracting new customers.

Feedback is very important. A customer can be retained by listening to his/her feedback. Getting proper feedback is needed to understand where and how a business stands and then take necessary measures.

- Areas where IoT can help in making retail smarter.
- 1. All surveillance systems can be made IoT-driven.
 - 2. IoT drives fire & smoke alerts and alarms can be deployed.
 - 3. Third is about energy. AC, lights etc. can be controlled and maintained through IoT finally.
- work flow
- flow of business
- feedback customers
- from various point
- Sensors / IoT
- Collect data into Cloud
- Analysis / understand
- Accelerate business

Smart Health Care :- Elderly fall detection with IoT and Sensors.

The potential of IoT is much appreciated these days in the health care sector.

We have built a very useful product for elderly healthcare, making use of IoT, sensors and data analytics.

The NCOA stated that rate of deaths in elderly population has reached a critical state and once in 11 seconds an elderly person is being treated for a fall. So, to reduce risks in elderly people, we present an economical & affordable system that could monitor their movement and can detect their fall after it has occurred.

Immediately after an old person falls, the system alerts his/her caretaker to take necessary actions to save the person.

We combined the power of IoT with the utilizing of sensors to develop fall detection system. With sensors, the data is read and analysed.

If detected as a fall, the caretaker will be immediately called for an alert.

Sensor Module

fetches data from the wearable

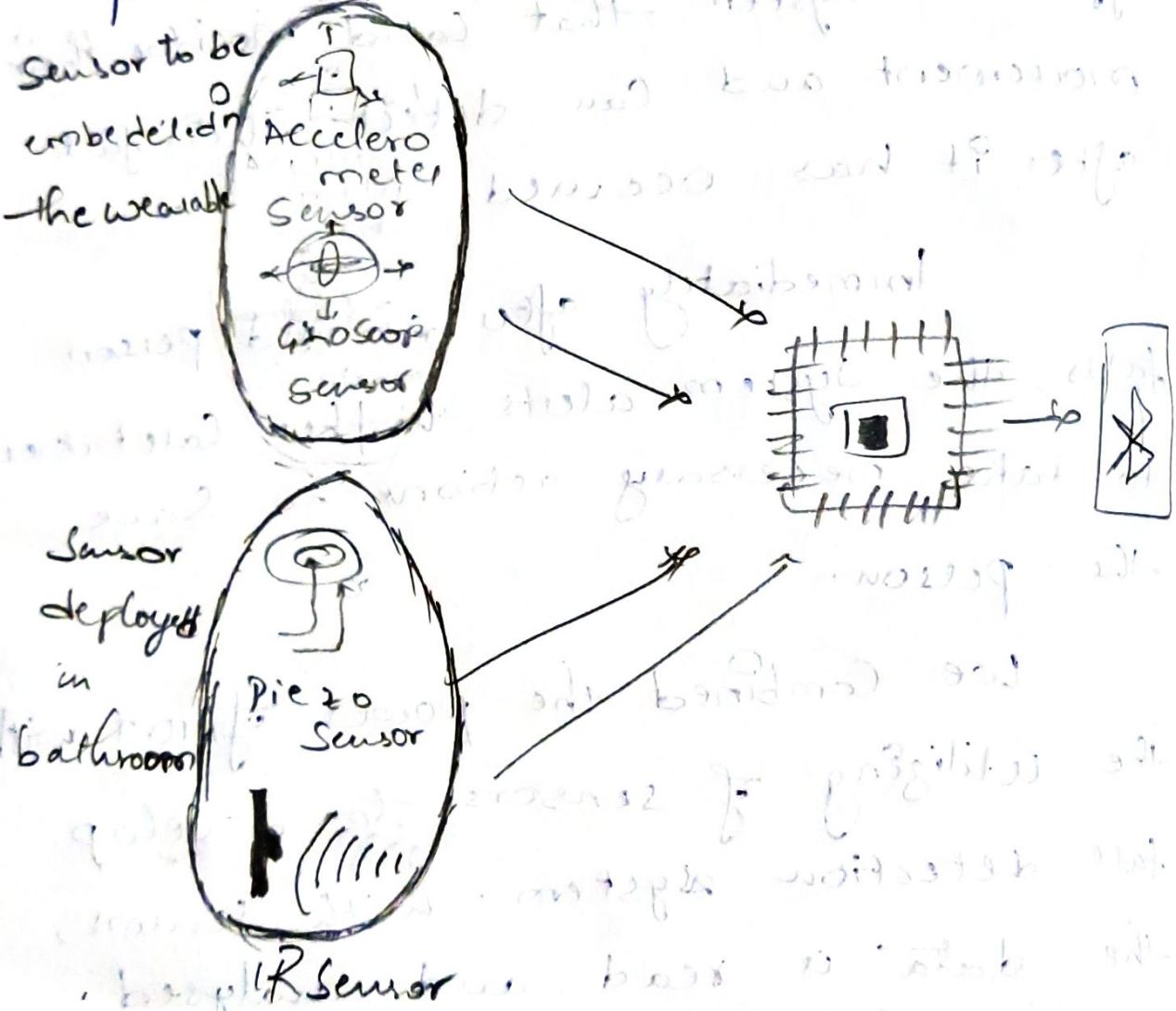
data form

the wearable

Processing block → Call

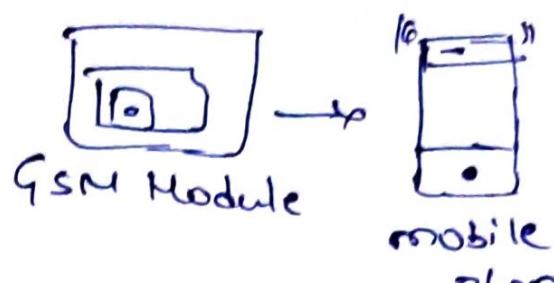
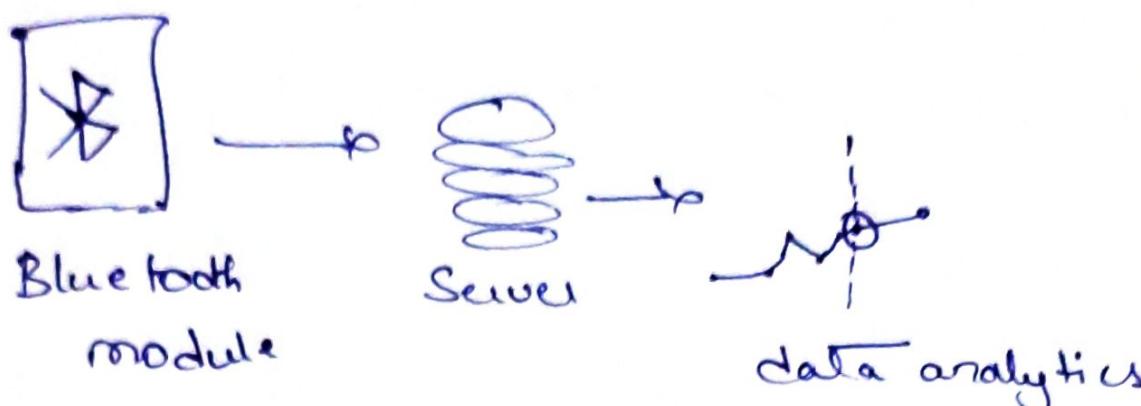
of the data to Caretaker

once Caretaker understands the functional of the transmitter and receiver of the fall detection system through diagrammatic representation.



from person, the data is fetched into micro controller using sensor which is return sent to server using bluetooth module.

working of receiver



In the receiver part, the data from bluetooth is fed to the server for data analytics and trigger a call in case of emergency.