

**ADHIYAMAAN COLLEGE OF ENGINEERING**

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**TEAM ID : PNT2022TMID07957**

**A MINI PROJECT REPORT**

**ANALYTICS FOR HOSPITAL'S HEALTH-CARE DATA**

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**BONAFIDE CERTIFICATE**

Certified that this mini project report “**ANALYTICS FOR HOSPITALS’ HEALTH-CARE DATA**” is the bonafide work of “” who carried out the project under my supervision.

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**INTERNAL EXAMINER**

**EXTERNAL EXAMINER**

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# **CHAPTER 1**

## **INTRODUCTION**

### **1.1 PROJECT OVERVIEW**

Healthcare management has various use cases for using data science, patient length of stay is one critical parameter to observe and predict if one wants to improve the efficiency of the healthcare management in a hospital.

This parameter helps hospitals to identify patients of high LOS-risk (patients who will stay longer) at the time of admission. Once identified, patients with high LOS risk can have their treatment plan optimized to minimize LOS and lower the chance of staff/visitor infection. Also, prior knowledge of LOS can aid in logistics such as room and bed allocation planning.

Suppose you have been hired as Data Scientist of Health Man – a not for profit organization dedicated to manage the functioning of Hospitals in a professional and optimal manner

### **1.2 PURPOSE**

The goal is to accurately predict the Length of Stay for each patient on case by case basis so that the Hospitals can use this information for optimal resource allocation and better functioning. The length of stay is divided into 11 different classes ranging from 0-10 days to more than 100 days.

- a) Length of stay for each Case of Patients.
- b) Stay by patient ID using Column Chart.
- c) Severity of illness by Patient-ID using Tree Map.
- d) Age, Department wise patient using Table.
- e) Room availability by Pie Chart.
- f) Dashboard Creation.
- g) Department wise no. of Admissions by Waterfall Chart.

## **CHAPTER 2**

### **LITERATURE SURVEY**

#### **2.1 EXISTING SOLUTION**

A dashboard solution for a private practice enables private practitioners and clinicians to optimize resource allocation and improve the standards of the quality of care they deliver. Typically, it includes KPIs such as patient satisfaction and average time spent per consultation and aims to find ways to drive patient engagement and increase profitability.

##### **USES**

- Helps to view patient's information within a fraction of seconds.
- Personal care.

**Advantage:** saves time, can minimize spreading of infections to others, personalized care.

**Disadvantage:** The main disadvantage is Heterogenous data.

#### **2.2 REFERENCES**

##### **1. Smart Healthcare System using big Data analytics(2022).**

In this paper, it gives a review on Big Data technologies, big data analytics, its implementation and challenges in making a smart healthcare system.

**Tools:** Apache Hadoop, Tableau.

**Technology:** Big Data analytics

**Advantages:** -Automation of hospital administrative process.

- Accurate calculation of health insurance rates.

**Disadvantages:** -Lots of big data is unstructured.

- High cost to store more data.

## **2.Development of the health information analytics Dashboard using big data analytics(2020).**

In this paper,they have created a dashboard that contains health information of the patients.

**Technology:**Big Data analytics

**Advantage:-**Health information dashboard can improve the ability of health service facilities.

## **3. Concurrence of big data analytics and healthcare(2018)**

The application of big data analytics in healthcare has immense potential for improving the quality of care,reducing waste and error and reducing the cost of care.

**Technology:**Big Data analytics

**Advantage:-**Big data analytics helps in understanding and targeting customers.

-It helps in optimizing business processes.

**Disadvantage:** -It needs to be analyzed for longer duration to leverage its benefits.

## **4.Systematic perspective on the applications of big Data analytics in healthcare management(2018).**

The exponential growth in the data collected in the form of electronic healthrecords,wear able sensors has brought revolution. Software integration platform and messaging system.

**Technology:** Big Data analytics

**Advantage:-**Increase productivity.

-Reducing cost.

**Disadvantage:-**Speedy updates in big data can mismatch real figure.

## 2.3 PROBLEM STATEMENT DEFINITION



### Customer Problem Statement

A well articulated customer problem statement allows us to find the ideal solution for the challenges our customers face. Throughout the process you will also be able to empathize with your customer which helps you understand how they perceive your service.

#### Problem Statements:

Problem Statement (PS)	I am (Customer)	I'm trying to	But	Because	Which makes me feel
PS-1	Hospital Management	Predict how long the patient will stay in the hospital.	It is difficult to predict the stay of patients all the time.	It takes a lot of time to do it manually.	Frustrated to wait till the complete.
PS-2	Hospital Management	Predict how long the patient will stay in the hospital.	It is difficult to predict the stay of patients all the time.	It requires a lot of staffs.	Dependent on them all the time.



## CHAPTER 3

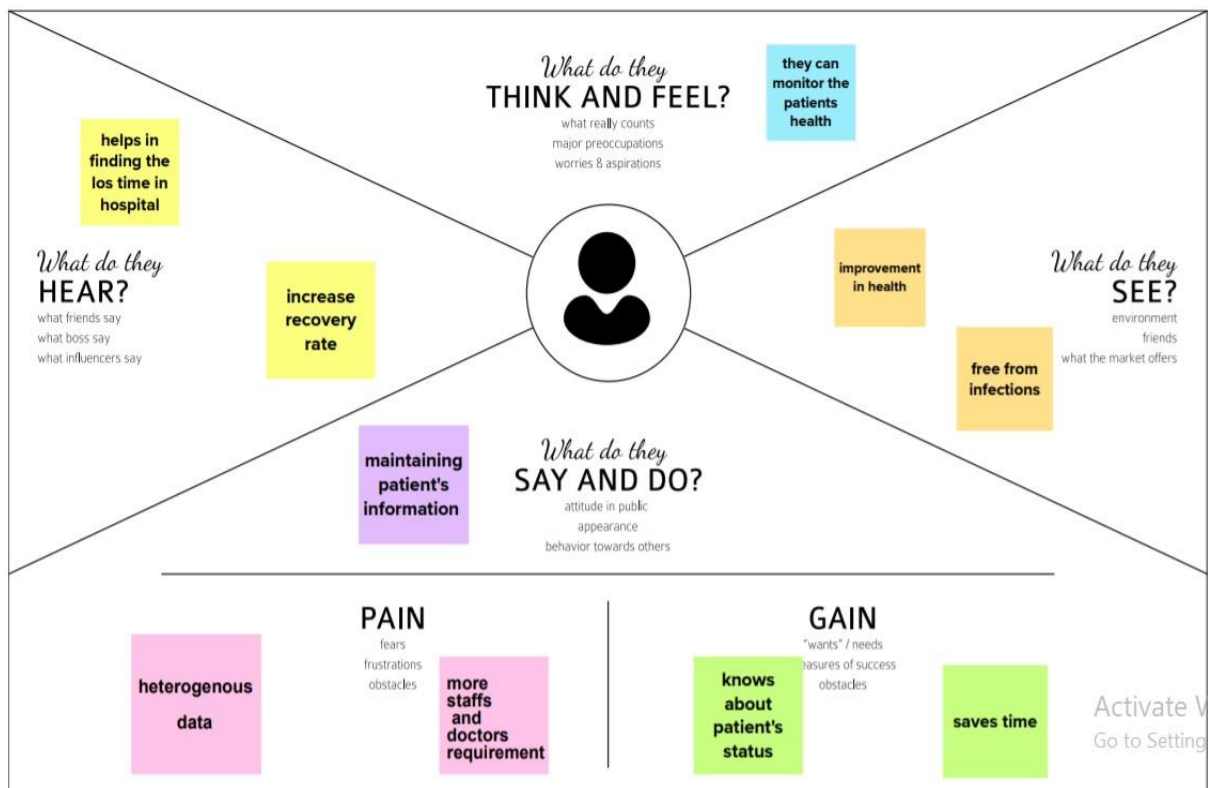
### IDEATION & PROPOSED SOLUTION

#### 3.1 EMPATHY MAP CANVAS

##### Empathy map canvas:

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes.


It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.



## 3.2 Brainstorm & Idea Prioritization Template:

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

### Step-1: Team Gathering, Collaboration and Select the Problem Statement



## Brainstorm & idea prioritization

Use this template in your own brainstorming sessions so your team can unleash their imagination and start shaping concepts even if you're not sitting in the same room.

- 10 minutes to prepare
- 1 hour to collaborate
- 3-8 people recommended

[Share template feedback](#)

➕

**Before you collaborate**

A little bit of preparation goes a long way with this session. Here's what you need to do to get going.

[10 minutes](#)

1

**Team gathering**

Define who should participate in the session and send an invite. Share relevant information or pre-work ahead.

2

**Set the goal**

Think about the problem you'll be focusing on solving in the brainstorming session.

3

**Learn how to use the facilitation tools**

Use the Facilitator Superpowers to run a happy and productive session.

[Open article](#)

1

**Define your problem statement**

What problem are you trying to solve? Frame your problem as a How Might We statement. This will be the focus of your brainstorm.

[5 minutes](#)

PROBLEM

To predict how long the patient will stay in the Hospital

Key rules of brainstorming

To run an smooth and productive session

1 Stay on topic

2 Encourage wild ideas

3 Defer judgement

4 Listen to others

5 Use lots of volume

6 If possible, let ideas



**Need some inspiration?**

Here's a random selection of ideas to inspire your work.

[View examples](#)

Step-2: Brainstorm, Idea Listing and Grouping

2

Brainstorm

Write down any ideas that come to mind that address your problem statement.

🕒 10 minutes

**TIP**

You can select a sticky note and hit the pencil [switch to sketch] icon to start drawing!

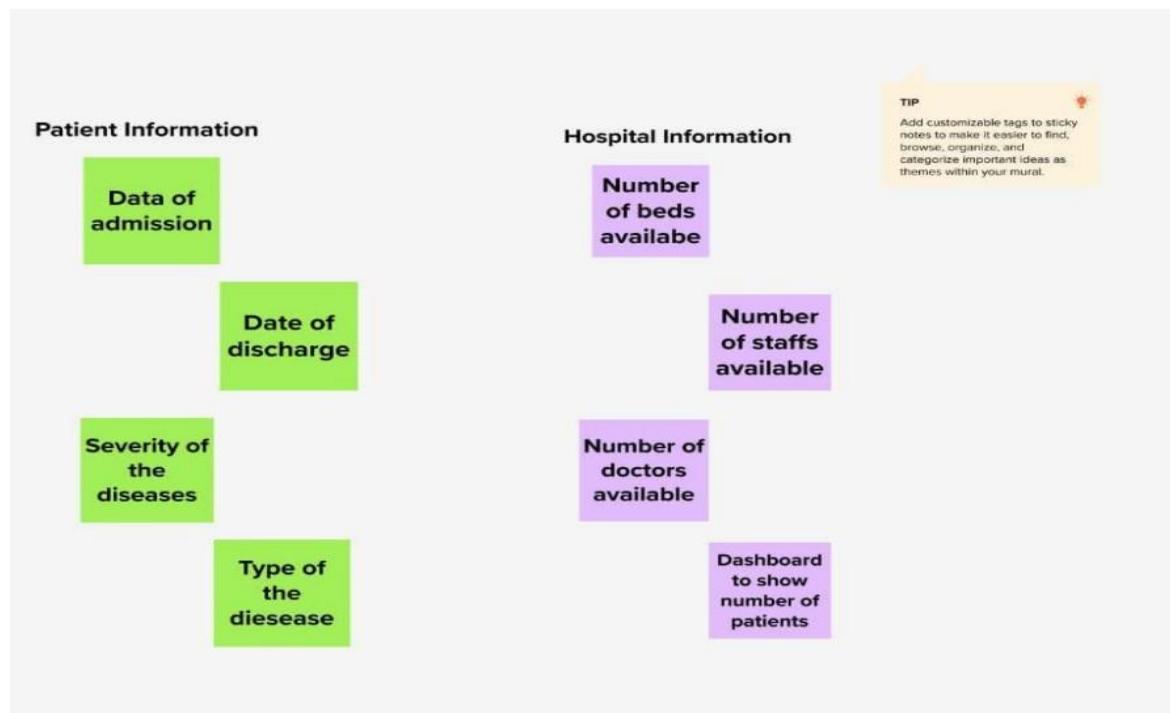
JAYAKEERTHANA R			DHANUSHYA M			GAYATHRI S			NAVEENKUMAR S		
severity of illness	Number of patients by ward type	Time of admission	What kind of disease	Age wise patients	Time of discharge	To keep the patient under observation	Age of the patient	Diagonishing the patient	Proper medication	Dashboard to predict the LOS of the patient	Severity of the diseases
interaction with the patient	View patient record frequently	Number of bed available	Dashboard to show number of patients	Number of bed available	Staff allocation	Availability of doctors in case of emergency	Visualization	Personalization of patient care	Alerting system	Staff scheduling	Monitoring patient's health
Total length of stay	Personalized treatment		Severity of diseases	EHRS		Data exploration	Admission and discharge date		Number of bed	Age of the patient	

3

### Group ideas

Take turns sharing your ideas while clustering similar or related notes as you go. In the last 10 minutes, give each cluster a sentence-like label. If a cluster is bigger than six sticky notes, try and see if you can break it up into smaller sub-groups.

🕒 20 minutes



## Step 3: idea prioritization



### 3.3 PROPOSED SOLUTION

S.NO	Parameter	Description
1.	Problem Statement (Problem to be solved)	To predict (LOS) how long the patient will stay in the Hospital.
2.	Idea / Solution description	<ul style="list-style-type: none"><li>• Healthcare management has various use cases for using data science, patient length of stay is one critical parameter to observe and predict if one wants to improve the efficiency of the healthcare management in a hospital.</li><li>• This parameter helps hospitals to identify patients of high LOSrisk (patients who will stay longer) at the time of admission. Once identified, patients with high LOS risk can have their treatment plan optimized to minimize LOS and lower the chance of staff/visitor infection.</li></ul>
3.	Novelty / Uniqueness	In this project, we will create a dashboard that contain prediction about how long the patient will stay in the hospital.
4.	Social Impact / Customer Satisfaction	<ul style="list-style-type: none"><li>• Access to primary healthcare</li><li>• Less casualty.</li></ul>
5.	Business Model (Revenue Model)	<ul style="list-style-type: none"><li>• Pharmacy companies will sell their medical products to generate more revenue.</li><li>• Insurance companies will sell their health policies to needed people.</li></ul>
6.	Scalability of the Solution	Prior knowledge of LOS can aid in logistics such as room and bed allocation planning.

### 3.4 PROBLEM SOLUTION FIT

The Problem-Solution Fit simply means that you have found a problem with your customer and that the solution you have realized for it actually solves the customer's problem. It helps entrepreneurs, marketers and corporate innovators identify behavioral patterns and recognize what would work and why.

Project Title: ANALYTICS FOR HOSPITALS' HEALTH-CARE DATA		Team ID: PNT2022TMID07957	
Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> <span>CS</span> Who is your customer? I.e. working parents of 0-5 y.o. kids  Hospital management who want to predict how long the patient will stay in the hospital.	<b>6. CUSTOMER CONSTRAINTS</b> <span>CC</span> What constraints prevent your customers from taking action or limit their choices of solutions? I.e. spending power, budget, no cash, network connection, available devices.  -Treatment facilities will be a challenging problem. -lack of doctors and caretakers.	<b>5. AVAILABLE SOLUTIONS</b> <span>AS</span> Which solutions are available to the customers when they face the problem or need to get the job done? What have they tried in the past? What pros & cons do these solutions have? I.e. pen and paper is an alternative to digital notetaking  Predicting how long the patient will stay in the hospital.
	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <span>J&amp;P</span> Which jobs-to-be-done (or problems) do you address for your customers? There could be more than one; explore different sides.  Create a dashboard and predict the patient's length of stay.	<b>9. PROBLEM ROOT CAUSE</b> <span>RC</span> What is the real reason that this problem exists? What is the back story behind the need to do this job? I.e. customers have to do it because of the change in regulations.  -Sometimes there will be lack of rooms and doctors. -personal care should be given.	<b>7. BEHAVIOUR</b> <span>BE</span> What does your customer do to address the problem and get the job done? I.e. directly related: find the right solar panel installer; calculate usage and benefits; indirectly associated: customers spend free time on volunteering work (I.e. Greenpeace)
Identify	<b>3. TRIGGERS</b> <span>TR</span> What triggers customers to act? I.e. seeing their neighbour installing solar panels, reading about a more efficient solution in the news.  The hospital management runs out of bed so it will be easy for them if they have prior knowledge about the patient's length of stay.	<b>10. YOUR SOLUTION</b> <span>SL</span> If you are working on an existing business, write down your current solution first, fill in the canvas, and check how much it fits reality. If you are working on a new business proposition, then keep it blank until you fill in the canvas and come up with a solution that fits within customer limitations, solves a problem and matches customer behaviour.  Creating a dashboard and predicting how long the patient will stay in the hospital using data analytics.	<b>8. CHANNELS OF BEHAVIOUR</b> <span>CH</span> <b>8.1 ONLINE</b> What kind of actions do customers take online? Extract online channels from #7 they have the knowledge about the bed allocation.
	<b>4. EMOTIONS: BEFORE / AFTER</b> <span>EM</span> <b>BEFORE:</b> Hospital donot have any knowledge about the patient's length of stay.  <b>AFTER:</b> Now, they can predict the patient's length of stay during admission.		<b>8.2 OFFLINE</b> What kind of actions do customers take offline? Extract offline channels from #7 and use them for customer development. they run to other Hospitals due to lack of beds.



Problem-Solution fit canvas is licensed under a Creative Commons Attribution-NonCommercial-NoDerivatives 4.0 license  
 Created by Daria Nepriakhina / Amaltama.com



## **PURPOSE OF SOLUTION FIT:**

- Solve complex problems in a way that fits the state of your customers.
- Succeed faster and increase your solution adoption by tapping into existing mediums and channels of behavior.
- Sharpen your communication and marketing strategy with the right triggers and messaging.
- Increase touch-points with your company by finding the right problem-behavior fit and building trust by solving frequent annoyances, or urgent or costly problems.
- Understand the existing situation in order to improve it for your target group.

## **CHAPTER 4**

### **REQUIREMENT ANALYSIS**

#### **4.1 FUNCTIONAL REQUIREMENTS**

<b>FR no</b>	<b>Functional requirement (epic)</b>	<b>Sub Requirement (story/sub-task)</b>
<b>FR-1</b>	Registration process of SRS (Software Requirements Specification)	Adding Patients: The Hospital Management enables the staff at the front desk to include new patients in the system.
<b>FR-2</b>	Check Out of SRS:	Deleting Patient ID: The staff in the administration section of the ward can delete the patient ID from the system when the patient checkout from the hospital.
<b>FR-3</b>	Report Generation of SRS:	Information of the Patient: The Hospital Management System generates a report on every patient regarding various information like patients name, Phone



		number, bed number, the doctor's name whom its assigns, ward name, and more.
<b>FR-4</b>	Database of SRS:	Mandatory Patient Information: Every patient has some necessary data like phone number, their first and last name, personal health number, postal code, country, address, city, 'patient's ID number, etc.

## 4.2 NON-FUNCTIONAL REQUIREMENTS

<b>NFR No</b>	<b>Non-Functional Requirement</b>	<b>Description</b>
<b>NFR-1</b>	Security	<ul style="list-style-type: none"> <li>● Patient Identification: The system needs the patient to recognize herself or himself using the phone.</li> <li>● Logon ID: Any users who make use of the system need to hold a Logon ID and password.</li> <li>● Modifications: Any modifications like insert, delete, update, etc. for the database can be synchronized quickly and executed only by the ward administrator.</li> </ul>
<b>NFR-2</b>	Performance	<ul style="list-style-type: none"> <li>● Response Time: The system provides acknowledgment in just one second</li> </ul>

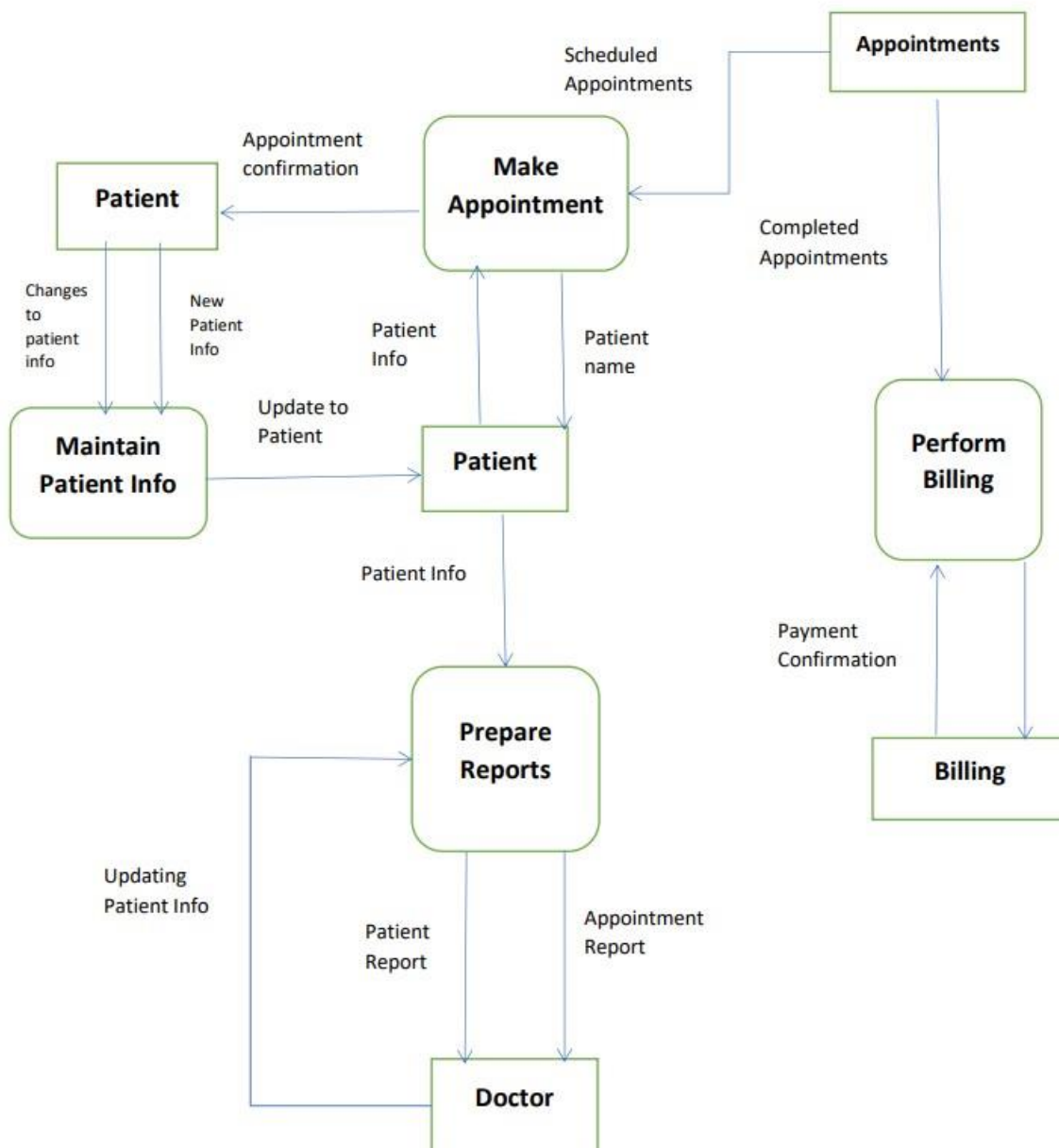
		once the 'patient's information is checked.
<b>NFR-3</b>	Capacity	<p>The system needs to support at least 1000 people at once.</p> <p>Maintainability</p> <ul style="list-style-type: none"> <li>● Back-Up: The system offers efficiency for data backup.</li> <li>● Errors: The system will track every mistake as well as keep a log of it.</li> </ul>
<b>NFR-4</b>	Errors	<ul style="list-style-type: none"> <li>● Availability: The system is available all the time</li> </ul>

## CHAPTER 5

### PROJECT DESIGN

#### 5.1 DATA FLOW DIAGRAMS

A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored.



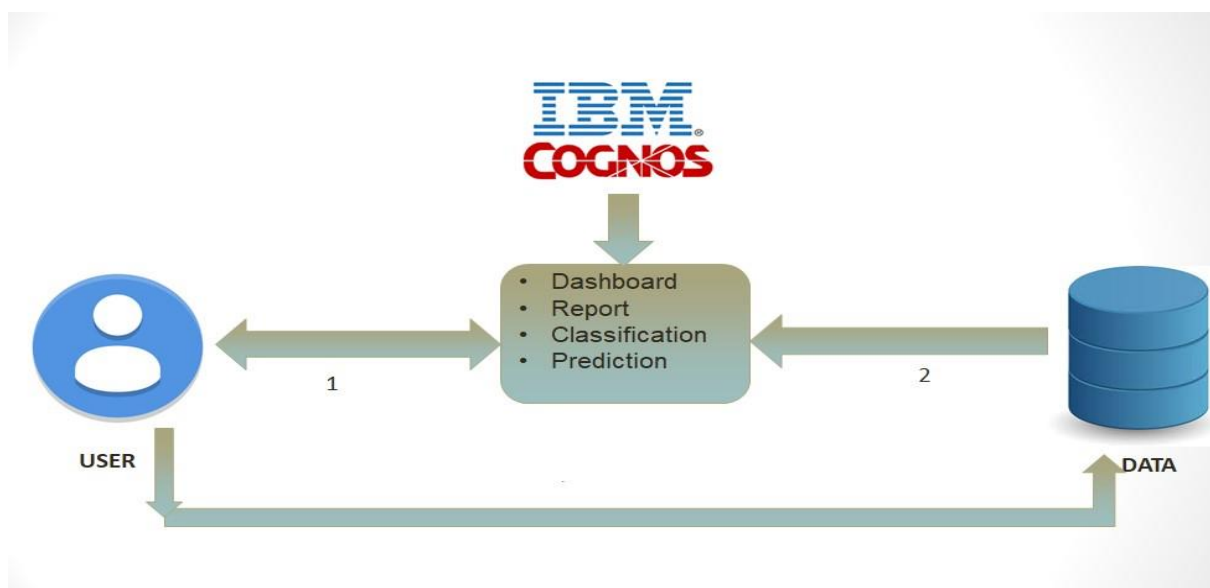
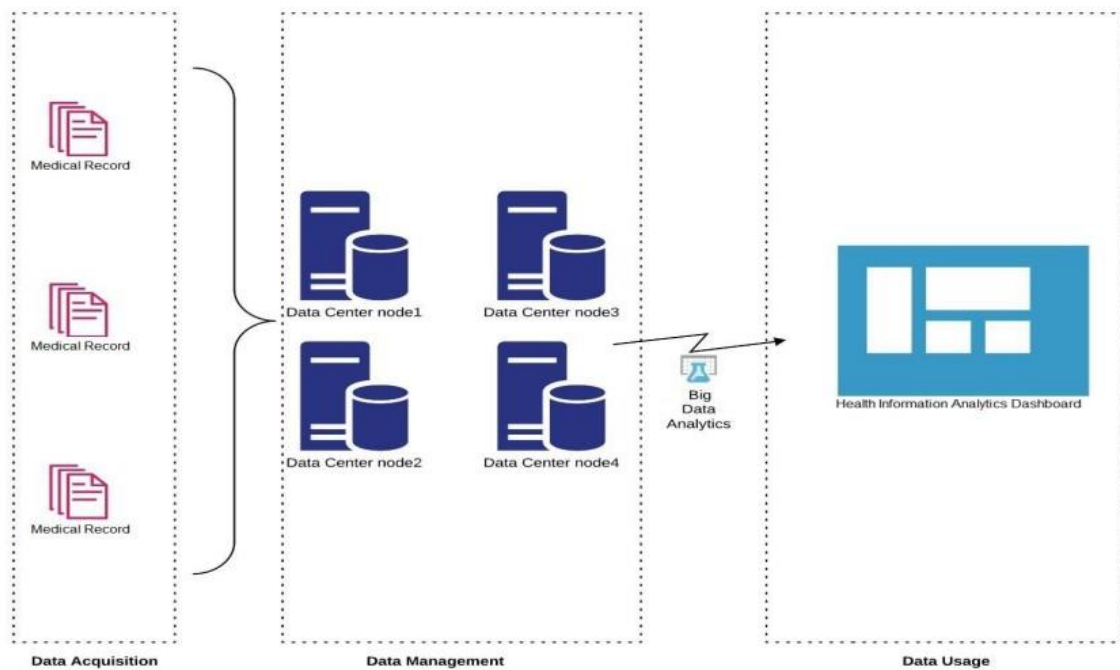
## 5.2 SOLUTION & TECHNICAL ARCHITECTURE

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions.

Its goals are to:

- Find the best tech solution to solve existing business problems.

- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.



## 5.3 USER STORIES

Use the below template to list all the user stories for the product.

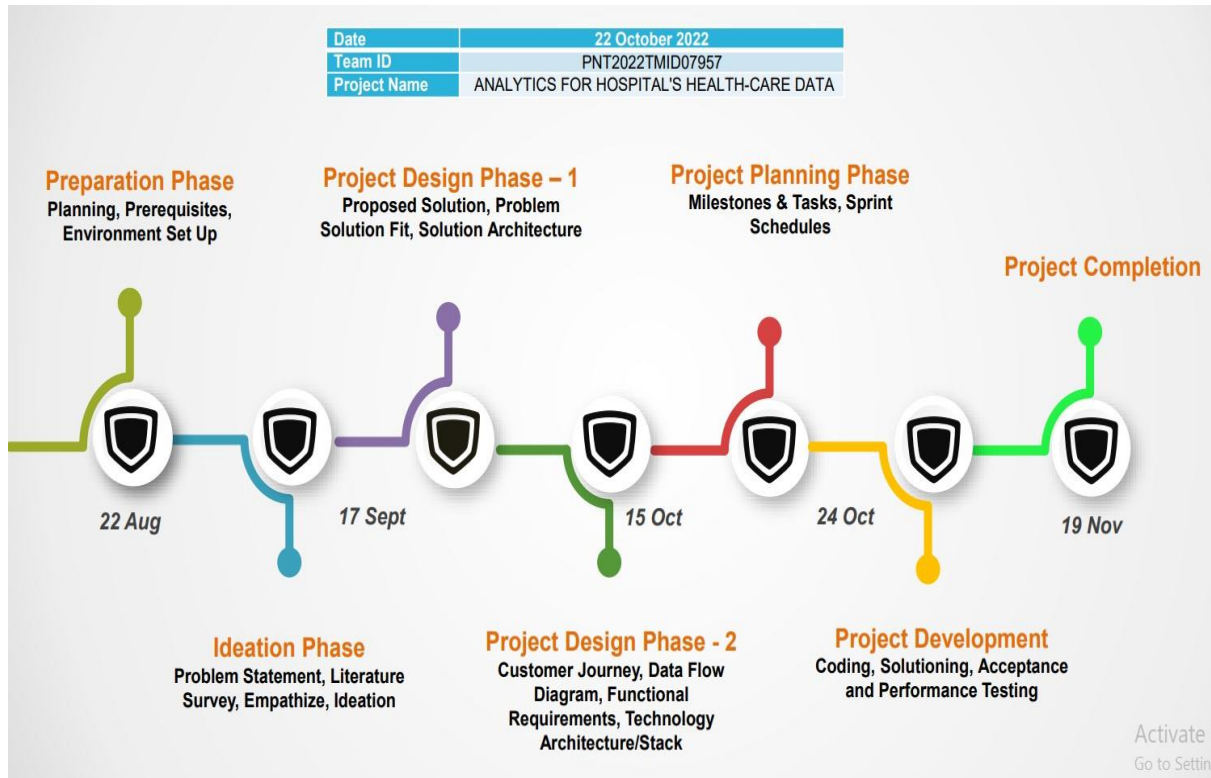
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Patient	Patient_name	USN-1	The preferred name of the patient	Name of the patient	High	Sprint-1
Patient	Patient_id	USN-2	Patient identification is the process of correctly matching a patient to appropriately intended interventions and communicating information about the patient	matching a patient identification	High	Sprint-1
Patient	Patient_room	USN-3	The space where patients receive care and treatment from medical staff	patient receive care and treatment	High	Sprint-1
Patient	Appointment report	USN-4	Including patient name, clinic location treatment appointment date and booking date	Appointment date and booking date	High	Sprint-1
Patient	Bed	USN-5	Hospital and to	Which	High	Sprint-2

	allocated		efficiently which patient to where	patient to where		
Patient	Maintain patient info	USN-6	Patient demographics progress notes problem medications	problem medication s	High	Sprint-2
Patient	Updating patient info	USN-7	Improving health care quality safety and patient	Health care quality	High	Sprint-3
Patient	Changes to patient info	USN-8	Change patient details	Patient details	High	Sprint-3
Patient	payment confirmati on	USN-9	A transaction document that can be part of receipt	Payment	High	Sprint-3
Patient	Perform billing	USN-10	To bill the claims for in patient and out patient services provided by hospitals	patient services provided by hospitals	High	Sprint-4
Patient	Patient info	USN-11	Patient during consultations health disease	patient information	High	Sprint-4
Patient	Health condition	USN-12	Medical records	information that refers individual's	High	Sprint-4

## CHAPTER 6

### PROJECT PLANNING & SCHEDULING

#### 6.1 SPRINT PLANNING AND ESTIMATION



#### 6.2 SPRINT DELIVERY SCHEDULE

sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story points	Priority	Team members
Sprint1	Patient_name	USN-1	The preferred name of the patient	2	high	Jayakeerthana R
	Patient _id	USN-2	Patient identification	1	high	Dhanushya M
	Patient_room	USN-3	The space for patients	1	high	Gayathri S
	Appointment report	USN-4	name,clinic location treatment appointment	2	high	Naveenkumar S

Sprint 2	Bed allocated	USN-5	Hospital and to efficiently which patient to where	2	high	Jayakeerthana R
	Maintain patient info	USN-6	Patient demographics progress notes problem medications	2	high	Dhanushya M

Sprint 3	Updating patient info	USN-7	Improving health care quality safety and patient	2	high	Gayathri S
	Changes to patient info	USN-8	change patient details	2	high	Naveenkumar S
	Payment confirmation	USN-9	A transaction document that can be part of receipt	2	high	Jayakeerthana R

Sprint 4	Perform billing	USN-10	To bill the claims for in patient and out patient services provided by hospitals	2	high	Dhanushya M
	Patient info	USN-11	Patient during consultations health disease	2	high	Gayathri S
	Health condition	USN-12	Medical records	2	high	Naveenkumar S



## CHAPTER 7

### CODING & SOLUTIONING

#### **Index.html**

```
<!DOCTYPE html>
```

```
<html lang="en">
```

```
<head>
```

```
<meta charset="utf-8">
```

```
<meta content="width=device-width, initial-scale=1.0" name="viewport">
```

```
<title>IBM Nalaiyathiran Project</title>
```

```
<meta content="" name="description">
```

```
<meta content="" name="keywords">
```

```
<!-- Favicons -->
```

```
<link href="assets/img/anonymus.png" rel="anonymus">
```

```
<link href="assets/img/anonymus.png" rel="anonymus">
```

```
<!-- Google Fonts -->
```

```
<link
```

```
href="https://fonts.googleapis.com/css?family=Open+Sans:300,300i,400,400i,600,600i,700,700i|Jost:300,300i,400,400i,500,500i,600,600i,700,700i|Poppins:300,300i,400,400i,500,500i,600,600i,700,700i" rel="stylesheet">
```

```
<!-- Vendor CSS Files -->

<link href="assets/vendor/aos/aos.css" rel="stylesheet">

<link href="assets/vendor/bootstrap/css/bootstrap.min.css" rel="stylesheet">

<link href="assets/vendor/bootstrap-icons/bootstrap-icons.css"
rel="stylesheet">

<link href="assets/vendor/boxicons/css/boxicons.min.css" rel="stylesheet">

<link href="assets/vendor/glightbox/css/glightbox.min.css" rel="stylesheet">

<link href="assets/vendor/remixicon/remixicon.css" rel="stylesheet">

<link href="assets/vendor/swiper/swiper-bundle.min.css" rel="stylesheet">


<!-- Template Main CSS File -->

<link href="assets/css/style.css" rel="stylesheet">


</head>

<body>


<!-- ===== Header ===== -->

<header id="header" class="fixed-top ">

    <div class="container d-flex align-items-center">

        <h1 class="logo me-auto"><a href="index.html">IBM Project</a></h1>

        <!-- Uncomment below if you prefer to use an image logo -->

        <!-- <a href="index.html" class="logo me-auto"></a>-->
```

```

<nav id="navbar" class="navbar">
  <ul>
    <li><a class="nav-link scrollto active" href="#hero">Home</a></li>
    <li><a class="nav-link scrollto" href="#Project">Project Idea</a></li>
    <li><a class="nav-link scrollto" href="#Dashboard">Cognos
Dashboard</a></li>
    <li><a class="nav-link scrollto" href="#Report">Report</a></li>
    <li><a class="nav-link scrollto" href="#Story">Story</a></li>
    <li><a class="nav-link scrollto" href="#Prediction">Prediction</a></li>
    <li><a class="nav-link scrollto" href="#team">Team</a></li>
    <li><a class="nav-link scrollto" href="#Contact">Contact</a></li>
  </ul>
  <i class="bi bi-list mobile-nav-toggle"></i>
</nav><!-- .navbar -->

</div>

</header><!-- End Header -->

<!-- ===== Hero Section ===== -->
<section id="hero" class="d-flex align-items-center">

  <div class="container">

    <div class="row">

      <div class="col-lg-6 d-flex flex-column justify-content-center pt-4 pt-lg-0
order-2 order-lg-1" data-aos="fade-up" data-aos-delay="200">

```

<h1>Analytics for Hospital's Health Care Data</h1>

<h2>Being a developing country, India has gone through many issues especially during the pandemic period. The most unforgettable era for India is the second wave of the covid-19 pandemic. Data analytics in health care sector can help us to face any situations in the future</h2>

<div class="d-flex justify-content-center justify-content-lg-start">

<a href="#Project" class="btn-get-started scrollto">Get Started</a>

</div>

</div>

<div class="col-lg-6 order-1 order-lg-2 cover-pic-medical-data-analytics" data-aos="zoom-in" data-aos-delay="200">



</div>

</div>

</div>

</section><!-- End Hero -->

<main id="main">

<!-- ===== Clients Section ===== -->

<section id="clients" class="clients section-bg">

<div class="container">

<div class="row" data-aos="zoom-in">

```
<div class="col-lg-2 col-md-4 col-6 d-flex align-items-center justify-content-center">
```

```

```

```
</div>
```

```
<div class="col-lg-2 col-md-4 col-6 d-flex align-items-center justify-content-center">
```

```

```

```
</div>
```

```
<div class="col-lg-2 col-md-4 col-6 d-flex align-items-center justify-content-center">
```

```

```

```
</div>
```

```
<div class="col-lg-2 col-md-4 col-6 d-flex align-items-center justify-content-center">
```

```

```

```
</div>
```

```
<div class="col-lg-2 col-md-4 col-6 d-flex align-items-center justify-content-center">
```

```

```

```
</div>
```

```
<div class="col-lg-2 col-md-4 col-6 d-flex align-items-center justify-content-center">
```

```

```

```
</div>
```

```
</div>
```

```
</div>
```

```
</section><!-- End Cliens Section -->
```

```
<!-- ===== Project Idea Section ===== -->
```

```
<section id="Project" class="about">
```

```
<div class="container" data-aos="fade-up">
```

```
<div class="section-title">
```

```
<h2>Project Idea</h2>
```

```
</div>
```

```
<div class="row content">
```

```
<div class="col-lg-6">
```

```
<p>
```

```
    Main Idea of this Project is:
```

```
</p>
```

```
<ul>
```

```
<li><i class="ri-check-double-line"></i>Data Collection</li>
```

```
<li><i class="ri-check-double-line"></i>Data Cleaning</li>
<li><i class="ri-check-double-line"></i>Data Exploration</li>
<li><i class="ri-check-double-line"></i>Visualization</li>
<li><i class="ri-check-double-line"></i> Story Creation</li>
<li><i class="ri-check-double-line"></i> Prediction</li>
<li><i class="ri-check-double-line"></i> Report Creation </li>

</ul>

</div>

<div class="col-lg-6 pt-4 pt-lg-0">

  <div class="pic"></div>

</div>

</div>

</section><!-- End Project Idea Section -->


<!-- ===== Dashboard Section ===== -->

<section id="Dashboard" class="Dashboard section-bg">

  <div class="container" data-aos="fade-up">

    <div class="section-title">
```

<h2>Dashboard</h2>

<p>This Dashboard is created in Cognos Analytics</p>

</div>

<iframe

src="https://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&pathRef=.my\_folders%2FSprint%2B3%2BDashboard%2B2&closeWindowOnLastView=true&ui\_appbar=false&ui\_navbar=false&shareMode=embedded&action=view&mode=dashboard&subView=model0000018488cd6a1f\_00000002" width="1500" height="1000" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>

</div>

</section><!-- End Dashboard Section -->

<!-- ===== Report Section ===== -->

<section id="Report" class="Report section-bg">

<div class="container" data-aos="fade-up">

<div class="section-title">

<h2>Report</h2>

<p>This Report is created in Cognos Analytics</p>

</div>

<iframe

src="https://us3.ca.analytics.ibm.com/bi/?pathRef=.my\_folders%2FSprint%2B4%2Breport%2B2&closeWindowOnLastView=true&ui\_appbar=false&ui\_navbar=false&shareMode=embedded&action=run&format=HTML&prompt=false" width="1500" height="1000" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>



```

</div>

</section>

<!-- ===== Report Section ===== -->

<!-- ===== Story Section ===== -->

<section id="Story" class="Story section-bg">

  <div class="container" data-aos="fade-up">

    <div class="section-title">

      <h2>Story</h2>

      <p>This Story is created in Cognos Analytics</p>

    </div>

    <iframe
src="https://us3.ca.analytics.ibm.com/bi/?perspective=story&pathRef=.my
_folders%2FSprint%2B4%2BStory&closeWindowOnLastView=true&am
p;ui_appbar=false&ui_navbar=false&shareMode=embedded&ac
tion=view&sceneId=model00000184850abab4_00000002&sceneTim
e=0" width="1500" height="1000" frameborder="0" gesture="media"
allow="encrypted-media" allowfullscreen=""></iframe>  </div>

  </section>

  <!-- ===== Story Section ===== -->

  <!-- ===== Goal Section ===== -->

  <section id="cta" class="cta">

    <div class="container" data-aos="zoom-in">

      <div class="row">

```

```
<div class="col-lg-9 text-center text-lg-start">
```

```
<h3>Goal</h3>
```

```
<p> The goal is to accurately predict the Length of Stay for each patient  
on case by case basis so that the Hospitals can use this information for optimal  
resource allocation and better functioning. The length of stay is divided into 11  
different classes ranging from 0-10 days to more than 100 days.</p>
```

```
</div>
```

```
<div class="col-lg-3 cta-btn-container text-center">
```

```
<a class="cta-btn align-middle" href="#">Description</a>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
</section><!-- End Goal Section -->
```

```
<!-- ===== Prediction Section ===== -->
```

```
<section id="Prediction" class="Prediction section-bg">
```

```
<div class="container" data-aos="fade-up">
```

```
<div class="section-title">
```

```
<h2>Prediction</h2>
```

```
<p>This Prediction was done in google colab by using Naive Bayes  
Algorithm</p>
```

```
</div>
```

```
<button class="btn text-light bg-dark button1">
```

```
<a class="" href="/Prediction.html">Predit the length of stay (LoS)</a>
```

```
</button>
```

</div>

</section>

<!-- ===== Report Section ===== -->

<!-- ===== Team Section ===== -->

<section id="team" class="team section-bg">

<div class="container" data-aos="fade-up">

<div class="section-title">

<h2>Team</h2>

<p>Team Work is so essential for this whole project without them this project will be just few lines of unexcecutable codes</p>

</div>

<div class="row">

<div class="col-lg-6">

<div class="member d-flex align-items-start" data-aos="zoom-in" data-aos-delay="100">

<div class="member-info">

<h4>JAYAKEERTHANA R</h4>

<span>Team Leader</span>

<p>Worked on Model Creation , Cognos Analytics , Colab</p>

</div>

</div>

</div>

<div class="col-lg-6 mt-4 mt-lg-0">

<div class="member d-flex align-items-start" data-aos="zoom-in" data-aos-delay="200">

<div class="member-info">

<h4>DHANUSHYA M</h4>

<span>Team Member 1</span>

<p>Worked on Idea Creation, Cognos Analytics , Documentation</p>

</div>

</div>

</div>

<div class="col-lg-6 mt-4">

<div class="member d-flex align-items-start" data-aos="zoom-in" data-aos-delay="300">

<div class="member-info">

<h4>GAYATHRI S</h4>

<span>Team member 2</span>

<p>Worked on Story Creation , Predictive Analysis , Colab , Cognos Analytics</p>

</div>

</div>

</div>

<div class="col-lg-6 mt-4">

<div class="member d-flex align-items-start" data-aos="zoom-in" data-aos-delay="400">

<div class="member-info">

<h4>NAVEENKUMAR S</h4>

<span>Team Member 3</span>

<p>Worked on Literature Survey , Delivery Plan , Technical Stack</p>

</div>

</div>

</div>

</div>

</div>

</section><!-- End Team Section -->

<!-- ===== Frequently Asked Questions Section ===== -->

<section id="faq" class="faq section-bg">

<div class="container" data-aos="fade-up">

<div class="section-title">

<h2>Frequently Asked Questions</h2>

<p>Data Analytics in Hospital Data is very challenging task since a minor error in data can risk people life so there are some of the questions listed below</p>

</div>

<div class="faq-list">

<ul>

<li data-aos="fade-up" data-aos-delay="100">

<i class="bx bx-help-circle icon-help"></i> <a data-bs-toggle="collapse" class="collapse" data-bs-target="#faq-list-1">How does Data analytics helps us in Hospital Data? <i class="bx bx-chevron-down icon-show"></i><i class="bx bx-chevron-up icon-close"></i></a>

<div id="faq-list-1" class="collapse show" data-bs-parent=".faq-list">

<p>

During Covid 19 we faced a lot of trouble because of wrong prediction analysis which was made manually , if Data Analytics was used then there will be pre prediction which can reduce the mortality rate and avoids last minute chaos

</p>

</div>

</li>

<li data-aos="fade-up" data-aos-delay="200">

*<i class="bx bx-help-circle icon-help"></i> <a data-bs-toggle="collapse" data-bs-target="#faq-list-2" class="collapsed">Will it makes major error in prediction and Visualization <i class="bx bx-chevron-down icon-show"></i><i class="bx bx-chevron-up icon-close"></i></a>*

*<div id="faq-list-2" class="collapse" data-bs-parent=".faq-list">*

*<p>*

IBM Cognos has low level of error in prediction and visualization this can help us to make accurate results

*</p>*

*</div>*

*</li>*

*<li data-aos="fade-up" data-aos-delay="300">*

*<i class="bx bx-help-circle icon-help"></i> <a data-bs-toggle="collapse" data-bs-target="#faq-list-3" class="collapsed">How it will help people? <i class="bx bx-chevron-down icon-show"></i><i class="bx bx-chevron-up icon-close"></i></a>*

*<div id="faq-list-3" class="collapse" data-bs-parent=".faq-list">*

*<p>*

This project can help people to make analysis so that resource allocation can be done easily and better than the manual method

*</p>*

*</div>*

*</li>*

*<li data-aos="fade-up" data-aos-delay="400">*

*<i class="bx bx-help-circle icon-help"></i> <a data-bs-toggle="collapse" data-bs-target="#faq-list-4" class="collapsed">Why we use IBM cognos? <i class="bx bx-chevron-down icon-show"></i><i class="bx bx-chevron-up icon-close"></i></a>*

*<div id="faq-list-4" class="collapse" data-bs-parent=".faq-list">*

*<p>*

IBM Cognos can help us to make visualization faster than we do in python IDE , also it has a AI feature to predict and produce insights from the visualizations made

*</p>*

*</div>*

*</li>*

*</ul>*

*</div>*

*</div>*

*</section><!-- End Frequently Asked Questions Section -->*

*<!-- ===== Contact Section ===== -->*

*<section id="contact" class="contact">*

*<div class="container" data-aos="fade-up">*

*<div class="section-title">*

*<h2>Contact</h2>*



</div>

<div class="row">

<div class="col-lg-5 d-flex align-items-stretch">

<div class="info">

<div class="address">

<i class="bi bi-geo-alt"></i>

<h4>Location:</h4>

<p>Computer Science and Engineering , Adhiyamaan College of Engineering, Hosur</p>

</div>

<div class="email">

<i class="bi bi-envelope"></i>

<h4>Email:</h4>

<p>jayakeerthana816@gmail.com</p>

</div>

</div>

<div class="col-lg-7 mt-5 mt-lg-0 d-flex align-items-stretch">

<form action="forms/contact.php" method="post" role="form" class="php-email-form">

<div class="row">

```
<div class="form-group col-md-6">

  <label for="name">Your Name</label>

  <input type="text" name="name" class="form-control" id="name"
required>

</div>

<div class="form-group col-md-6">

  <label for="name">Your Email</label>

  <input type="email" class="form-control" name="email" id="email"
required>

</div>

</div>

<div class="form-group">

  <label for="name">Subject</label>

  <input type="text" class="form-control" name="subject" id="subject"
required>

</div>

<div class="form-group">

  <label for="name">Message</label>

  <textarea class="form-control" name="message" rows="10"
required></textarea>

</div>

<div class="my-3">

  <div class="loading">Loading</div>

  <div class="error-message"></div>

  <div class="sent-message">Your message has been sent. Thank
you!</div>
```

</div>

<div class="text-center"><button type="submit">Send  
Message</button></div>

</form>

</div>

</div>

</div>

</section><!-- End Contact Section -->

</main><!-- End #main -->

<!-- ===== Footer ===== -->

<footer id="footer">

<div class="footer-newsletter">

<div class="container">

<div class="row justify-content-center">

<div class="col-lg-6">

<h4>Join Us</h4>

<p>Health is Wealth , Technology can change the World</p>

<form action="" method="post">

<input type="email" name="email"><input type="submit" value="Join  
Us ...">

</form>

</div>

</div>

</div>

</div>

<div class="footer-top">

<div class="container">

<div class="row">

<div class="col-lg-3 col-md-6 footer-contact">

<h3>JAYAKEERTHANA R</h3>

<p>Computer Science and Engineering , Adhiyamaan College of  
Engineering, Hosur<br><br>

<strong>Email:</strong>jayakeerthana816@gmail.com<br>

</p>

</div>

<div class="col-lg-3 col-md-6 footer-links">

<h4>Go to</h4>

<ul>

<li><i class="bx bx-chevron-right"></i> <a href="#">Home</a></li>

<li><i class="bx bx-chevron-right"></i> <a href="#">Project  
Idea</a></li>

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Cognos Dashboard</a></li>\*](#)

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Report</a></li>\*](#)

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Story</a></li>\*](#)

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">team</a></li>\*](#)

*</ul>*

*</div>*

*<div class="col-lg-3 col-md-6 footer-links">*

*<h4>Project Idea</h4>*

*<ul>*

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Data Collection</a></li>\*](#)

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Data Exploration</a></li>\*](#)

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Visualization</a></li>\*](#)

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Prediction</a></li>\*](#)

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Dashboard Creation</a></li>\*](#)

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Report Creation</a></li>\*](#)

[\*<li><i class="bx bx-chevron-right"></i> <a href="#">Story Creation</a></li>\*](#)

*</ul>*

*</div>*

```
<div class="col-lg-3 col-md-6 footer-links">
```

```
<h4>Our Social Networks</h4>
```

```
<div class="social-links mt-3">
```

```
<a href="#" class="twitter"><i class="bx bxl-twitter"></i></a>
```

```
<a href="#" class="facebook"><i class="bx bxl-facebook"></i></a>
```

```
<a href="#" class="instagram"><i class="bx bxl-instagram"></i></a>
```

```
<a href="#" class="google-plus"><i class="bx bxl-skype"></i></a>
```

```
<a href="#" class="linkedin"><i class="bx bxl-linkedin"></i></a>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
</div>
```

```
<div class="container footer-bottom clearfix">
```

```
<div class="copyright">
```

```
&copy; Belongs to <strong><span>Dharshan</span></strong>. Please  
Don't Copy
```

```
</div>
```

```
</div>
```

```
</div>
```

```
</footer><!-- End Footer -->
```

```

<div id="preloader"></div>

<a href="#" class="back-to-top d-flex align-items-center justify-content-center"><i class="bi bi-arrow-up-short"></i></a>

<!-- Vendor JS Files -->
<script src="assets/vendor/aos/aos.js"></script>
<script src="assets/vendor/bootstrap/js/bootstrap.bundle.min.js"></script>
<script src="assets/vendor/glightbox/js/glightbox.min.js"></script>
<script src="assets/vendor/isotope-layout/isotope.pkgd.min.js"></script>
<script src="assets/vendor/swiper/swiper-bundle.min.js"></script>
<script src="assets/vendor/waypoints/noframework.waypoints.js"></script>
<script src="assets/vendor/php-email-form/validate.js"></script>

<!-- Template Main JS File -->
<script src="assets/js/main.js"></script>

</body>

</html>

```

## LOS.pynb

```

import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
np.set_printoptions(suppress=True)
import warnings
warnings.filterwarnings('ignore')
from google.colab import drive
drive.mount('/content/drive')

```

```

#load data
d1 = pd.read_csv('/content/drive/My Drive/Healthcare_Data/sample_sub.csv')
d2 = pd.read_csv('/content/drive/My
Drive/Healthcare_Data/train_data_dictionary.csv')
test = pd.read_csv('/content/drive/My Drive/Healthcare_Data/test_data.csv')
train = pd.read_csv('/content/drive/My Drive/Healthcare_Data/train_data.csv')
train.head()
train.info()
train.Stay.unique()
# NA values in train dataset :
train.isnull().sum().sort_values(ascending = False)
# NA values in test dataset :
test.isnull().sum().sort_values(ascending = False)
# Dimension of train dataset
train.shape
# Dimension of test dataset
test.shape
# Number of distinct observations in test dataset
for i in test.columns:
    print(i, ':', test[i].nunique())
#Replacing NA values in Bed Grade Column for both Train and Test datasets
train['Bed Grade'].fillna(train['Bed Grade'].mode()[0], inplace = True)
test['Bed Grade'].fillna(test['Bed Grade'].mode()[0], inplace = True)

#Replacing NA values in City Code Patient Column for both Train and Test datasets
train['City_Code_Patient'].fillna(train['City_Code_Patient'].mode()[0], inplace =
True)
test['City_Code_Patient'].fillna(test['City_Code_Patient'].mode()[0], inplace =
True)

# Label Encoding Stay column in train dataset
from sklearn.preprocessing import LabelEncoder
le = LabelEncoder()
train['Stay'] = le.fit_transform(train['Stay'].astype('str'))

train.head()

#Imputing dummy Stay column in test dataset to concatenate with train dataset
test['Stay'] = -1
df = pd.concat([train, test])
df.shape
#Label Encoding all the columns in Train and test datasets
for i in ['Hospital_type_code', 'Hospital_region_code', 'Department',

```



```
    'Ward_Type', 'Ward_Facility_Code', 'Type of Admission', 'Severity of  
Illness', 'Age']:
```

```
    le = LabelEncoder()
```

```
    df[i] = le.fit_transform(df[i].astype(str))
```

```
#Spearating Train and Test Datasets
```

```
train = df[df['Stay']!= -1]
```

```
test = df[df['Stay']== -1]
```

```
def get_countid_enocde(train, test, cols, name):
```

```
    temp = train.groupby(cols)['case_id'].count().reset_index().rename(columns =  
{ 'case_id': name })
```

```
    temp2 = test.groupby(cols)['case_id'].count().reset_index().rename(columns =  
{ 'case_id': name })
```

```
    train = pd.merge(train, temp, how='left', on= cols)
```

```
    test = pd.merge(test,temp2, how='left', on= cols)
```

```
    train[name] = train[name].astype('float')
```

```
    test[name] = test[name].astype('float')
```

```
    train[name].fillna(np.median(temp[name]), inplace = True)
```

```
    test[name].fillna(np.median(temp2[name]), inplace = True)
```

```
    return train, test
```

```
train, test = get_countid_enocde(train, test, ['patientid'], name =  
'count_id_patient')
```

```
train, test = get_countid_enocde(train, test,  
                                ['patientid', 'Hospital_region_code'], name =  
'count_id_patient_hospitalCode')
```

```
train, test = get_countid_enocde(train, test,  
                                ['patientid', 'Ward_Facility_Code'], name =  
'count_id_patient_wardfacilityCode')
```

```
# Droping duplicate columns
```

```
test1 = test.drop(['Stay', 'patientid', 'Hospital_region_code',  
'Ward_Facility_Code'], axis =1)
```

```
train1 = train.drop(['case_id', 'patientid', 'Hospital_region_code',  
'Ward_Facility_Code'], axis =1)
```

I

```
# Splitting train data for Naive Bayes and XGBoost
```

```
X1 = train1.drop('Stay', axis =1)
```

```
y1 = train1['Stay']
```

```
from sklearn.model_selection import train_test_split
```

```
X_train, X_test, y_train, y_test = train_test_split(X1, y1, test_size =0.20,  
random_state =100)
```

## MODEL

```
from sklearn.naive_bayes import GaussianNB  
target = y_train.values  
features = X_train.values  
classifier_nb = GaussianNB()  
model_nb = classifier_nb.fit(features, target)
```

I

```
prediction_nb = model_nb.predict(X_test)  
from sklearn.metrics import accuracy_score  
acc_score_nb = accuracy_score(prediction_nb,y_test)  
print("Acurracy:", acc_score_nb*100)  
# Segregation of features and target variable  
X = train.drop('Stay', axis =1)  
y = train['Stay']  
print(X.columns)  
z = test.drop('Stay', axis = 1)  
print(z.columns)
```

*# Data Scaling*

```
from sklearn import preprocessing  
X_scale = preprocessing.scale(X)  
X_scale.shape  
X_train, X_test, y_train, y_test = train_test_split(X_scale, y, test_size =0.20,  
random_state =100)
```

```
import keras  
from keras.models import Sequential  
from keras.layers import Dense  
import tensorflow as tf
```

```
from keras.utils import to_categorical
```

*#Sparse Matrix*

```
a = to_categorical(y_train)  
b = to_categorical(y_test)
```

```
model = Sequential()
```

```

model.add(Dense(64, activation='relu', input_shape = (254750, 20)))
model.add(Dense(128, activation='relu'))
model.add(Dense(256, activation='relu'))
model.add(Dense(512, activation='relu'))
model.add(Dense(512, activation='relu'))
model.add(Dense(11, activation='softmax'))

```

```

model.summary()
model.compile(optimizer= 'SGD',
              loss='categorical_crossentropy',
              metrics=['accuracy'])

```

## **PREDICTION**

```

pred_nb = classifier_nb.predict(test1.iloc[:,1:])
result_nb = pd.DataFrame(pred_nb, columns=['Stay'])
result_nb['case_id'] = test1['case_id']
result_nb = result_nb[['case_id', 'Stay']]

result_nb['Stay'] = result_nb['Stay'].replace({0:'0-10', 1: '11-20', 2: '21-30',
3:'31-40', 4: '41-50', 5: '51-60', 6: '61-70', 7: '71-80', 8: '81-90', 9: '91-100', 10:
'More than 100 Days'})
result_nb.head()

test_scale = preprocessing.scale(z)
test_scale.shape
print(result_nb.groupby('Stay')['case_id'].nunique())

```

## **CHAPTER 8**

## TESTING

### 8.1 TEST CASE

SECTION	TOTAL CASES	NOT TESTED	FAIL	PASS
Print Engine	7	0	0	7
Client Application	51	0	0	51
Security	2	0	0	2
Outsource Shipping	3	0	0	3
Excepting reporting	9	0	0	
Final report out put	4	0	0	4
Version control	2	0	0	2

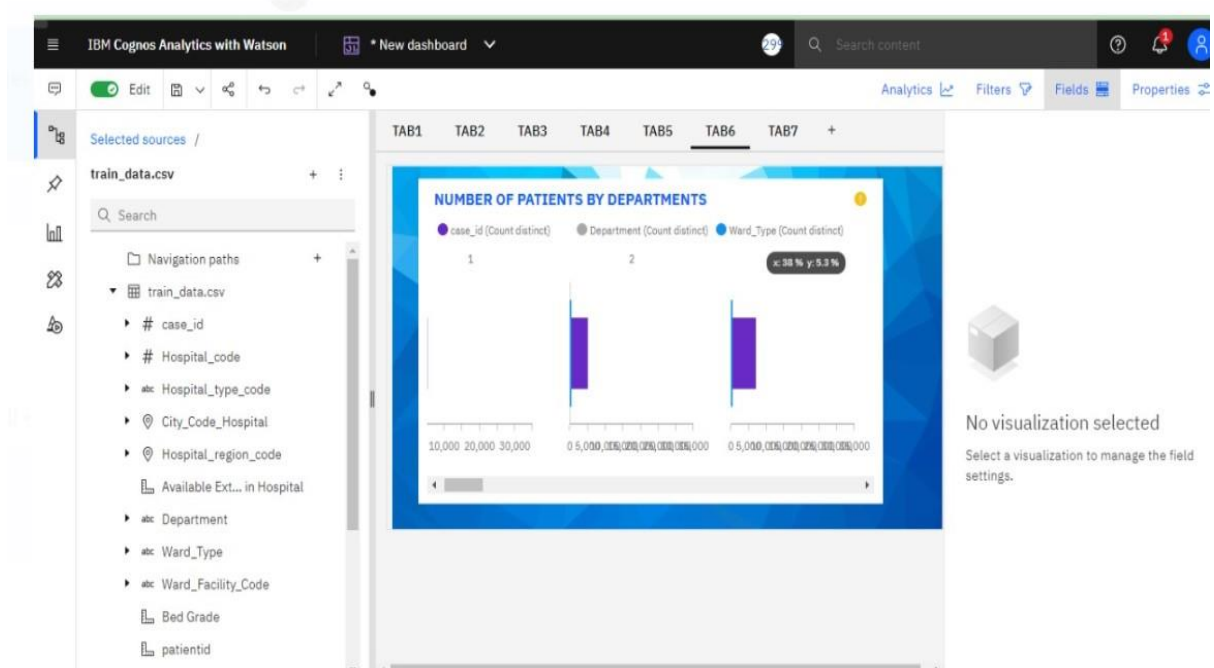
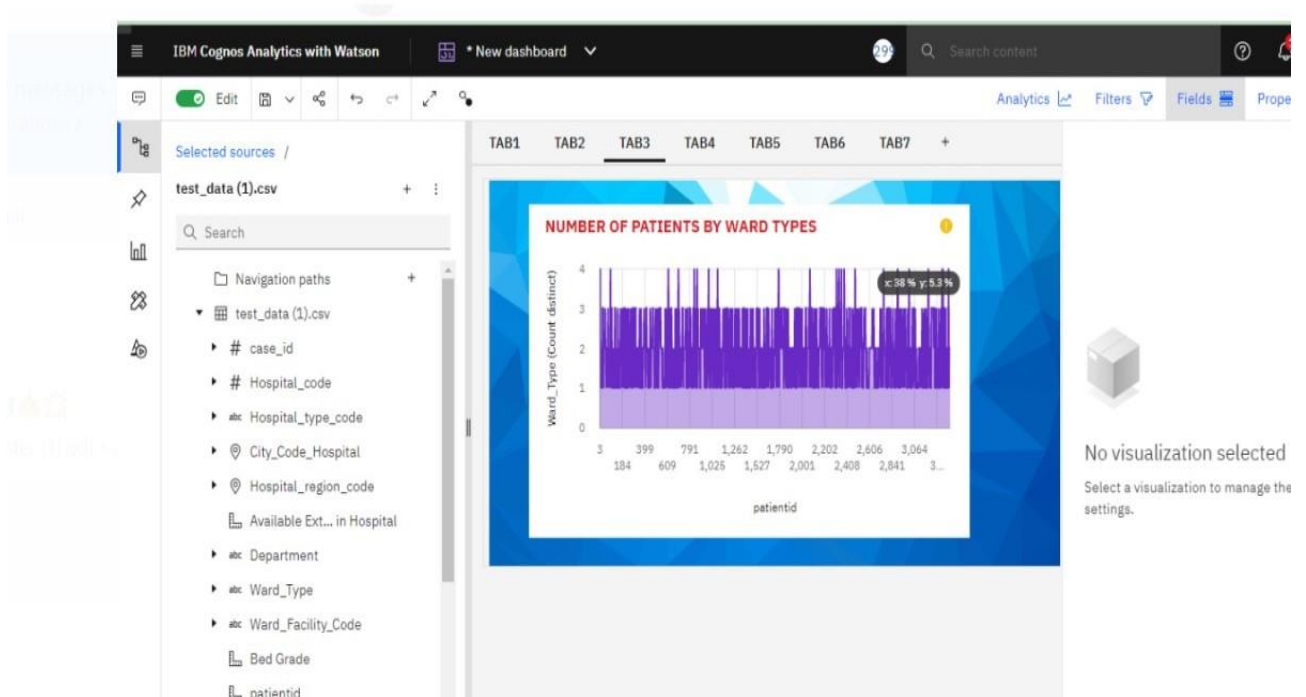
### 8.2 USER ACCEPTANCE TESTING

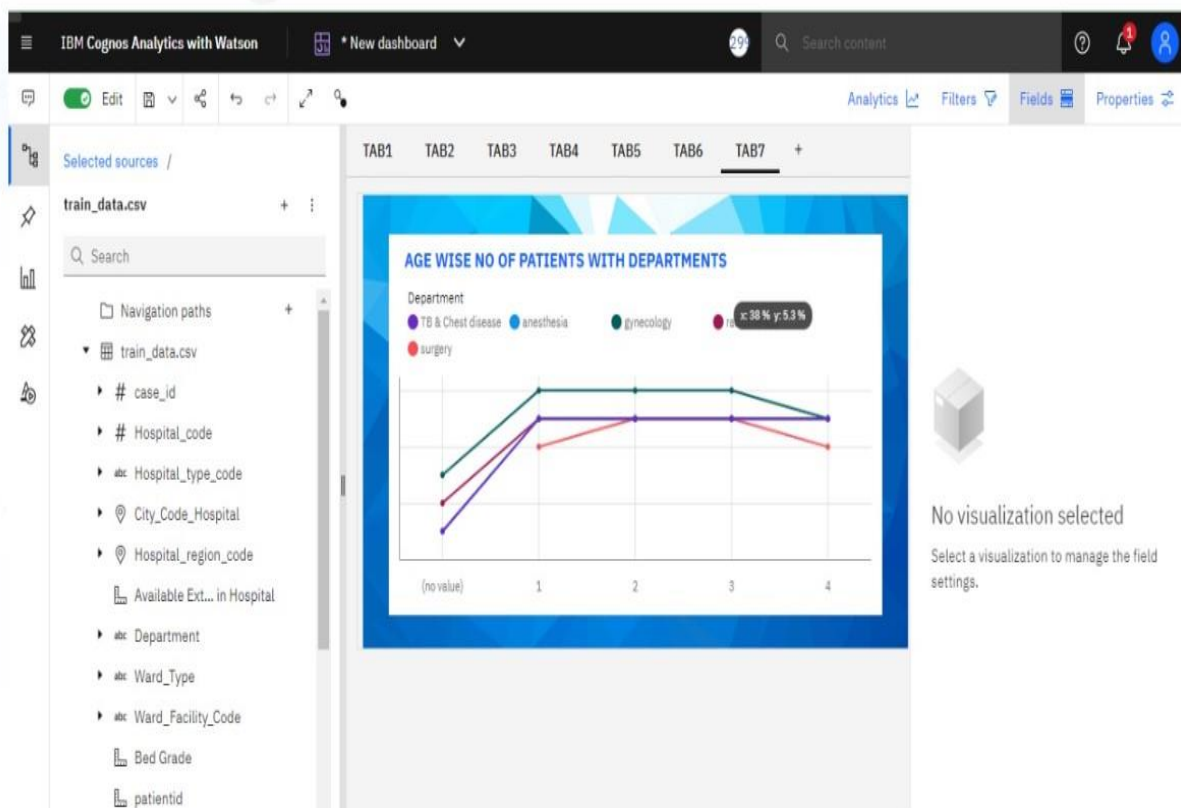
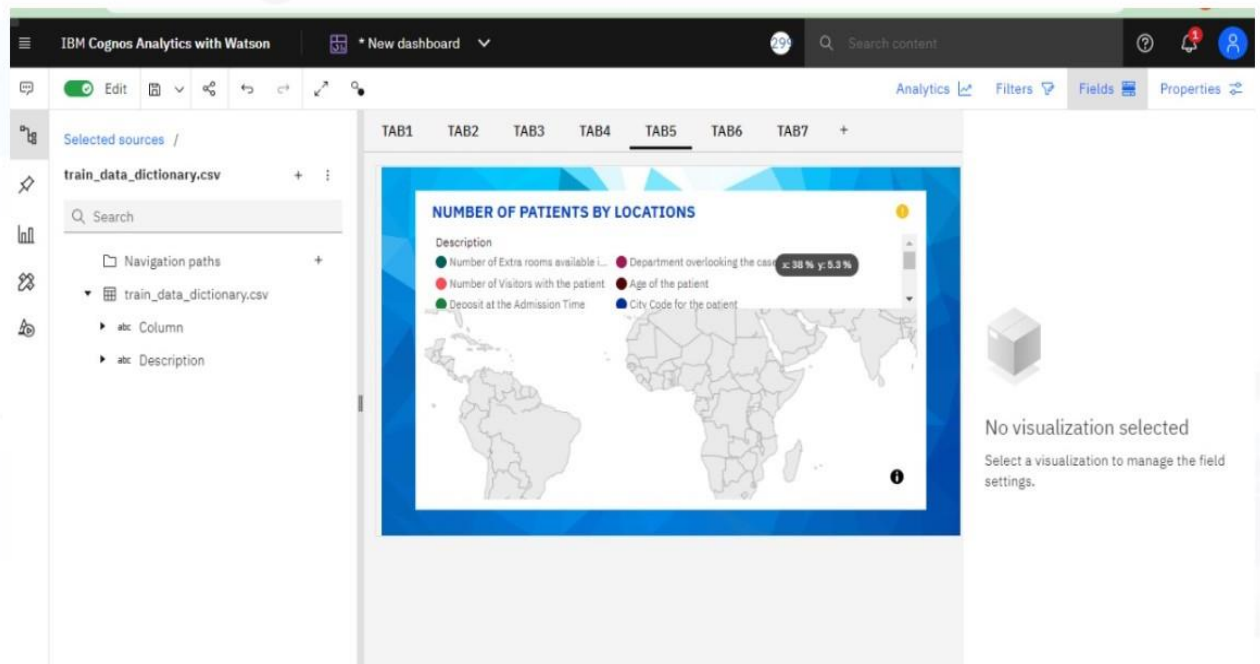
Resolution	Severity 1	Severity 2	Severity 3	Severity 4	subtotal
By Design	5	5	4	0	14
Duplicate	0	0	0	0	0
External	7	8	6	0	21
Fixed	11	4	0	6	21
Not reproduced	1	3	0	0	4
Skipped	0	0	0	0	0
Won't fix	0	0	0	0	0
Total	24	20	10	6	60

## CHAPTER 9

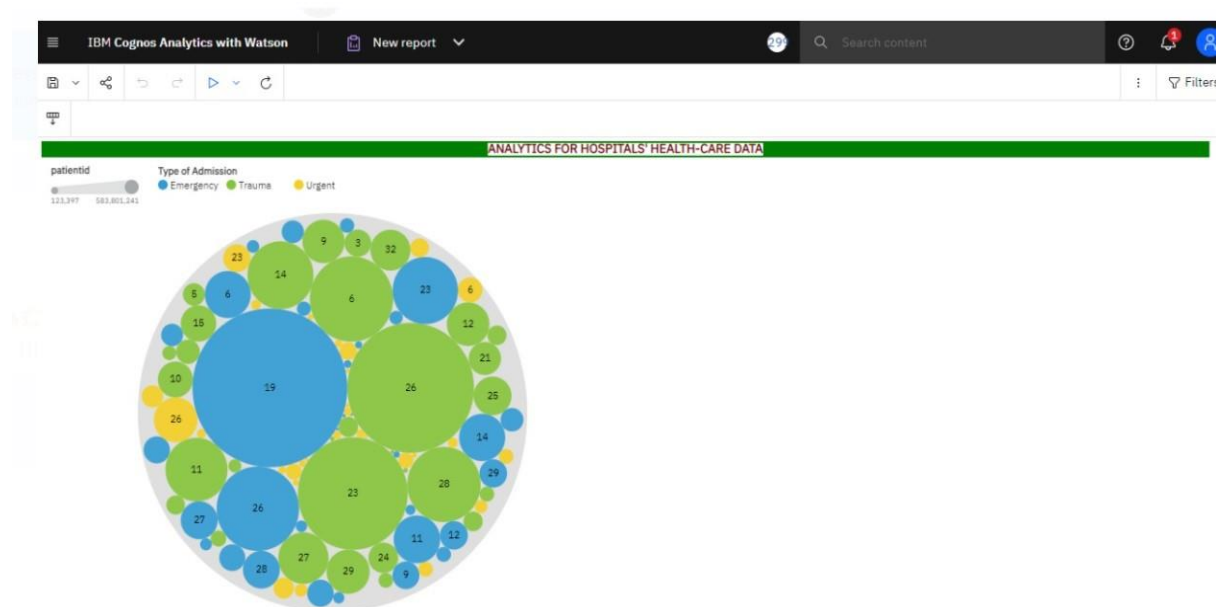
# RESULTS

## DASHBOARD





## REPORT



## WEBPAGE

IBM PROJECT

Home Project Idea Cognos Dashboard Report Story Team Contact

### Analytics for Hospital's Health Care Data

Being a developing country, India has gone through many issues especially during the pandemic period. The most unforgettable era for India is the second wave of the covid-19 pandemic. Data analytics in health care sector can help us to face any situations in the future

[Get Started](#)

COLLECTING HEALTHCARE DATA

TRANSFORMING DATA INTO ACTIONABLE INSIGHTS

The webpage features a dark blue header with the title "IBM PROJECT" and a navigation menu. The main content area has a white background with a large heading "Analytics for Hospital's Health Care Data" and a paragraph describing the project's context in India during the COVID-19 pandemic. A "Get Started" button is prominently displayed. To the right, there is an illustration showing the process of collecting healthcare data and transforming it into actionable insights, with a person working on a laptop.

## **FINAL OUTPUT**

### **Stay**

<b>0-10</b>	<b>2598</b>
<b>11-20</b>	<b>26827</b>
<b>21-30</b>	<b>72206</b>
<b>31-40</b>	<b>15639</b>
<b>41-50</b>	<b>469</b>
<b>51-60</b>	<b>13651</b>
<b>61-70</b>	<b>92</b>
<b>71-80</b>	<b>955</b>
<b>81-90</b>	<b>296</b>
<b>91-100</b>	<b>2</b>

**More than 100 Days    4322**

**Name: case\_id, dtype: int64**

## **CHAPTER 10**

### **ADVANTAGES & DISADVANTAGES**

#### **ADVANTAGES:**

- Helps an organization to make a better decision
- Increase the efficiency of the work
- The analytics keeps you updated of your customer behavioral changes.
- Personalization of hospital details.
- Improving quality of service and health care.



## **DISADVANTAGES:**

- Lack of alignment within teams
- Lack of commitment and patience
- Low quality of data
- Privacy Concerns
- Complexity and Bias

## **CHAPTER 11**

### **CONCLUSION**

Data analytics in health care is vital. It helps health care organizations to evaluate and develop Number of patients by ward, Age wise patients with department details, Various types of visualizations to analyze the hospital's datasets and hence predict outbreaks in illness, Data analytics can also lower costs for health care organizations and boost business intelligence.

## **CHAPTER 12**

### **FUTURE SCOPE**

While every fact of the industry stands to be changed by data analytics in healthcare, data has significantly improved healthcare in three areas: conducting medical studies, understanding the cost of medical tests and health insurance, and making preventative recommendations to patients. Hospital Healthcare data analytics helps in analyzing the patient details via hospital that the availability of doctors and number of beds to the patients and hence, it reduce the manpower and time of the respective Hospital.

