

## **PROJECT REPORT**

<b>TEAM-ID</b>	<b>PNT2022TMID29035</b>
<b>PROJECT NAME</b>	<b>ANALYTIC'S FOR HOSPITAL HEALTH-CARE DATA</b>

### **TEAM MEMBERS:**

YOGAPRIYAA.S P(TL)

VISHALI.M

PRASANTHI SHREEJA.P

HARITHA.S

# **CHAPTER-1**

## **INTRODUCTION**

### **1.1Project Overview**

Like any organization's success is based on the updated information for its smooth functioning, in the same way, hospital administration's utmost desire is to have updated data about the admitted patients and their stay in the hospitals. Since emergency cases are increasing day by day worldwide due to climate change as of COVID-19 and population, it has become a severe issue for the hospital administration to deal with many inflows of patients. Most of the time, hospital management does not know when the existing patient leaves the hospital; this information could be crucial for hospital management. It could allow them to take more patients for admission. Since patients' Length of stay (LOS) has always remained unpredictable due to complicated issues like a mutation of viruses, chronic diseases, etc., hospital administrations face many problems related to managing available resources and admitting or facilitating new patients. Therefore, it is essential to design such models that could help hospital administration predict patients' LOS.

### **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.

## CHAPTER 2

### LITERATURE SURVEY

#### 2.1 Existing Problem

The average length of stay (LOS) for a hospitalization is 5½ days. Unnecessary days in hospital may lead to increased hospital-acquired patient complications (e.g., healthcare-associated infections, falls) and increased costs for patients and healthcare systems. In addition, prolonged LOS may negatively affect both patient and staff experience. Delays in hospital discharge may be related to unnecessary waiting, poor organization of care, delays in decision-making, or difficulties related to discharge planning.

#### 2.2 References

1. Zhu N, Zhang D, Wang W, Li X, Yang B, Song J, et al. A Novel Coronavirus from Patients with Pneumonia In China, 2019. N Engle J Med. 2020; 382:727–33. - [PMC](#) - [PubMed](#)
2. Malapertly S. Scientists Fear Coronavirus Spread in Vulnerable Nations. Nature. 2020; 578:348. - [PubMed](#)
3. Gorblimey AE, Baker SC, Baric RS, de Groot RJ, Dorsten C, Gulyaeva AA, et al. The Species Severe Acute Respiratory Syndrome-related Coronavirus: Classifying 2019-nCoV and Naming it SARS-CoV-2. Nat Microbial. 2020; 5:536–44. - [PMC](#) - [PubMed](#)
4. Omer SB, Malini P, del Rio MC. The COVID-19 Pandemic in the US A Clinical Update. JAMA. 2020; 30303:2019–20. - [PubMed](#)
5. [Last accessed on 2020 Jun 30]; WHO Director-General's Opening Remarks at the Media Briefing on COVID-19 11 March 2020. Available from: <https://www.who.int/dg/speeches/detail/who-director-general-s-opening-re...> .

#### 2.3 Problem Statement Definition

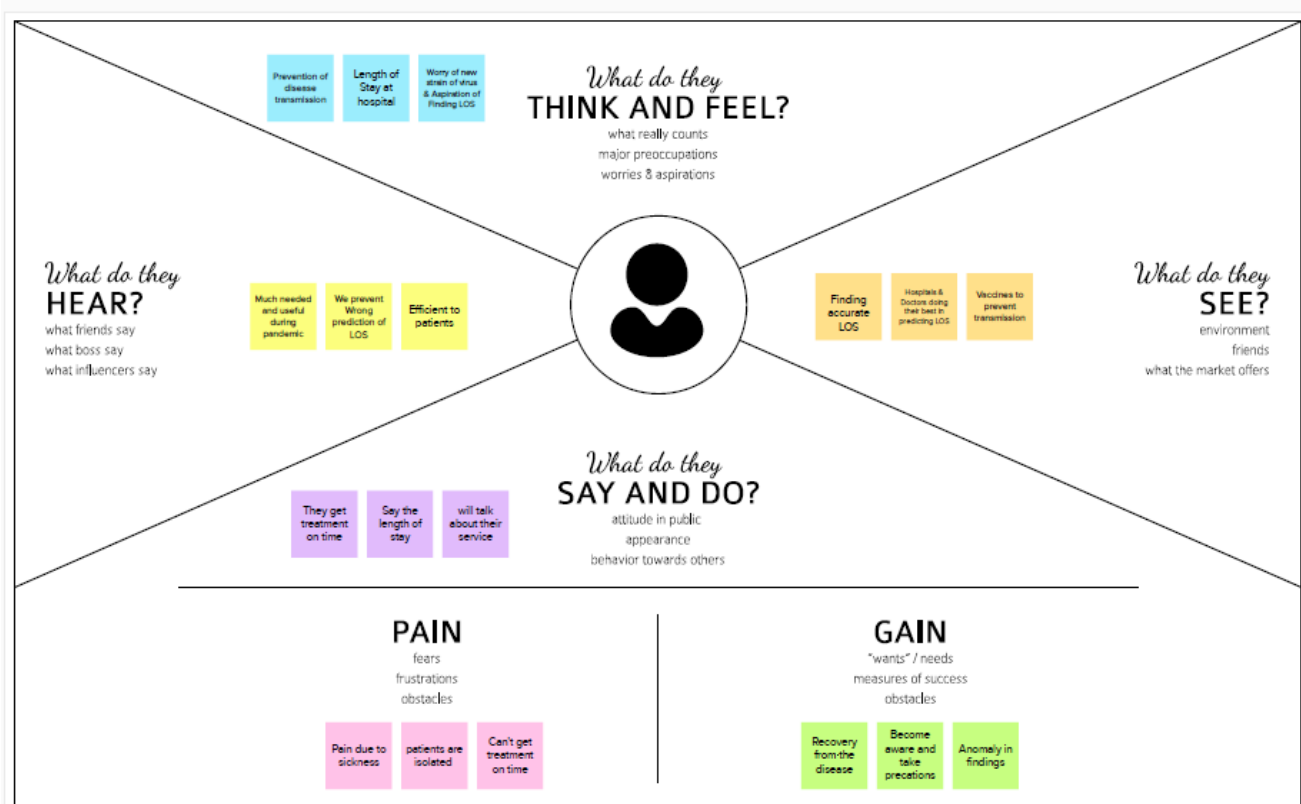
Recent Covid-19 Pandemic has raised alarms over one of the most overlooked areas to focus: Healthcare Management. While healthcare management has various use cases for using data science, patient length of stay is one critical parameter to observe and predict if one wants to improve the efficiency of 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 managing the functioning of Hospitals in a professional and optimal manner.

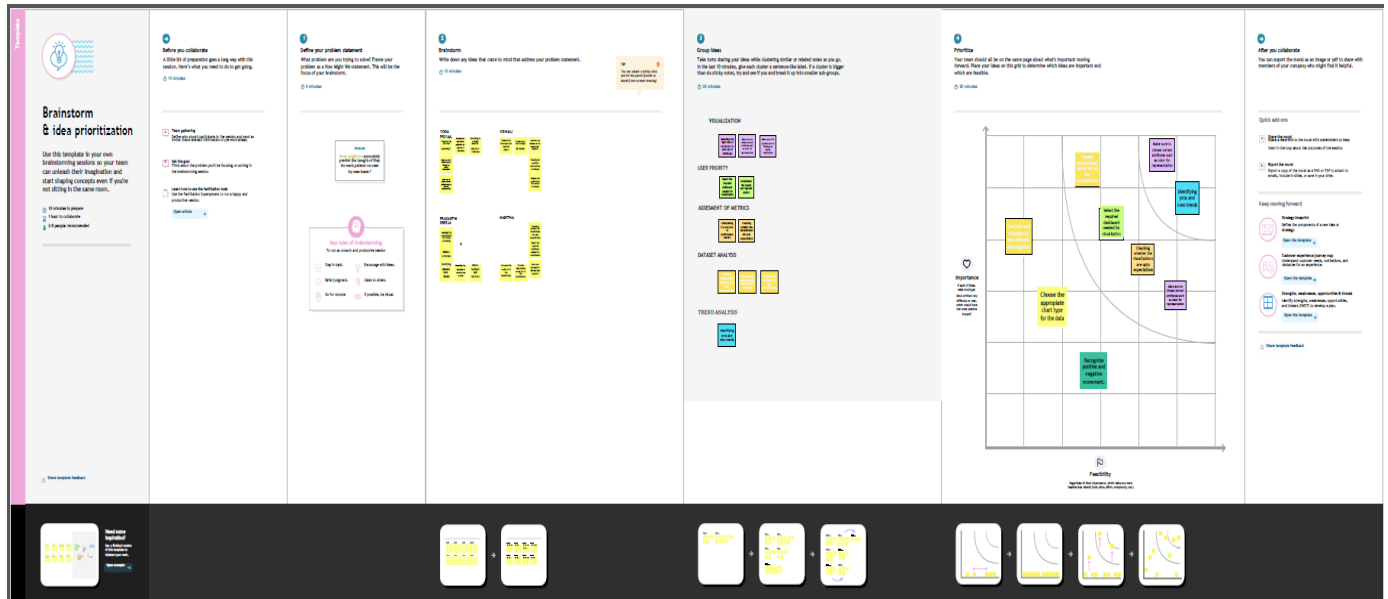
## CHAPTER-3

### IDEATION AND PROPOSED SYSTEM

#### 3.1 Empathy Map Canvas



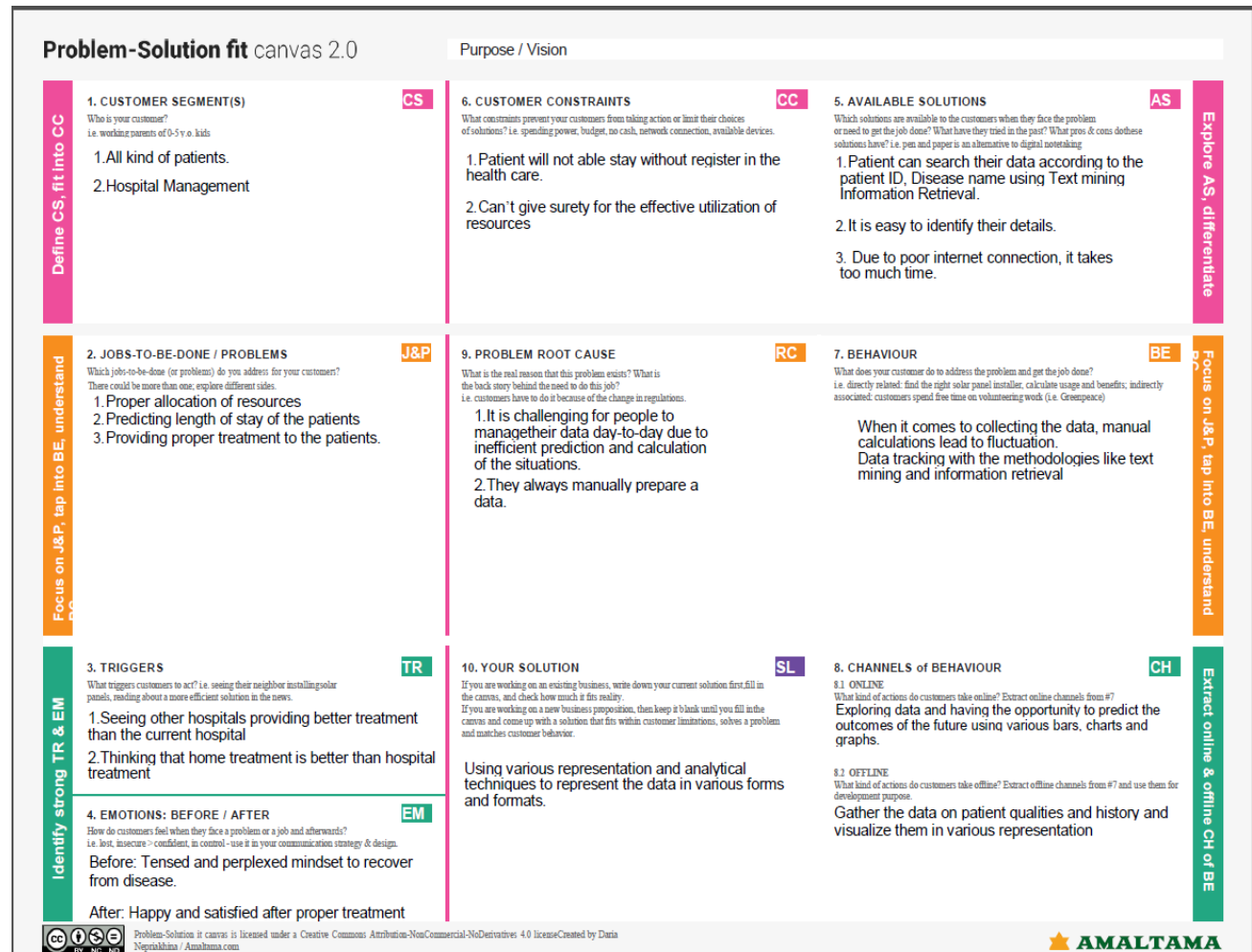
## 3.2 Ideation and Brainstorming



### 3.3 Proposed Solution

SNo:	Specification	Description
1.	Problem Statement	Identify Patients who will stay longer at the time of admission to predict patient length of stay using the patients information details.
2.	Solution Description	Tracking the length of stay of patient in the hospital Health care Data using the data provided by the hospital .Create a dashboard using Cognos- Analytics to visualize the patient who stay longer at the time admission.
3.	Novelty	It predict the result with more accuracy and proper resources can be provided.
4.	Patient Satisfaction	Patient satisfaction is the strongest determinant of hospital functioning. Patient's happiness with the treatment and the services provided in the hospital that can be visualized by the dashboard of the patients data provided by the hospitals.
5.	Business Model	Health care revenue the set of all administrative and clinical functions that contribute to the capture, management, and collection of patient service revenue .The hospital staff can easily view the Patients trouble and they give the correct treatment.
6.	Scalability of the Solution	<ul style="list-style-type: none"> <li>• Ensuring patient data privacy.</li> <li>• Personalized patient details.</li> <li>• Hospital can view the length of stay of patients.</li> </ul>

## 3.4 Problem Solution Fit



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



## CHAPTER 4

### REQUIREMENT ANALYSIS

#### 4.1 Functional Requirements

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Utilizing a Form for Registration, Signing up with Gmail
FR-2	User Confirmation	Email confirmation required
FR-3	Interoperability	A dashboard makes it possible to quickly and inter-operably transmit patient information with hospitals.
FR-4	Accuracy	Based on LOS (Length of Stay), the dashboard accurately predicts the patient's health risks.
FR-5	Compliance	The use of a dashboard for compliance by hospitals is quite dynamic and takes place in real time.
FR-6	Concise	These dashboards are easy to understand, simple to customize, and interactive.



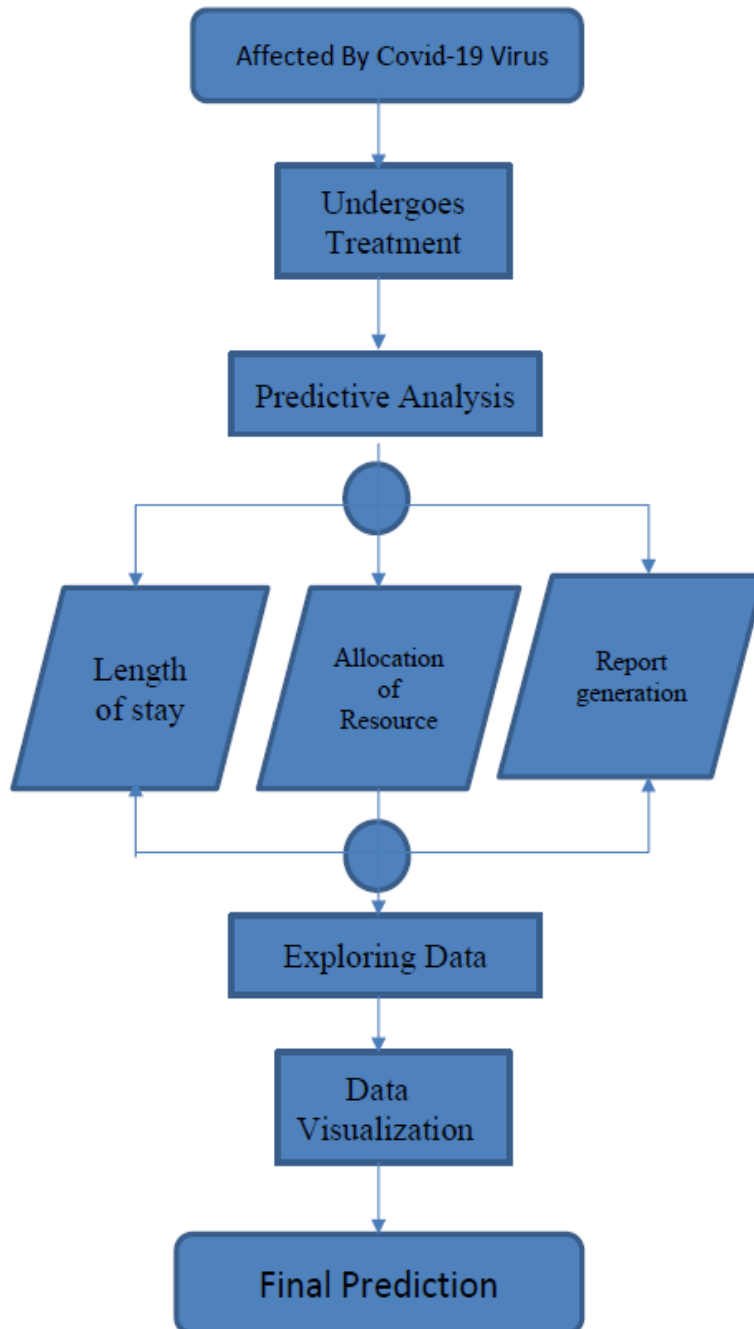
## 4.2 Non-Functional Requirement

<b>FR No.</b>	<b>Non-Functional Requirement</b>	<b>Description</b>
NFR-1	<b>Usability</b>	In order to provide a through visual representation of the patient's LOS, this dashboard makes use of data visualization techniques including charts and graphs.
NFR-2	<b>Security</b>	The Dashboard aids in indicating the level of threat that currently exists for the hospitals, as well as past occurrences and incidents, authentication mistakes, scans, probes, and unwanted access.
NFR-3	<b>Reliability</b>	Users will find this dashboard to be consistent, dependable, and helpful in using in an effective, efficient, and dependable manner.
NFR-4	<b>Performance</b>	This dashboard may scan backend users, and examining how frequently they visit the dashboard might reveal relevant information about the jobs the data is beneficial for.
NFR-5	<b>Availability</b>	The dashboard is able to promptly satisfy user needs and aids in giving the user's dataset the relevant information.
NFR-6	<b>Scalability</b>	A hosted feature layer, feature layer view, or hosted tile layer are the layers that are used in the dashboard.

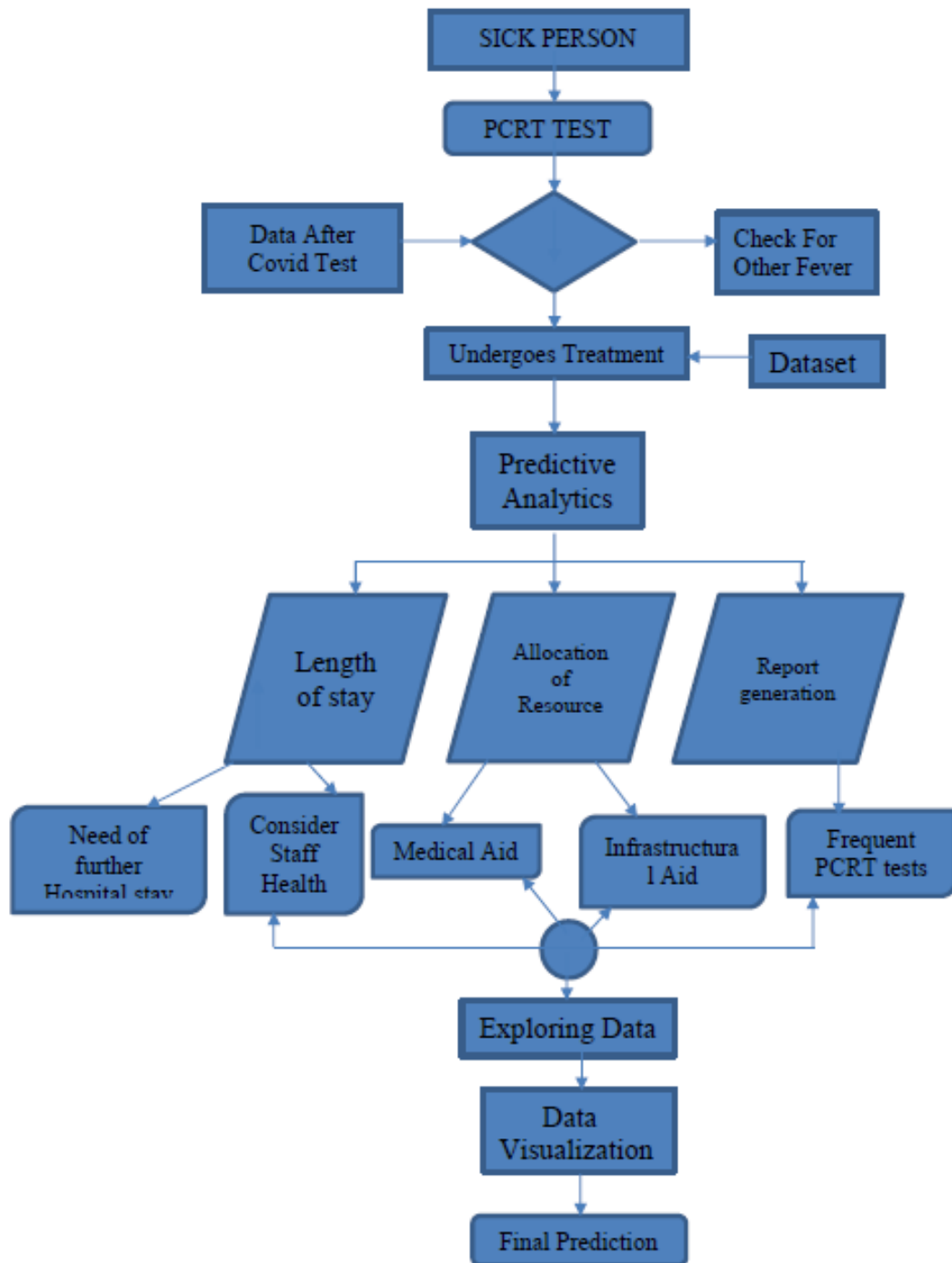
## CHAPTER 5- PROJECT DESIGN

### 5.1 Data Flow Diagrams

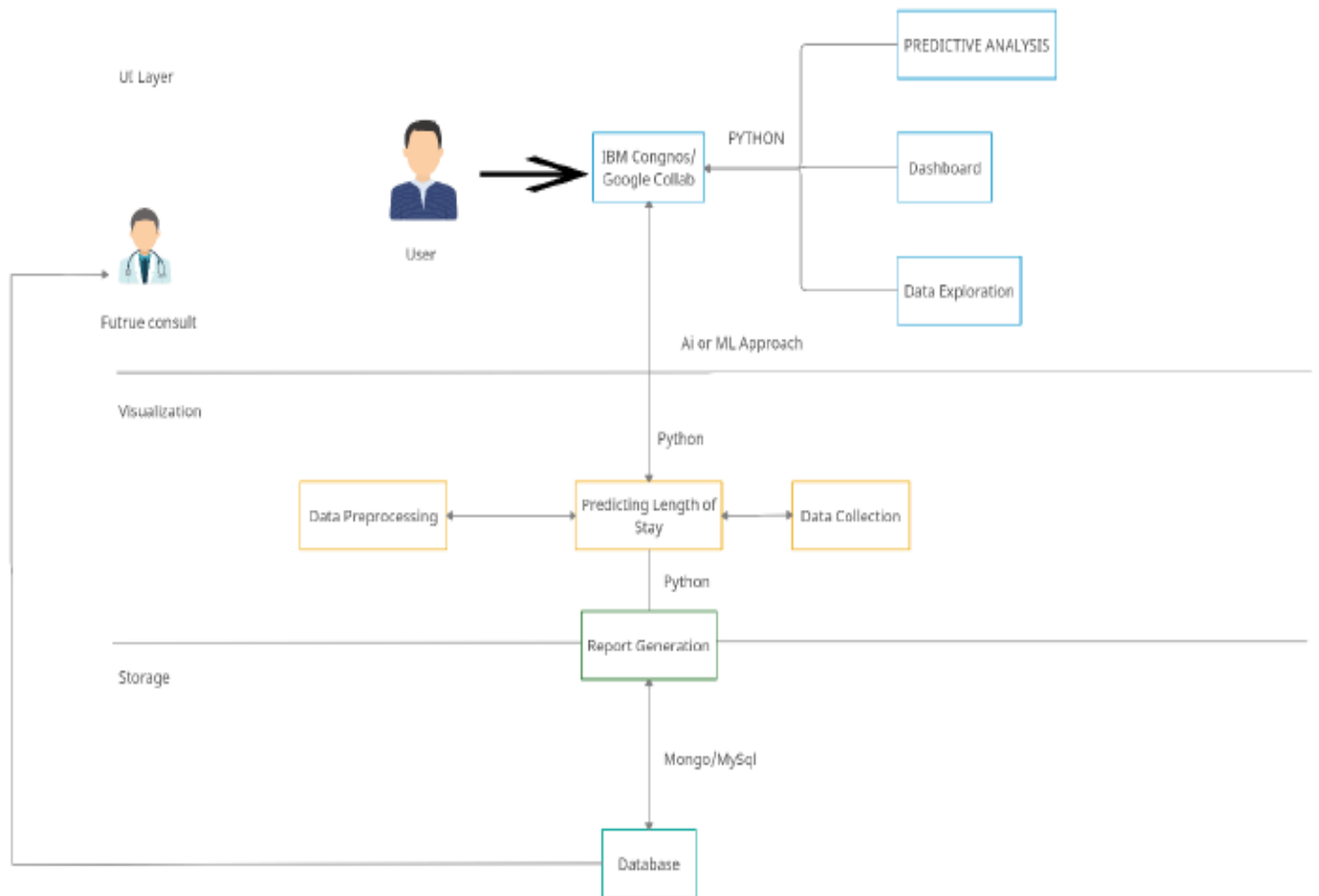
#### Level-0



## Level-1



## 5.2 Solution and Technical Architecture



### 5.3 User Stories

User Type	Functional Requirements	User Story No.	User Task	Acceptance Criteria	Priority
Covid Patient	Undergoes Treatment	USN-1	Patients are required to get treatment if they have been tested as positive	Direct Hospitalization	High
	Report Generation	USN-2	Patients should collect their treatment report and get further doctor consult	They can get their report from hospital	High
Hospital Management	Allocation of Resource	USN-3	Hospital Management should allocate the necessary resource for treating the Patients	Should be ready for all circumstance	High
	Length of Stay	USN-4	The Doctors should be aware of condition of patients to predict the LoS	Exploring the data about the patient health condition and predicting LoS	High
	Resource Availability	USN-5	The Hospital Staff should be aware of available resources in hospital	Visualizing the about the resource availability	High
	Staff Welfare	USN-6	The working staff should be safe and conscious about the COVID	They can wear the PPE kit as instructed by Health experts	High

## CHAPTER 6

### PROJECT PLANNING AND SCHEDULING

#### 6.1 Sprint Planning and Estimation

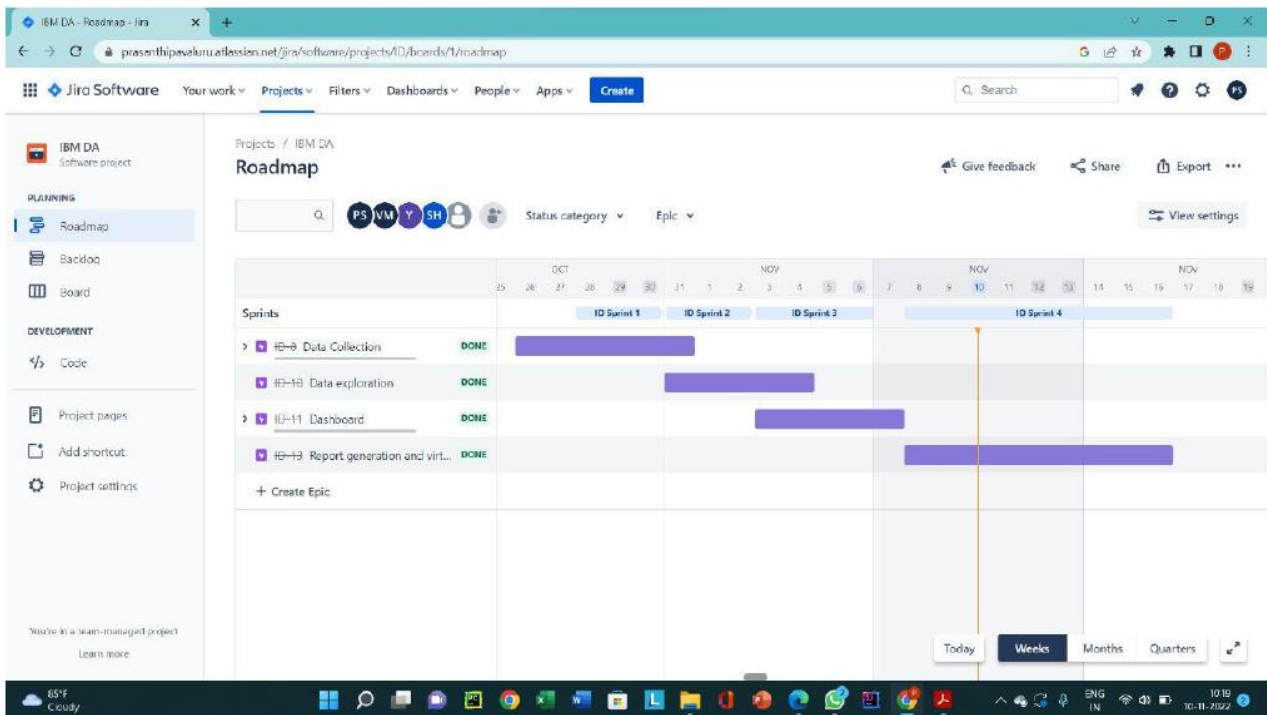
Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Data Collection	USN-1	As a Admin, I can collect data and maintain it	10	Medium	Yogapriyaa.s.p
Sprint-1	Data Preparation	USN-1	As a admin I need to prepare the data for further process	20	High	Prasanthi Sreeja.p
Sprint-2	Data exploration	USN-2	After preparing the data,the data need to be explored .	10	High	Vishali.M
Sprint-3	Dashboard	USN-3	A Dashboard is created for the project ..	10	High	Haritha.S
Sprint-3	Dashboard	USN-4	As a user, I can upload patient medical reports.	20	High	Yogapriyaa.S.p
Sprint-4	Report generation and virtualise	USN-5	As a user, I can virtualize the data which are analyzed	20	High	Vishali.M

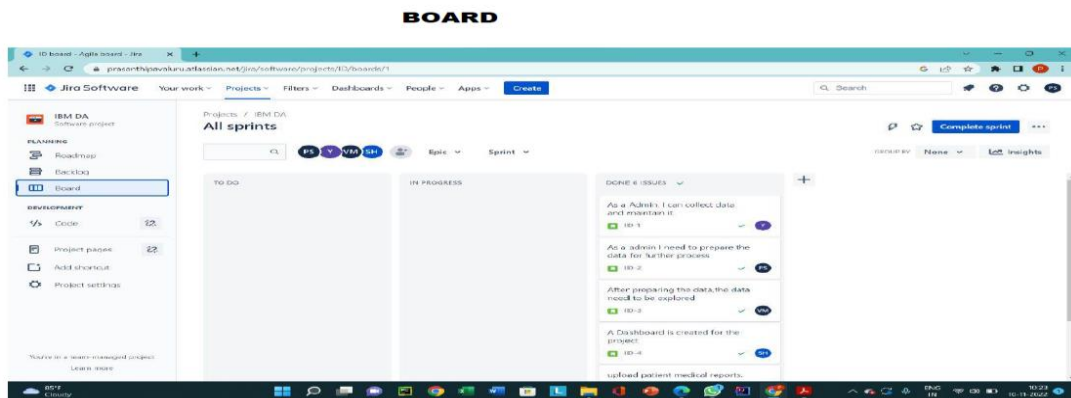
## 6.2 Sprint Delivery Schedule

Sprint	Total Story Points	Duration	Sprint Start Date	Sprint End Date (Planned)	Story Points Completed (as on Planned End Date)	Sprint Release Date (Actual)
Sprint-1	20	3 Days	28 Oct 2022	31 Oct 2022	20	31 Oct 2022
Sprint-2	20	3 Days	31 Oct 2022	03 Nov 2022	20	02 Nov 2022
Sprint-3	20	3 Days	03 Nov 2022	6 Nov 2022	20	4 Nov 2022
Sprint-4	20	6 Days	8 Nov 2022	16 Nov 2022	20	16 Nov 2022

## 6.3 Reports from JIRA

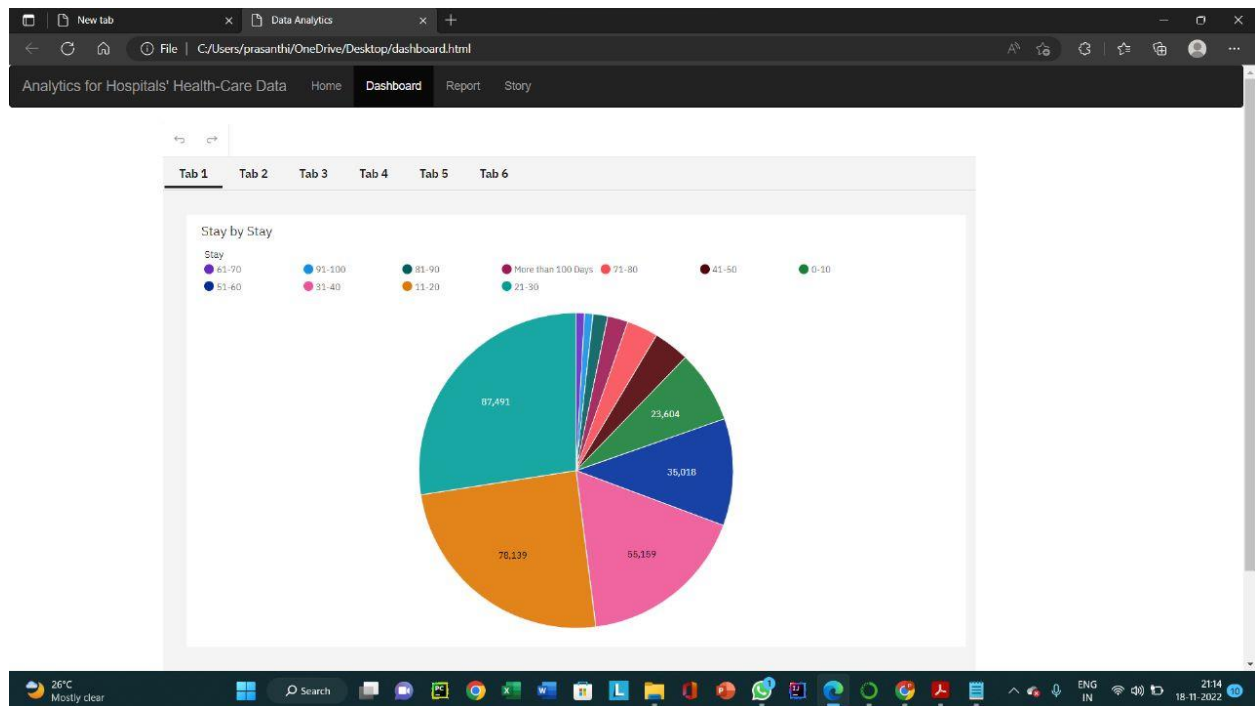
### ROAD MAP



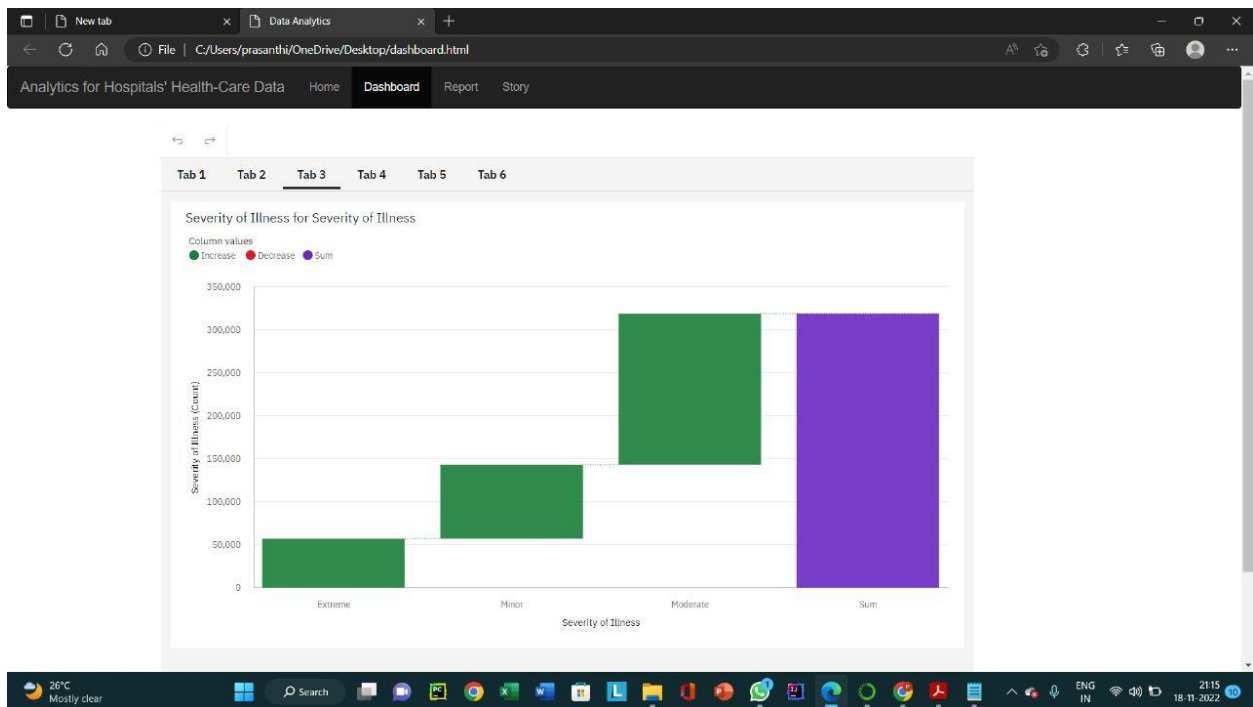
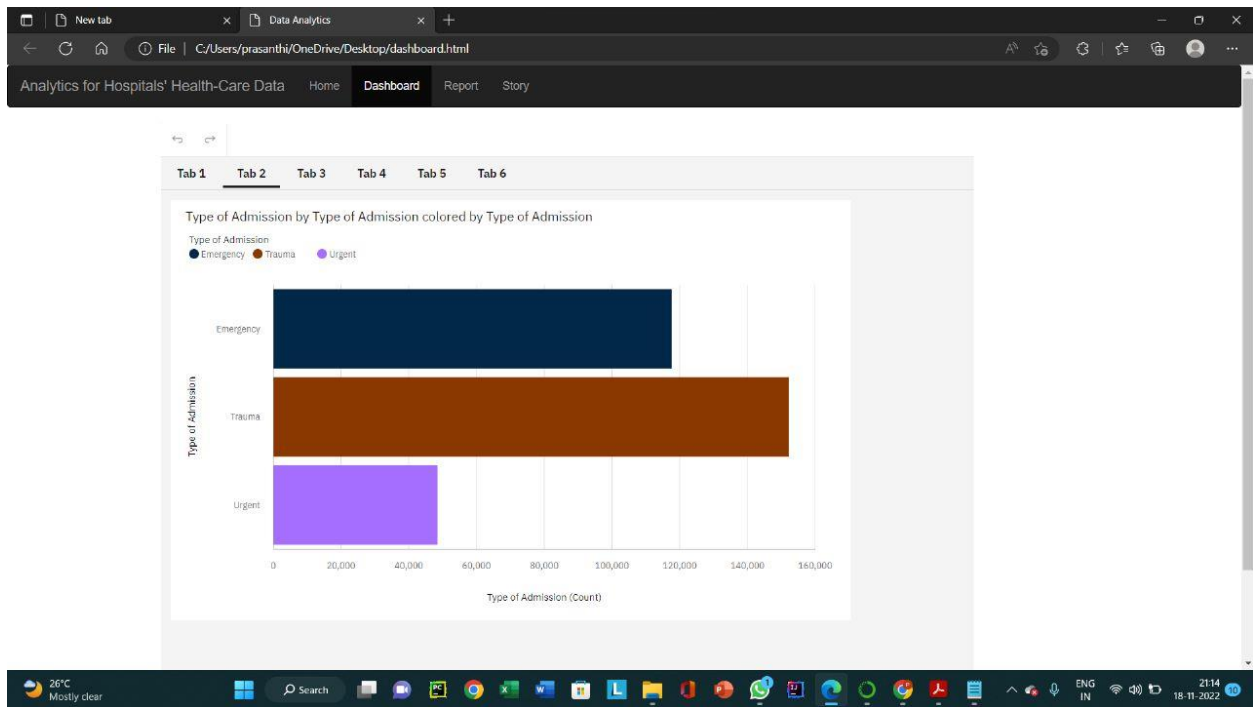


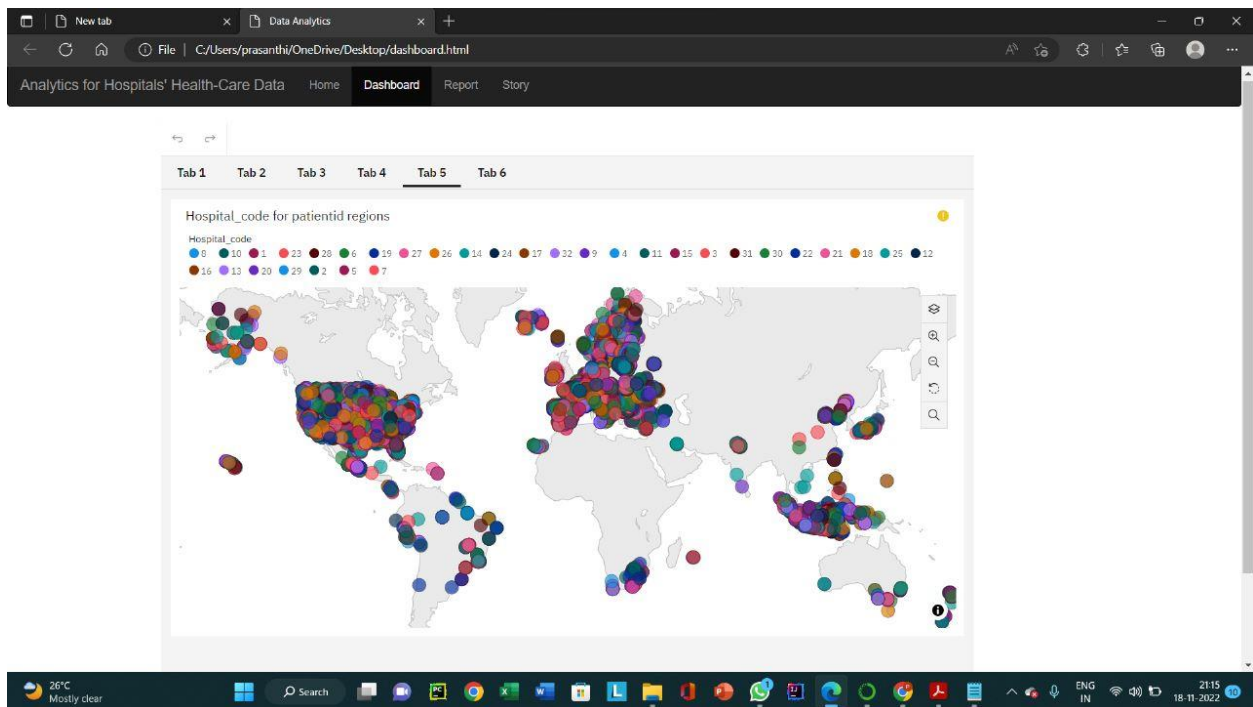
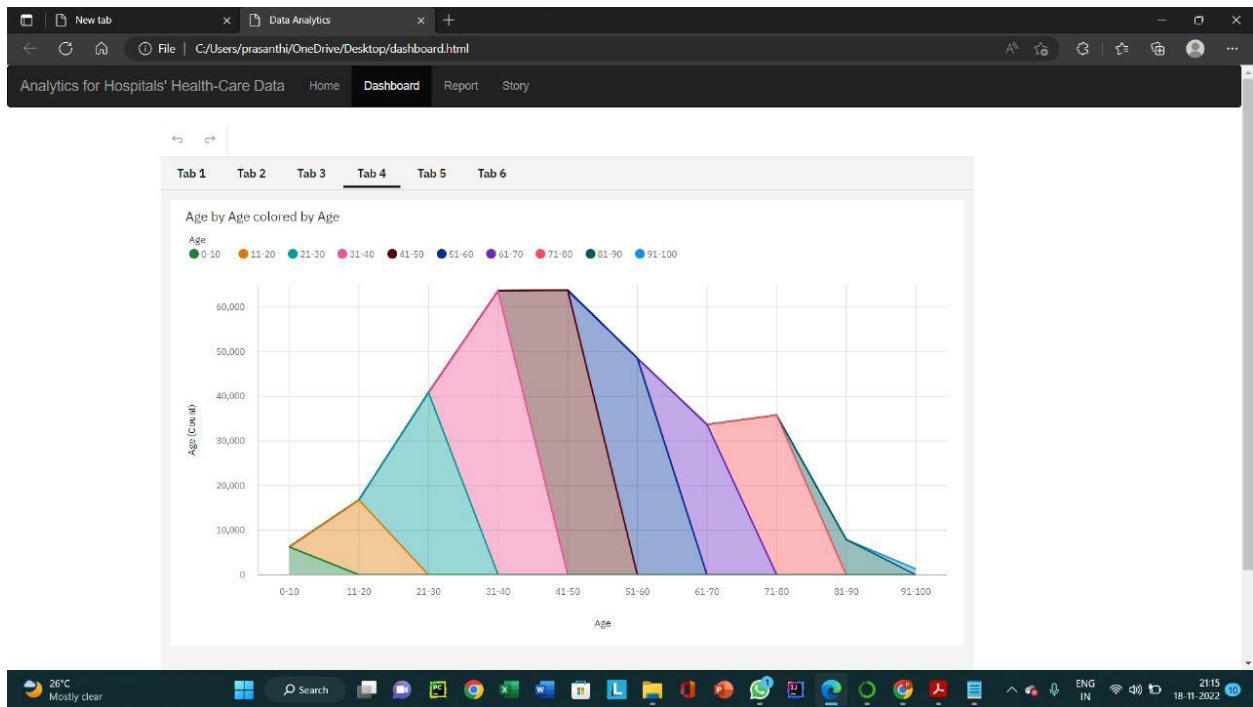
## CHAPTER 7-CODING AND SOLUTIONING

### 7.1 Feature 1

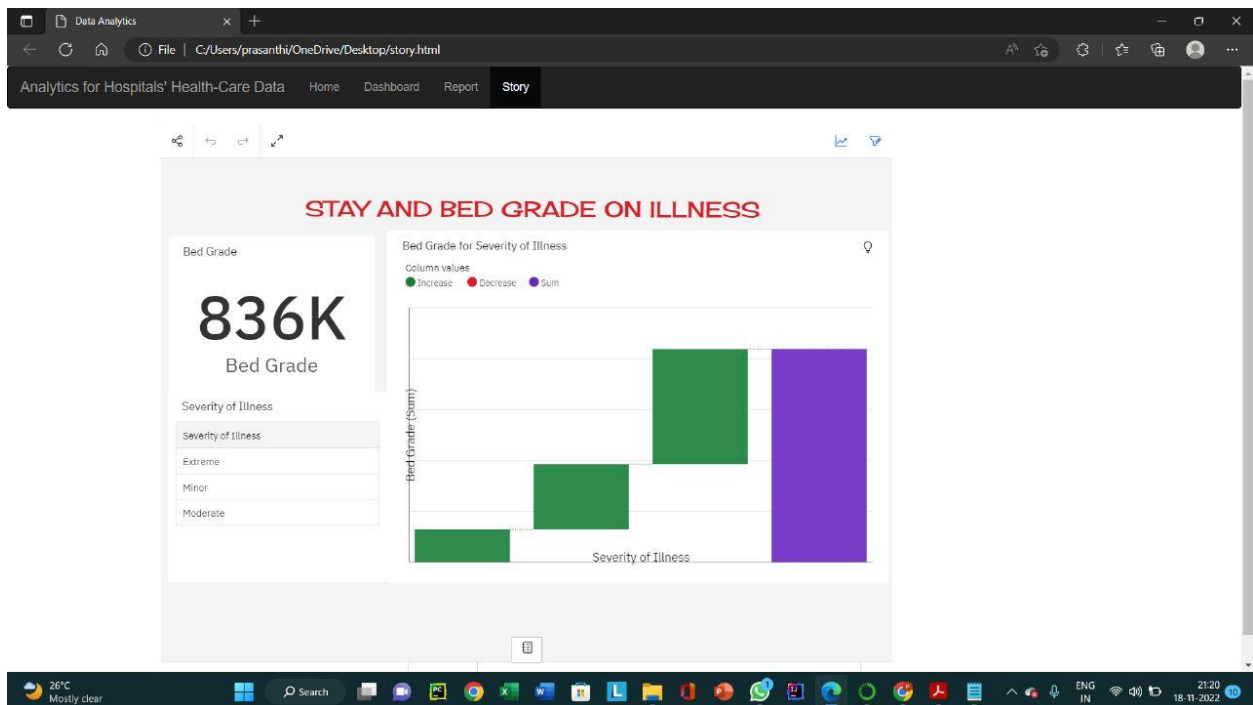
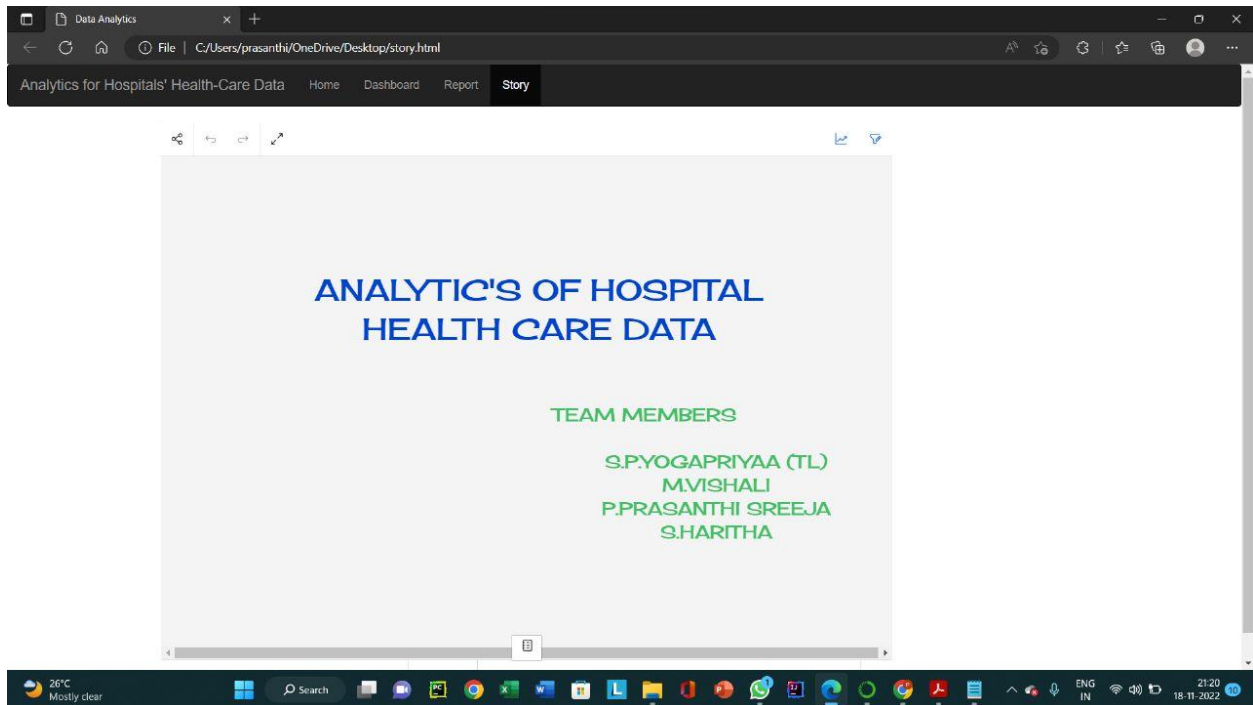


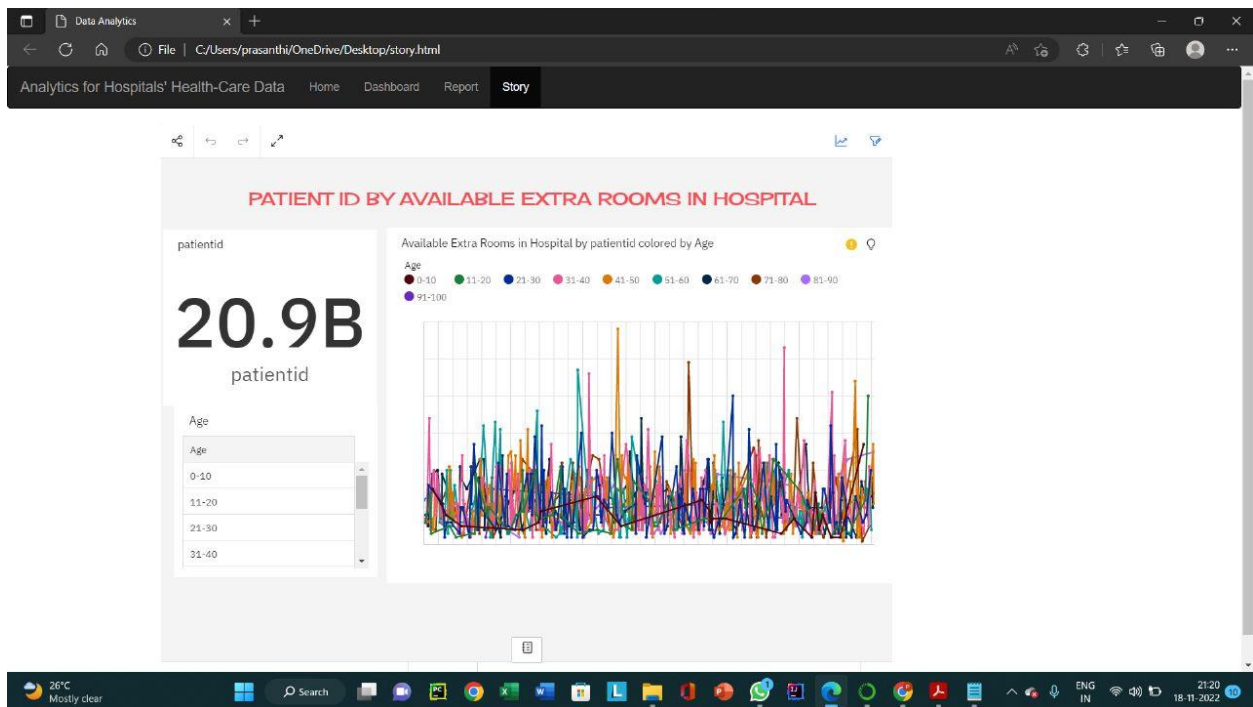
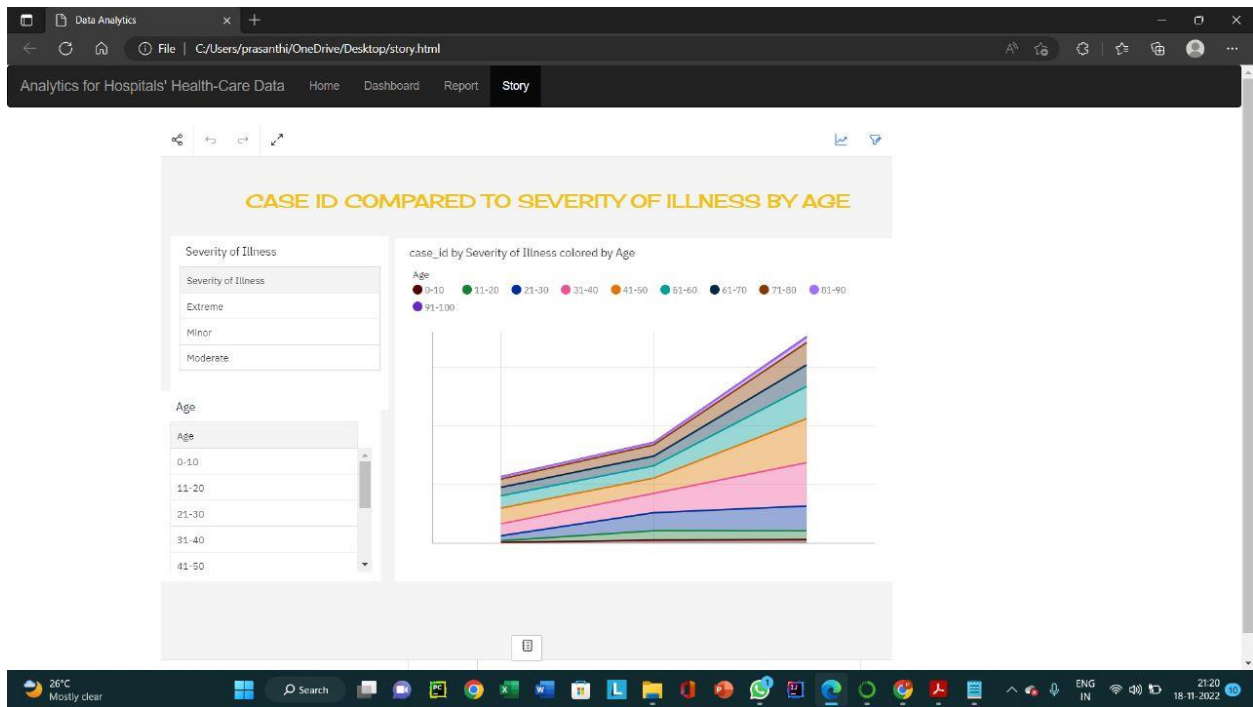






## 7.1 Feature 2





## 7.3 Database Schema

The screenshot displays the IBM Cognos Analytics web interface. The browser tabs include IBM, IBM Cloud, My IBM, Home, HCIBMDB2, and Data Analytics. The URL is <https://us1.ca.analytics.ibm.com/bi/?perspective=home>. The page title is "IBM Cognos Analytics with Watson".

**Data server connections**

Name	Modified
HCIBMDB2	11/17/2022 2:58 AM
Weather Company	3/31/2022 8:44 PM

**HCIBMDB2 Details**

Owner: Prasan ... 837d46 | Created: 11/17/2022, 2:58 AM | Modified: 11/17/2022, 2:58 AM | Type: Data Server

General | **Connections** | Permissions

Name	Modified
HCIBMDB2	11/17/2022 5:20 AM

**HCIBMDB2 Schemas**

Owner: Prasan ... 837d46 | Created: 11/17/2022, 2:58 AM | Modified: 11/17/2022, 5:20 AM | Type: Connection

General | Settings | **Schemas** | Permissions

Status	Schema name	Tables loaded
<input type="radio"/>	AUDIT	
<input type="radio"/>	DB2INST1	
<input type="radio"/>	ERRORSCHEMA	
<input checked="" type="radio"/>	JBB79478	6 / 6
<input type="radio"/>	SQL64438	
<input type="radio"/>	SQL72906	

Show system schemas ☐

The Windows taskbar at the bottom shows the date and time as 11:38 on 19-11-2022, with a temperature of 29°C and weather conditions of "Partly sunny".

# CHAPTER 8

## TESTING

### 8.1 Test Cases

				Date	09-Nov-22				
				Team ID	PNT2022TMD29035				
				Project Name	Project - Analytics for Hospitals' He				
				Maximum Marks	4 marks				
Test case ID	Feature Type	Component	Test Scenario	Pre-Requisite	Steps To Execute	Test Data	Expected Result	Actual Result	Status
LoginPage_TC_001	Functional	Home Page	Verify user is able to see the Login/Signup popup when user clicked on My account button		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup popup displayed or not	<a href="https://healthcare.com/">https://healthcare.com/</a>	Login/Signup popup should display	Working as expected	Pass
LoginPage_TC_002	UI	Home Page	Verify the UI elements in Login/Signup popup		1.Enter URL and click go 2.Click on My Account dropdown button 3.Verify login/Signup popup with below UI elements: a.email text box b.password text box c.Login button d.New customer? Create account link e.Last password? Recovery password link	<a href="https://healthcare.com/">https://healthcare.com/</a>	Application should show below UI elements: a.email text box b.password text box c.Login button with orange colour d.New customer? Create account link e.Last password? Recovery password link	Working as expected	pass
LoginPage_TC_003	Functional	Home page	Verify user is able to log into application with Valid credentials		1.Enter URL( <a href="https://shopenzer.com/">https://shopenzer.com/</a> ) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: prash@gmail.com password: Testing123	User should navigate to user account homepage	Working as expected	pass
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with Invalid credentials		1.Enter URL( <a href="https://shopenzer.com/">https://shopenzer.com/</a> ) and click go 2.Click on My Account dropdown button 3.Enter Invalid username/email in Email text box 4.Enter valid password in password text box 5.Click on login button	Username: prash@gmail.com password: Testing123	Application should show 'Incorrect email or password' validation message.	Working as expected	pass
LoginPage_TC_004	Functional	Login page	Verify user is able to log into application with Invalid credentials		1.Enter URL( <a href="https://shopenzer.com/">https://shopenzer.com/</a> ) and click go 2.Click on My Account dropdown button 3.Enter Valid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	Username: prash@gmail.com password: Testing123678666786876676	Application should show 'Incorrect email or password' validation message.	Working as expected	pass
LoginPage_TC_005	Functional	Login page	Verify user is able to log into application with Invalid credentials		1.Enter URL( <a href="https://shopenzer.com/">https://shopenzer.com/</a> ) and click go 2.Click on My Account dropdown button 3.Enter Invalid username/email in Email text box 4.Enter Invalid password in password text box 5.Click on login button	Username: chalam@gmail.com password: Testing123678666786876676	Application should show 'Incorrect email or password' validation message.	Working as expected	pass

## 8.2 User Acceptance Testing

### 1. Purpose of Document

The purpose of this document is to briefly explain the test coverage and open issues of the [ProductName] project at the time of the release to User Acceptance Testing (UAT).

### 2. Defect Analysis

This report shows the number of resolved or closed bugs at each severity level, and how they were resolved

Resolution	Severity 1	Severity 2	Severity 3	Severity 4	Subtotal
By Design	10	4	4	2	20
Duplicate	1	0	2	0	3
External	5	2	0	0	7
Fixed	9	4	7	20	40
Not Reproduced	0	0	0	1	1
Skipped	0	1	1	1	3
Won't Fix	0	8	2	1	11
Totals	24	17	15	26	83

### 3. Test Case Analysis

This report shows the number of test cases that have passed, failed, and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	5	0	0	5
Client Application	31	0	0	31
Security	3	0	0	3



Outsource Shipping	2	0	0	2
Exception Reporting	5	0	0	5
Final Report Output	3	0	0	3
Version Control	4	0	0	4

## CHAPTER 9- RESULTS

### 9.1 Performance Metrics

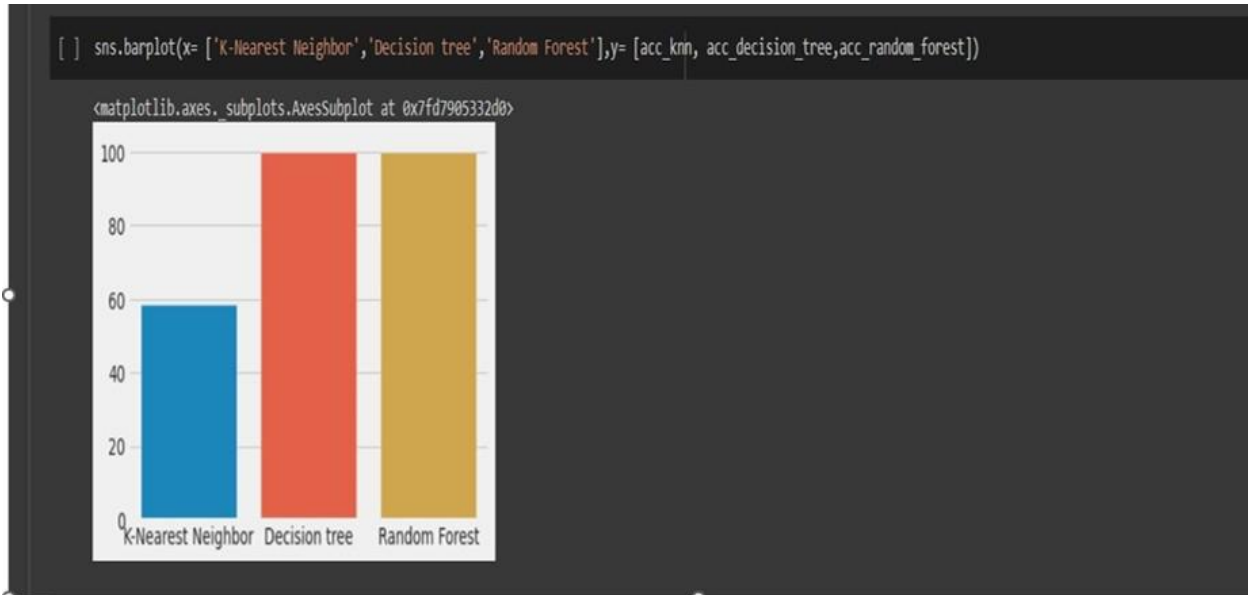


Table 1: National Performance Comparisons (All Hospitals in Study)

Table 1: National Performance Comparisons (All Hospitals in Study)						
Domain	Performance Measures	Medians		Benchmark Compared With Peer Group		
		Benchmark Hospitals (Winners)	Peer Hospitals (Nonwinners)	Difference	Percent Difference	Comments
Clinical Outcomes	Inpatient Mortality Index <sup>1</sup>	0.77	0.99	-0.22	-22.3%	Lower mortality
	Complications Index <sup>1</sup>	0.73	0.92	-0.18	-20.1%	Fewer complications
	HAI Index <sup>2</sup>	0.60	0.69	-0.09	-13.1%	Fewer infections
Extended Outcomes	30-Day Mortality Rate <sup>3</sup>	11.6	12.3	-0.7	n/a <sup>7</sup>	Lower 30-day mortality
	30-Day Hosp-Wide Readmission Rate <sup>4</sup>	15.0	15.6	-0.6	n/a <sup>7</sup>	Fewer 30-day readmissions
Operational Efficiency	Average Length of Stay <sup>1</sup>	4.4	4.7	-0.4	-7.7%	Shorter stays
	ED Throughput Measure <sup>5</sup>	111.3	131.0	-19.8	-15.1%	Less time to service
	Inpatient Expense per Discharge <sup>6</sup>	\$6,186	\$7,190	-\$1,004	-14.0%	Lower inpatient cost
	Medicare Spend per Beneficiary <sup>5</sup>	0.96	0.99	-0.03	-3.4%	Lower Episode Cost
Financial Health	Operating Profit Margin <sup>6</sup>	15.8	4.0	11.8	n/a <sup>7</sup>	Higher profitability
Patient Experience	HCAHPS Top Box (%) <sup>5</sup>	77.0	71.0	6.0	n/a <sup>7</sup>	Better patient experience



**Table 2: Major Teaching Hospital Performance Comparisons**

Table 2: Major Teaching Hospital Performance Comparisons						
Domain	Performance Measures	Medians		Benchmark Compared With Peer Group		
		Benchmark Hospitals (Winners)	Peer Hospitals (Nonwinners)	Difference	Percent Difference	Comments
Clinical Outcomes	Inpatient Mortality Index <sup>1</sup>	0.91	1.00	-0.09	-9.2%	Lower mortality
	Complications Index <sup>1</sup>	0.94	0.97	-0.03	-2.9%	Fewer complications
	HAI Index <sup>2</sup>	0.64	0.82	-0.19	-22.9%	Fewer infections
Extended Outcomes	30-Day Mortality Rate <sup>3</sup>	11.5	12.0	-0.5	n/a <sup>7</sup>	Lower 30-day mortality
	30-Day Hosp-Wide Readmission Rate <sup>4</sup>	15.1	16.2	-1.1	n/a <sup>7</sup>	Fewer 30-day readmissions
Operational Efficiency	Average Length of Stay <sup>1</sup>	4.4	5.0	-0.6	-11.5%	Shorter stays
	ED Throughput Measure <sup>5</sup>	161.0	205.0	-44.0	-21.5%	Less time to service
	Inpatient Expense per Discharge <sup>6</sup>	\$6,420	\$8,456	-\$2,036	-24.1%	Lower inpatient cost
	Medicare Spend per Beneficiary <sup>5</sup>	0.97	1.01	-0.04	-3.5%	Lower Episode Cost
Financial Health	Operating Profit Margin <sup>6</sup>	11.7	3.8	7.9	n/a <sup>7</sup>	Higher profitability
Patient Experience	HCAHPS Top Box (%) <sup>5</sup>	77.0	71.0	6.0	n/a <sup>7</sup>	Better patient experience

**Table 4: Large Community Hospital Performance Comparisons**

Table 4: Large Community Hospital Performance Comparisons						
Domain	Performance Measures	Medians		Benchmark Compared With Peer Group		
		Benchmark Hospitals (Winners)	Peer Hospitals (Nonwinners)	Difference	Percent Difference	Comments
Clinical Outcomes	Inpatient Mortality Index <sup>1</sup>	0.79	1.02	-0.23	-22.1%	Lower mortality
	Complications Index <sup>1</sup>	0.86	0.99	-0.13	-13.0%	Fewer complications
	HAI Index <sup>2</sup>	0.57	0.68	-0.10	-15.2%	Fewer infections
Extended Outcomes	30-Day Mortality Rate <sup>3</sup>	11.6	12.4	-0.8	n/a <sup>7</sup>	Lower 30-day mortality
	30-Day Hosp-Wide Readmission Rate <sup>4</sup>	15.2	15.5	-0.3	n/a <sup>7</sup>	Fewer 30-day readmissions
Operational Efficiency	Average Length of Stay <sup>1</sup>	4.7	5.0	-0.3	-6.0%	Shorter stays
	ED Throughput Measure <sup>5</sup>	122.5	148.3	-25.8	-17.4%	Less time to service
	Inpatient Expense per Discharge <sup>6</sup>	\$6,373	\$6,786	-\$412	-6.1%	Lower inpatient cost
	Medicare Spend per Beneficiary <sup>5</sup>	1.00	1.01	-0.01	-1.1%	Lower Episode Cost
Financial Health	Operating Profit Margin <sup>6</sup>	15.0	6.6	8.4	n/a <sup>7</sup>	Higher profitability
Patient Experience	HCAHPS Top Box (%) <sup>5</sup>	79.0	70.0	9.0	n/a <sup>7</sup>	Better patient experience

**Table 5: Medium Community Hospital Performance Comparisons**

Table 5: Medium Community Hospital Performance Comparisons						
Domain	Performance Measures	Medians		Benchmark Compared With Peer Group		
		Benchmark Hospitals (Winners)	Peer Hospitals (Nonwinners)	Difference	Percent Difference	Comments
Clinical Outcomes	Inpatient Mortality Index <sup>1</sup>	0.74	0.98	-0.23	-23.8%	Lower mortality
	Complications Index <sup>1</sup>	0.77	0.98	-0.21	-21.5%	Fewer complications
	HAI Index <sup>2</sup>	0.54	0.61	-0.07	-11.5%	Fewer infections
Extended Outcomes	30-Day Mortality Rate <sup>3</sup>	11.4	12.3	-0.8	n/a <sup>7</sup>	Lower 30-day mortality
	30-Day Hosp-Wide Readmission Rate <sup>4</sup>	14.8	15.6	-0.8	n/a <sup>7</sup>	Fewer 30-day readmissions
Operational Efficiency	Average Length of Stay <sup>1</sup>	4.4	4.9	-0.5	-9.9%	Shorter stays
	ED Throughput Measure <sup>5</sup>	103.8	131.3	-27.5	-21.0%	Less time to service
	Inpatient Expense per Discharge <sup>6</sup>	\$5,896	\$6,869	-\$973	-14.2%	Lower inpatient cost
	Medicare Spend per Beneficiary <sup>5</sup>	0.95	0.99	-0.05	-4.6%	Lower Episode Cost
Financial Health	Operating Profit Margin <sup>6</sup>	14.8	4.7	10.1	n/a <sup>7</sup>	Higher profitability
Patient Experience	HCAHPS Top Box (%) <sup>5</sup>	76.5	70.0	6.5	n/a <sup>7</sup>	Better patient experience

**Table 6: Small Community Hospital Comparisons**

Table 6: Small Community Hospital Comparisons						
Domain	Performance Measures	Medians		Benchmark Compared With Peer Group		
		Benchmark Hospitals (Winners)	Peer Hospitals (Nonwinners)	Difference	Percent Difference	Comments
Clinical Outcomes	Inpatient Mortality Index <sup>1</sup>	0.51	1.00	-0.49	-49.2%	Lower mortality
	Complications Index <sup>1</sup>	0.58	0.90	-0.32	-35.1%	Fewer complications
	HAI Index <sup>2</sup>	n/a	n/a	n/a	n/a	n/a
Extended Outcomes	30-Day Mortality Rate <sup>3</sup>	11.6	12.4	-0.8	n/a <sup>7</sup>	Lower 30-day mortality
	30-Day Hosp-Wide Readmission Rate <sup>4</sup>	14.7	15.4	-0.7	n/a <sup>7</sup>	Fewer 30-day readmissions
Operational Efficiency	Average Length of Stay <sup>1</sup>	4.3	4.9	-0.6	-13.0%	Shorter stays
	ED Throughput Measure <sup>5</sup>	93.8	100.5	-6.8	-6.7%	Less time to service
	Inpatient Expense per Discharge <sup>6</sup>	\$6,344	\$7,577	-\$1,233	-16.3%	Lower inpatient cost
	Medicare Spend per Beneficiary <sup>5</sup>	0.90	0.96	-0.06	-6.1%	Lower Episode Cost
Financial Health	Operating Profit Margin <sup>6</sup>	17.2	1.7	15.5	n/a <sup>7</sup>	Higher profitability
Patient Experience	HCAHPS Top Box (%) <sup>5</sup>	76.5	73.0	3.5	n/a <sup>7</sup>	Better patient experience

Figure 1 State-level Performance Comparisons, 2021 Study

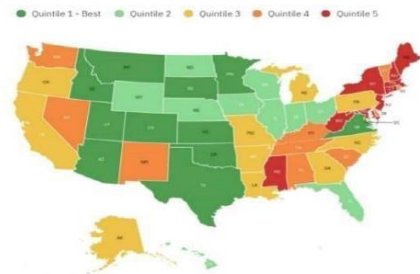


Figure 2 State-level Performance Comparisons, 2020 Study



Table 7. 100 Top Hospitals Two-year State-level Performance Comparisons

Northeast		Midwest		South		West	
Current Study	Previous Study	Current Study	Previous Study	Current Study	Previous Study	Current Study	Previous Study
CT	CT	IL	IL	AL	AL	AK	AK
ME	ME	IN	IN	AR	AR	AZ	AZ
MA	MA	IA	IA	DE	DE	CA	CA
NH	NH	KS	KS	DC	DC	CO	CO
NJ	NJ	MI	MI	FL	FL	HI	HI
NY	NY	MN	MN	GA	GA	ID	ID
PA	PA	MO	MO	KY	KY	MT	MT
RI	RI	NE	NE	LA	LA	NV	NV
VT	VT	ND	ND	MD	MD	NM	NM
		OH	OH	MS	MS	OR	OR
		SD	SD	NC	NC	UT	UT
		WI	WI	OK	OK	WA	WA
				SC	SC	WY	WY
				TN	TN		
				TX	TX		
				VA	VA		
				WV	WV		

## CHAPTER 10.

### ADVANTAGES AND DISADVANTAGES

#### ADVANTAGES:

- Cost-effective use of technology
- Improved project management
- Sustaining the improvements in the result
- Boosting hospital capacity
- Enhance the quality and efficiency of healthcare
- benefit areas like emergency preparation, charting, administration, compliance, and financial management.
- Analysing clinical data to improve medical research
- Using patient data to improve health outcomes
- Gaining operational insights from healthcare provider data
- Improved staffing through health business management analytics
- Early detection of disease.

- Prevention of unnecessary doctor's visits.
- Discovery of new drugs.
- More accurate calculation of health insurance rates.
- More effective sharing of patient data

## **DISADVANTAGES**

### **REPLACING MEDICAL PERSONNEL:**

Application of technology in every sphere of human life is improving the way things are done. These technologies are also posing some threat to world of works. Robotics are replacing human labour.

### **DATA SAFETY:**

Data security is another challenge in applying big data in health care. Big data storage is usually targets of hackers. This endangers the safety of medical data. Healthcare organisations are very much concerned about the safety of patients' sensitive personal data. For this, all healthcare applications must meet the requirement for data security and be HIPAA compliant they can be deployed for healthcare services.

### **PRIVACY:**

One of the major drawbacks in the application of big data in healthcare industry is the issue of lack of privacy. Application of big data technologies involves monitoring of patient's, tracking of medical inventory and assets, organizing collected data, and visualization of data on the dashboard and the reports. So, visualization of sensitive medical data especially that of the patients creates negative impression of big data as it violates privacy.

### **MANPOWER**

Applying big data solutions in healthcare requires special skills and such skills are scarce. Handling of big data requires the combination of medical, technological and statistical knowledge.

## **11.CONCLUSION**

The impact of data analytics in healthcare has already made a substantial difference in the ability of healthcare providers to offer patients high-quality care in an efficient, cost-effective manner. However, the role of data analytics in improving patient outcomes and healthcare processes continue to grow and expand as more types of data become available and new tools are developed that make the results of the analytics clear and easy for healthcare professionals to access. Realizing the potential of data analytics to transform the healthcare industry begins by understanding how the technology can be applied to address healthcare providers' challenges, including staff recruitment and utilization, operational efficiencies, and enhanced patient experiences. Patient-centred healthcare depends on knowing what patients want and need. Data analytics holds the key to unlocking this vital information.

## **12.FUTURE SCOPE**

Artificial Intelligence (AI) will play a significant role in data analytics in healthcare for the next decade. For example, the field of AI-enabled clinical decision support is just emerging. This type of support can compare patients who fit similar profiles within a system, then it can alert doctors to trends in data that may have been overlooked. The use of big data in healthcare will include testing for drug interactions that small studies are unlikely to catch and prevent patients from taking harmful drug combinations.

Decisions made by physicians, like what test or treatments to give a patient, makeup 80-90% of all healthcare spending, so using artificial intelligence to make more educated decisions will bring down healthcare costs. It's crucial to have informed leaders at the vanguard of these innovations in healthcare.

## CHAPTER 13

### APPENDIX

#### SOURCE CODE:

##### Index.html

```
<!DOCTYPE html>

<html lang="en">

<head>

  <title>Data Analytics</title>

  <meta charset="utf-8">

  <meta name="viewport" content="width=device-width, initial-scale=1">

  <link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css
">

  <script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></scrip
t>

  <script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js">
</script>

</head>

<body>

<nav class="navbar navbar-inverse">

  <div class="container-fluid">
```

<div class="navbar-header">

<a class="navbar-brand" href="about.html">Analytics for Hospitals'  
Health-Care Data</a>

</div>

<ul class="nav navbar-nav">

<li class="active"><a href="#">Home</a></li>

<li><a href="dashboard.html">Dashboard</a></li>

<li><a href="report.html">Report</a></li>

<li><a href="story.html">Story</a></li>

</ul>

</div>

</nav>

<div class="jumbotron">

<center> <h4><i><b>Team ID : PNT2022TMID29035  
</b></i></h4></center>

</div>

<table class="table table-bordered">

<tbody>

<tr>

<td>Team Leader</td>

<td> S.P.Yogapriyaa </td>

</tr>

<tr>

<td>Team member 1</td>

<td> M.Vishali </td>

</tr>

<tr>

<td>Team member 2 </td>

<td> P.Prasanthi Sreeja </td>

</tr>

<tr>

<td>Team member 3 </td>

<td> S.Haritha </td>

</tr>

</tbody>

</table>

</body>

</html>

**Dashboard.html**

<!DOCTYPE html>

<html lang="en">



```
<head>

<title>Data Analytics</title>

<meta charset="utf-8">

<meta name="viewport" content="width=device-width, initial-scale=1">

<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css
">

<script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></scrip
t>

<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js">
</script>

</head>

<body>

<nav class="navbar navbar-inverse ">

<div class="container-fluid">

<div class="navbar-header">

<a class="navbar-brand" href="#">Analytics for Hospitals' Health-Care
Data</a>

</div>

<ul class="nav navbar-nav">

<li><a href="index.html">Home</a></li>

<li class="active"><a href="#">Dashboard</a></li>
```

```
<li><a href="report.html">Report</a></li>

<li><a href="story.html">Story</a></li>

</ul>

</div>

</nav>

<div class="container">

  <iframe
src="https://us1.ca.analytics.ibm.com/bi/?perspective=dashboard&path
Ref=.my_folders%2Fdashboard&closeWindowOnLastView=true&
ui_appbar=false&ui_navbar=false&shareMode=embedded&a
ction=view&mode=dashboard&subView=model000001848640b0ab
_00000000" width="1500" height="1000" frameborder="0"
gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>

</div>

</body>

</html>
```

## Report.html

```
<!DOCTYPE html>

<html lang="en">

<head>

  <title>Data Analytics</title>

  <meta charset="utf-8">

  <meta name="viewport" content="width=device-width, initial-scale=1">
```

```
<link rel="stylesheet"
href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css
">
```

```
<script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></scrip
t>
```

```
<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js">
</script>
```

```
</head>
```

```
<body>
```

```
<nav class="navbar navbar-inverse ">
```

```
<div class="container-fluid">
```

```
<div class="navbar-header">
```

```
<a class="navbar-brand" href="#">Analytics for Hospitals' Health-Care
Data</a>
```

```
</div>
```

```
<ul class="nav navbar-nav">
```

```
<li><a href="index.html">Home</a></li>
```

```
<li><a href="dashboard.html">Dashboard</a></li>
```

```
<li class="active"><a href="#">Report</a></li>
```

```
<li><a href="story.html">Story</a></li>
```

```
</ul>
```

```
</div>
```

**</nav>**

**<div class="container">**

**<iframe**

**src="https://us1.ca.analytics.ibm.com/bi/?pathRef=.my\_folders%2Fdata%2Bmodule%2FHCIBMDB2.report&closeWindowOnLastView=true&ui\_appbar=false&ui\_navbar=false&shareMode=embedded&action=run&format=HTML&prompt=false" width="1500" height="1100" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>**

**</br>**

**</div>**

**</body>**

**</html>**

**Story.html**

**<!DOCTYPE html>**

**<html lang="en">**

**<head>**

**<title>Data Analytics</title>**

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

**<meta name="viewport" content="width=device-width, initial-scale=1">**

**<link rel="stylesheet" href="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/css/bootstrap.min.css">**

```
<script
src="https://ajax.googleapis.com/ajax/libs/jquery/3.6.0/jquery.min.js"></scrip
t>
```

```
<script
src="https://maxcdn.bootstrapcdn.com/bootstrap/3.4.1/js/bootstrap.min.js">
</script>
```

```
</head>
```

```
<body>
```

```
<nav class="navbar navbar-inverse ">
```

```
<div class="container-fluid">
```

```
<div class="navbar-header">
```

```
<a class="navbar-brand" href="#">Analytics for Hospitals' Health-Care
Data</a>
```

```
</div>
```

```
<ul class="nav navbar-nav">
```

```
<li><a href="index.html">Home</a></li>
```

```
<li><a href="dashboard.html">Dashboard</a></li>
```

```
<li><a href="report.html">Report</a></li>
```

```
<li class="active"><a href="#">Story</a></li>
```

```
</ul>
```

```
</div>
```

```
</nav>
```

<div class="container">

<iframe

src="https://us1.ca.analytics.ibm.com/bi/?perspective=story&pathRef=.my\_folders%2FNew%2Bstory%2B1&closeWindowOnLastView=true&ui\_appbar=false&ui\_navbar=false&shareMode=embedded&action=view&sceneId=model0000018489d28bbd\_00000000&sceneTime=0" width="1500" height="1000" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>

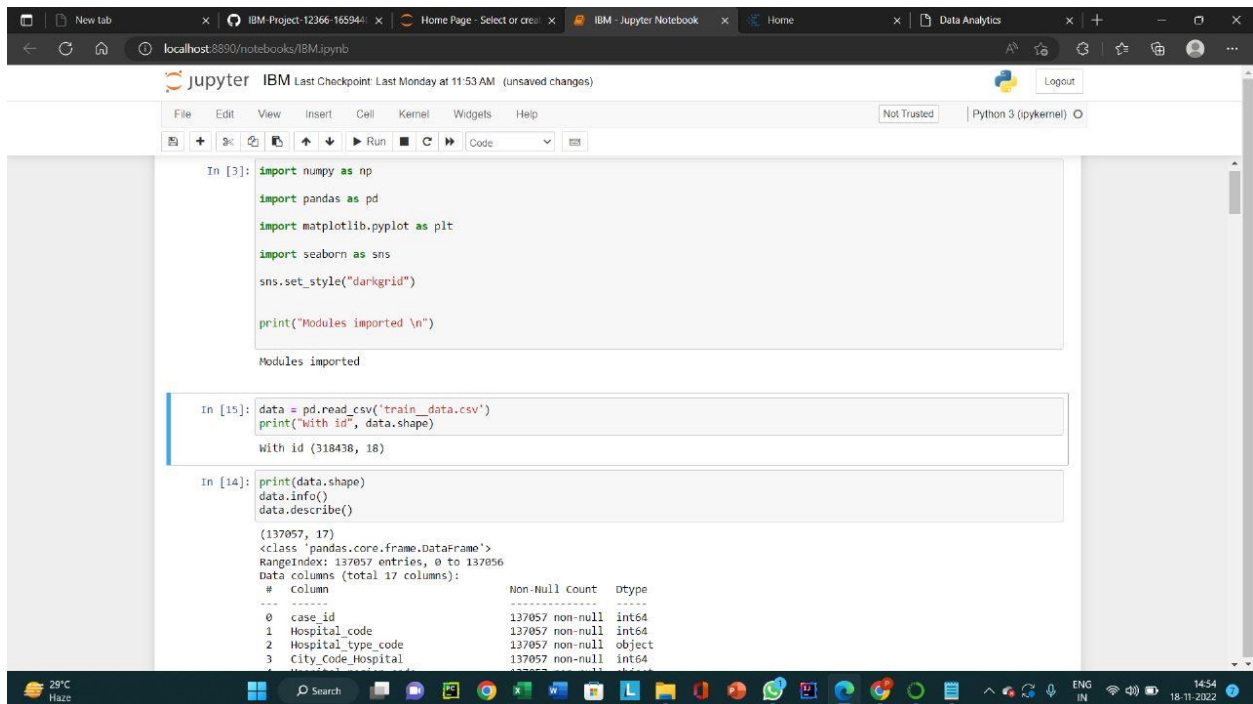
</br>

</div>

</body>

</html>

## JUPITER NOTEBOOK:



The screenshot displays a Jupyter Notebook interface within a web browser. The browser's address bar shows the URL `localhost:8890/notebooks/IBM.ipynb`. The notebook's title bar indicates it is an IBM project, with the last checkpoint from Monday at 11:53 AM. The interface includes a menu bar (File, Edit, View, Insert, Cell, Kernel, Widgets, Help) and a toolbar with icons for file operations, cell execution, and code editing. The notebook content consists of three code cells. The first cell imports `numpy`, `pandas`, `matplotlib.pyplot`, and `seaborn`, sets the style to `darkgrid`, and prints a confirmation message. The second cell reads a CSV file named `train_data.csv` and prints its shape. The third cell prints the data's shape, information, and a description. The output of the third cell shows the data has 137057 rows and 17 columns, with a detailed breakdown of each column's data type and non-null count.

```
In [3]: import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
sns.set_style("darkgrid")

print("Modules imported \n")

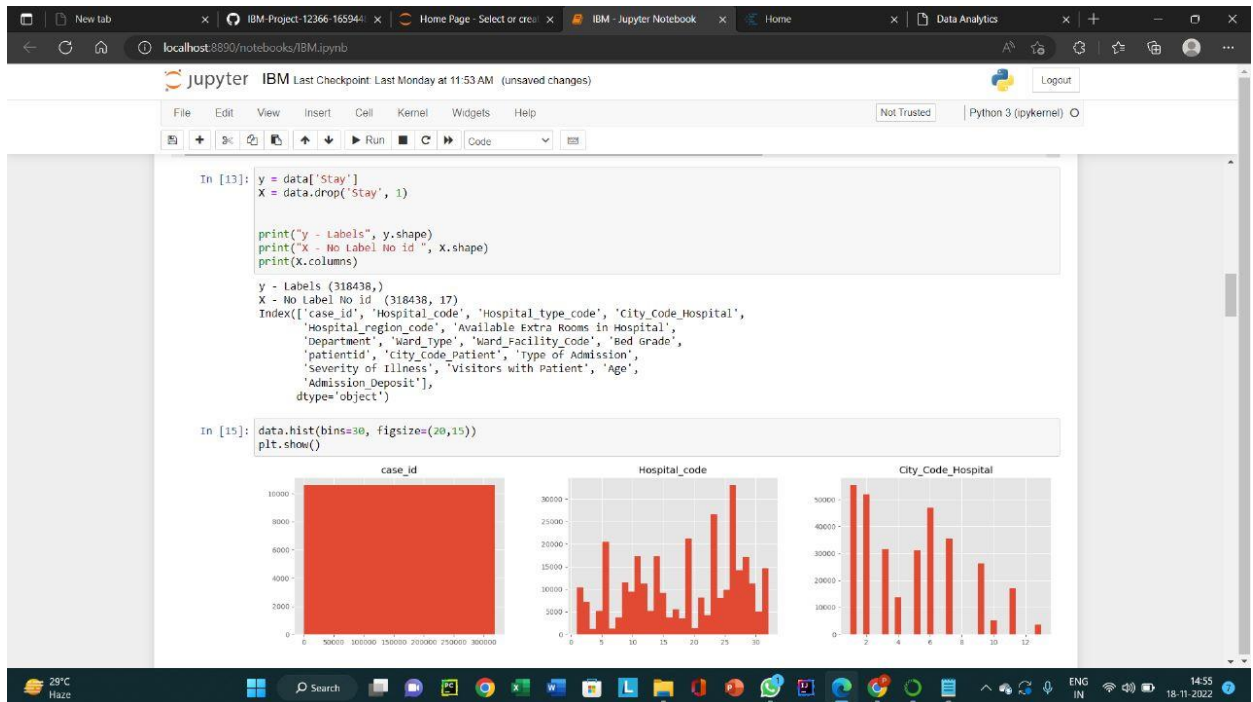
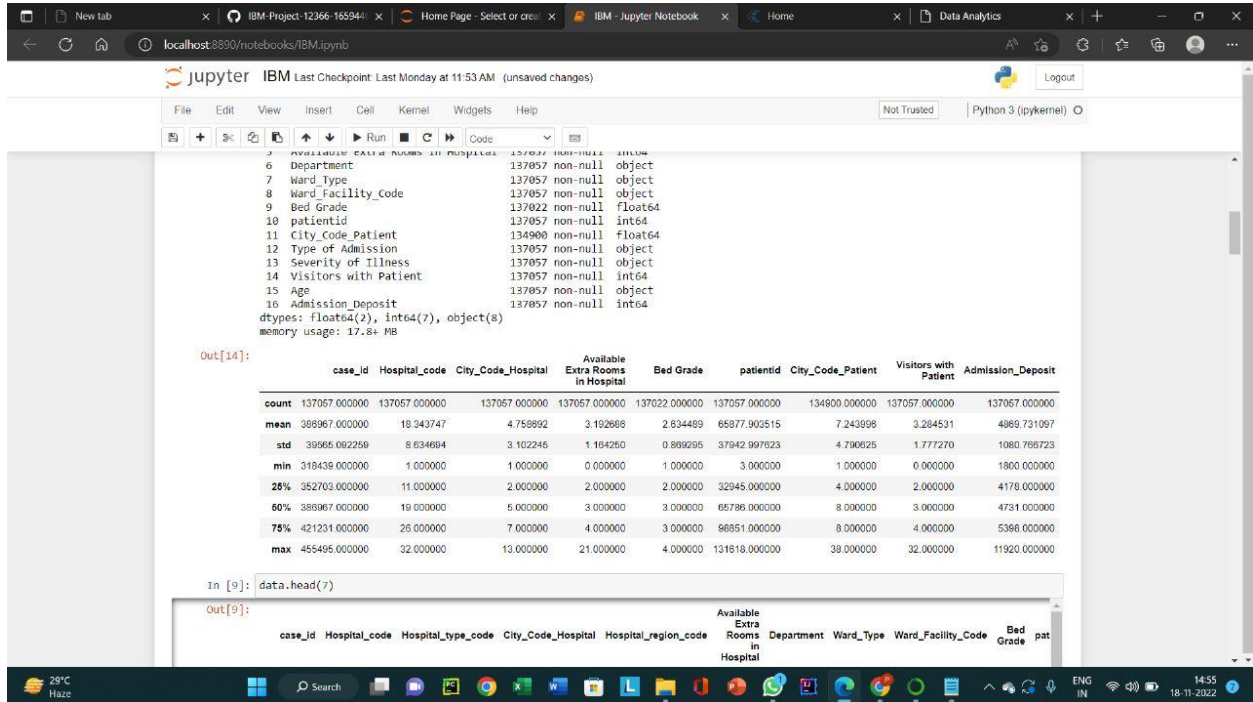
Modules imported

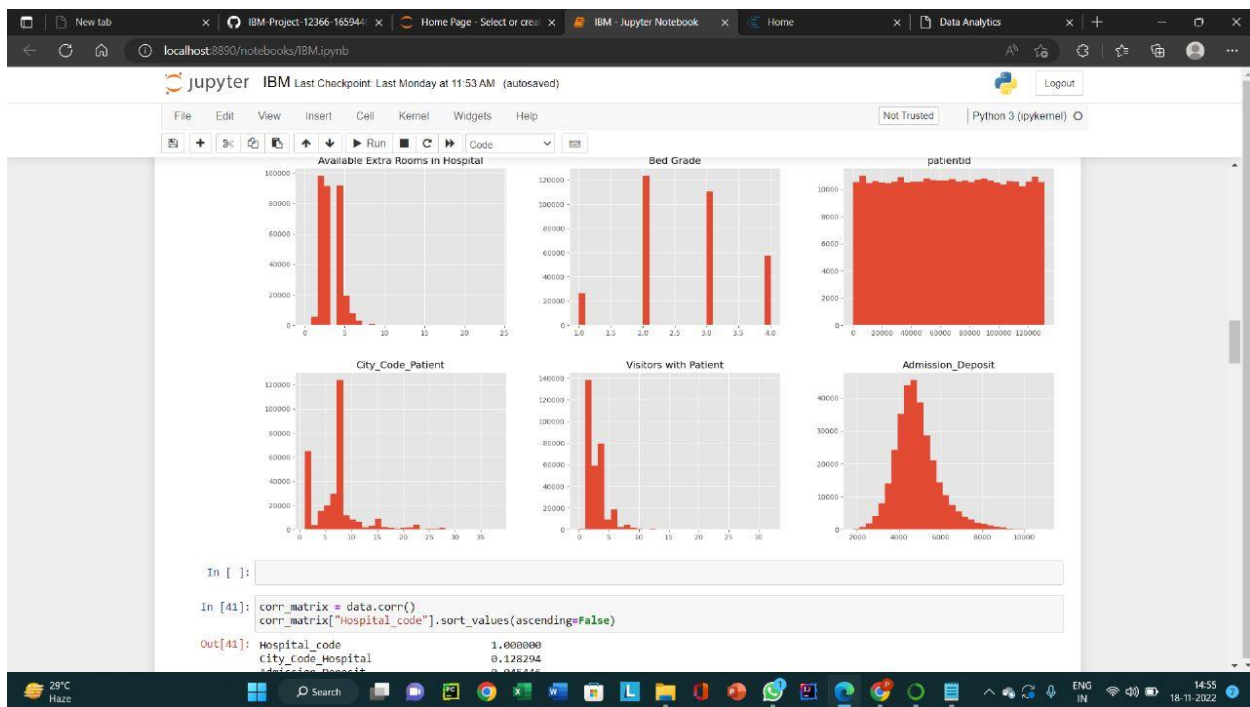
In [15]: data = pd.read_csv('train_data.csv')
print("With id", data.shape)

With id (318436, 18)

In [14]: print(data.shape)
data.info()
data.describe()

(137057, 17)
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 137057 entries, 0 to 137056
Data columns (total 17 columns):
#   column              Non-Null Count  Dtype
---  -
0    case_id             137057 non-null  int64
1    Hospital_code       137057 non-null  int64
2    Hospital_type_code  137057 non-null  object
3    City_Code_Hospital  137057 non-null  int64
```





Jupyter IBM Last Checkpoint: Last Monday at 11:53 AM (autosaved)

File Edit View Insert Cell Kernel Widgets Help

Not Trusted Python 3 (ipykernel)

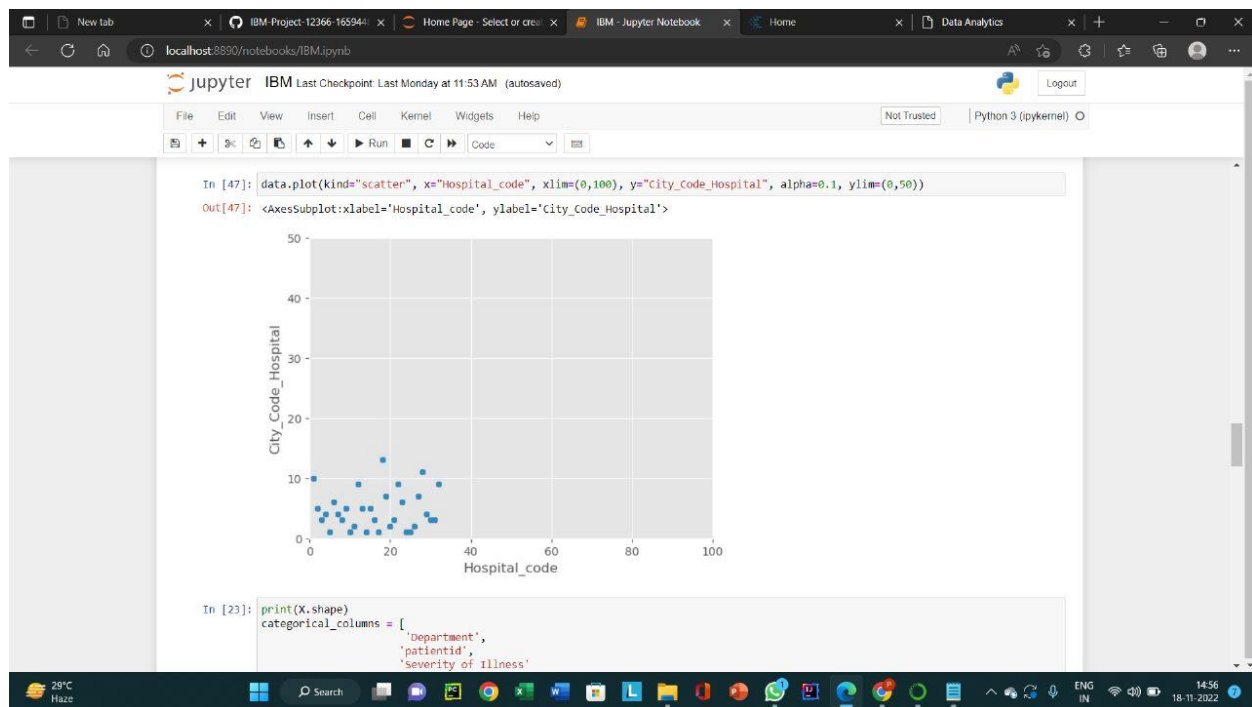
```
In [21]: X.info()
X.describe()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 318438 entries, 0 to 318437
Data columns (total 17 columns):
#   Column                                Non-Null Count  Dtype
---  -
0   case_id                               318438 non-null  int64
1   Hospital_code                         318438 non-null  int64
2   Hospital_type_code                   318438 non-null  object
3   City_Code_Hospital                   318438 non-null  int64
4   Hospital_region_code                 318438 non-null  object
5   Available Extra Rooms in Hospital    318438 non-null  int64
6   Department                           318438 non-null  object
7   Ward_Type                            318438 non-null  object
8   Ward_Facility_Code                   318438 non-null  object
9   Bed Grade                            318325 non-null  float64
10  patientid                             318438 non-null  int64
11  City_Code_Patient                    313906 non-null  float64
12  Type of Admission                     318438 non-null  object
13  Severity of Illness                   318438 non-null  object
14  Visitors with Patient                 318438 non-null  int64
15  Age                                  318438 non-null  object
16  Admission_Deposit                     318438 non-null  int64
dtypes: float64(2), int64(7), object(8)
memory usage: 41.3+ MB
```

```
Out[21]:
```

	case_id	Hospital_code	City_Code_Hospital	Available Extra Rooms in Hospital	Bed Grade	patientid	City_Code_Patient	Visitors with Patient	Admission_Deposit
count	318438.000000	318438.000000	318438.000000	318438.000000	318325.000000	318438.000000	313906.000000	318438.000000	318438.000000
mean	159219.500000	18.318841	4.771717	3.197627	2.625807	65747.576472	7.251859	3.284099	4880.749392
std	91926.276947	8.633765	3.102535	1.168171	0.873145	37979.936440	4.746266	1.764091	1086.776254
min	1.000000	1.000000	1.000000	0.000000	1.000000	1.000000	1.000000	0.000000	1800.000000





**GitHub link:**

**<https://github.com/IBM-EPBL/IBM-Project-11581-1659335264>**

**Project Demo Link:**

**[https://drive.google.com/file/d/1ZwLu2Q5yM283YQEt2ixjuy1Su4rbjKEc/view?usp=share\\_link](https://drive.google.com/file/d/1ZwLu2Q5yM283YQEt2ixjuy1Su4rbjKEc/view?usp=share_link)**