

# **PROJECT REPORT**

TEAM ID	PNT2022TMID44091
PROJECT NAME	ANALYTICS FOR HOSPITALS HEALTH -CARE DATA

## **TEAM MEMBERS:**

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## **CHAPTER 1**

### **INTRODUCTION**

This project deals with the analytics for hospital's health care data using data analytics. Data analytics (DA) is the process of examining data sets in order to find trends and draw conclusions about the information they contain. Increasingly, data analytics is done with the aid of specialized systems and software. Data analytics technologies and techniques are widely used in commercial industries to enable organizations to make more-informed business decisions.

#### **1.1 PROJECT OVERVIEW:**

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 manage the functioning of Hospitals in a professional and optimal manner

## **1.2 PURPOSE:**

Data analytics in health care is vital. It helps health care organizations to evaluate and develop practitioners, detect anomalies in scans and predict outbreaks in illness, per the Harvard Business School. Data analytics can also lower costs for health care organizations and boost business intelligence. Hospital data analytics can look over patient data and any prescribed medication to alert doctors and patients of incorrect dosages or wrong prescriptions, which lessens human error and the cost to your hospital. This in turn helps in gaining better insights and also enables healthcare practitioners to make well-informed decisions.

## **CHAPTER 2**

### **LITERATURE SURVEY**

The main aim of this paper is to provide a deep analysis on the research field of healthcare data analytics. This paper is analyzing the previous studies and works in this research area, as well as highlighting some of guidelines and gaps. This study has used seven popular databases and selected most relevant papers, in order to conduct this paper. The paper has listed some data analytics tools and techniques that have been used to improve healthcare performance in many areas such as: medical operations, reports, decision making, and prediction and prevention system. Moreover, the systematic review has showed an interesting demographic of fields of publication, research approaches, as well as outlined some of the possible reasons and issues associated with healthcare data analytics, based on geographical distribution theme[1]. This part deals with the advanced analytical methods focused on healthcare. This includes the clinical prediction models, temporal data mining methods, and visual analytics. Integrating heterogeneous data such as clinical and genomic data is essential for improving the predictive power of the data that will also be discussed. Information retrieval techniques that can enhance the quality of biomedical search will be presented. Data privacy is an extremely important concern in

healthcare. Privacy-preserving data publishing techniques will therefore be presented.[2].

One of the promises of the growing critical mass of clinical data accumulating in electronic health record (EHR) systems is secondary use (or re-use) of the data for other purposes, such as quality improvement and clinical research.<sup>1</sup> The growth of such data has increased dramatically in recent years due to incentives for EHR adoption in the US funded by the Health Information Technology for Economic and Clinical Health (HITECH) Act.<sup>2-3</sup> In the meantime, there has also been substantial growth in other kinds of health-related data, most notably through efforts to sequence genomes and other biological structures and functions.<sup>4</sup> The analysis of this data is usually called analytics (or data analytics). This chapter will define the terminology of this field, provide an overview of its promise, describe what work has been accomplished, and list the challenges and opportunities going forward[3].

Clinicians, healthcare providers-suppliers, policy makers and patients are experiencing exciting opportunities in light of new information deriving from the analysis of big data sets, a capability that has emerged in the last decades. Due to the rapid increase of publications in the healthcare industry, we have conducted a structured review regarding healthcare big data analytics. With reference to the resource-based view theory we focus on how big data resources are utilized to create organization values/capabilities, and through content analysis of the selected publications we discuss: the classification of big data types related to healthcare, the associated analysis techniques, the created value for stakeholders, the platforms and tools for handling big health data and future aspects in the field. We present a number of pragmatic examples to show how the advances in healthcare were made possible. We believe that the findings of this review are stimulating and provide valuable information to practitioners, policy makers and researchers while presenting them with certain paths for future research[4].

In this modern techno-world, the term data is unavoidable and certainly, nothing is possible without its usage. The trends about how to analyze the data are the need of the hour. Data analytics is becoming a future escalating tool of all industries including medicine, robotics, etc. This article briefly explains how data analytics is used in healthcare systems. Health care is the process of maintaining and improving the health of an individual by preventing, diagnosing and treating the diseases, illness and other physical and mental imbalances in people. Data analytics is classified into four types and they are descriptive,

diagnostic, predictive and prescriptive analysis. Health care makes use of prescriptive analysis to arrive at the best results and make better decisions. Big data plays a major role in data analytics. It helps the data analysts to collect data from the patients and store them efficiently. After the completion of this whole article, the reader will be able to get the collective idea about health care analytics.[5]

## 2.1 EXISTING PROBLEM

- The already existing model is trained with minimal parameters
- Low accuracy in prediction
- No feature extraction done
- High complexity

## 2.2 REFERENCES

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[2]. From:"Book of Data Analytics" Chandank Reddy(Wayne State University) Charu C.Aggarwal(Watson Research Center)

[3]. From: Hoyt,RE,Yoshihashi,A,Eds.(2014).Health Informatics:Practical Guide for Healthcare and formation Technology Professionals,Sixth Edition.Pensacola,FL,Lulu.com.

[4]. Panagiota Galetsia , Korina Katsaliakia , Sameer Kumarb,\* a School of Economics, Business Administration & Legal Studies, International Hellenic University, 14th km Thessaloniki-N. Moudania, Thessaloniki, 57001, Greece b Opus College of Business, University of St. Thomas Minneapolis Campus, 1000 LaSalle Avenue, Schulze Hall 435, Minneapolis, MN 55403, USA

[5]. from"n book: Innovative Data Communication Technologies and Application (pp.83-96)" P. Nagaraj-Professor (Assistant) at Kalasalingam University

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[15]. V. Mayer-Schönberger and K. Cukier, *Big Data: A Revolution That Will Transform How We Live, Work, and Think*. Eamon Dolan, 2014.

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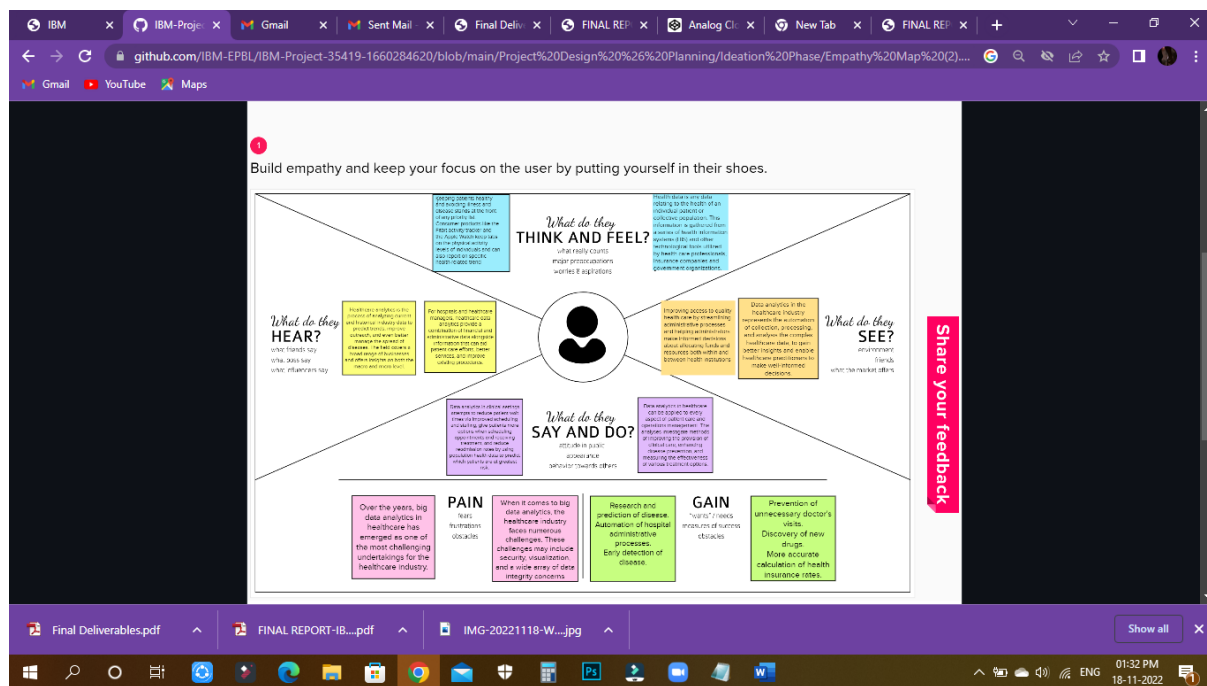
## 2.3 PROBLEM STATEMENT AND DEFINITION

- The aim 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 3

### IDEATION & PROPOSED SOLUTION

#### 3.1 EMPATHY MAP CAMPUS



#### 3.2 IDEATION & BRAINSTORMING



## 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
- 2-8 people recommended



### 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



#### A Team gathering

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



#### B Set the goal

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



#### C Learn how to use the facilitation tools

Use the Facilitation 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**  
How might we [your problem statement]?



### Key rules of brainstorming

To run a smooth and productive session

- Stay in topic.
- Encourage wild ideas.
- Defer judgment.
- Listen to others.
- Go for volume.
- If possible, be visual.

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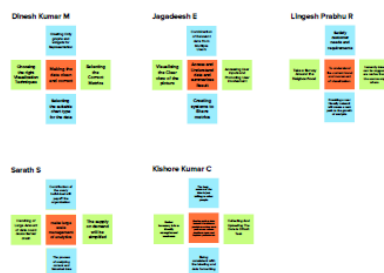


### 2 Brainstorm

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 (lock) to attach it to each drawing.



### 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

#### User View

Creating a user view that summarizes the requirements of the user.

#### Representation

Selecting the suitable chart type for the data.

#### Metrics

Creating a system to share metrics.

#### Data Sources

Using various data sources to inform the design and data gathering.

#### Trend

Identifying patterns or trends in the data.

**TIP**  
Add custom tags to sticky notes to make it easier to find, browse, organize, and categorize important ideas as themes within your mural.



### 3.3 PROPOSED SOLUTION

Predict the length of stay of patients.

The length of the stay can be predicted using either Random forest or Decision Tree for more accuracy. Certain parameters like age, stage of the diseases, disease diagnosis, severity of illness, type of admission, facilities allocated, etc., are used for prediction. IBM Cognos will be used for data analytics.

The model will be trained using colab. It predicts the length of stay (LOS) of the patients with more accuracy. As a result proper resources and therapy can be



provided. Patients can get proper treatment and better medical care than before which helps them for their faster recovery. So the prediction minimizes the overflow of patients and helps in resource management and optimize their resource utilization. Hence this leads to faster recovery and lower the expenses for treatment. It improves the trust in hospital management.

It avoids the major risk of spreading infection among the hospital staff. This leads to overall safety of hospital staff and patients. Resource consumption is optimized. This model can be used by all government hospitals, private hospitals, and this model is also trained with the real world hospital survey for better prediction small clinics.

Length of the stay will be predicted with more accuracy. This model predicts the length of the stay for all kinds of patients and predicts with more accuracy.

### 3.4 PROBLEM SOLUTION FIT



## CHAPTER 4

### REQUIREMENT ANALYSIS

#### 4.1 FUNCTIONAL REQUIREMENT

Following are the functional requirements of the proposed solution.

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail
FR-2	User Confirmation	Confirmation via Email Confirmation via Message
FR-3	Interoperability	Dashboard helps to share the patient's information interoperable to the hospitals in timely manner.
FR-4	Accuracy	Dashboard helps predict the patient's Health risks accurately based on LOS (Length of Stay).
FR-5	Compliance	The compliance of a dashboard is like to use very interactively in real time by the hospitals.
FR-6	Concise	These dashboards are clear, intuitive, and

		customizable and interactive in manner.
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## 4.2 NON FUNCTIONAL REQUIREMENT

Following are the non-functional requirements of the proposed solution.

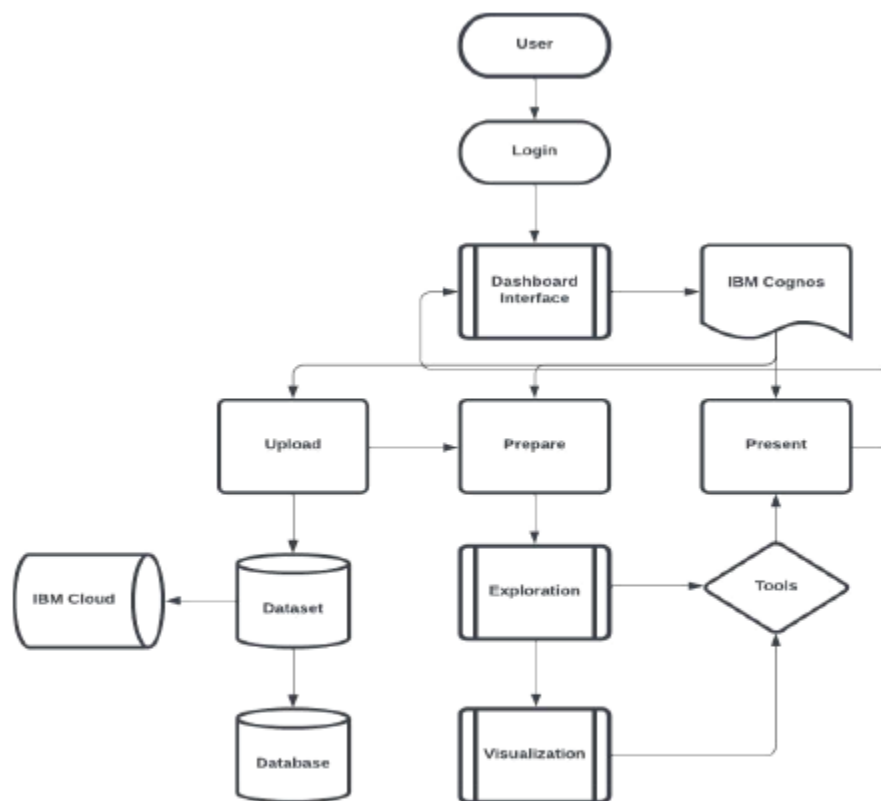
FR No.	Non-Functional Requirement	Description
NFR-1	Usability	This Dashboards are designed to offer a comprehensive overview of patient's LOS, and do so through the use of data visualization tools like charts and graphs.
NFR-2	Security	The Dashboard helps to indicate the current threat level to the Hospitals; an indication of events and incidents that have occurred; a record of authentication errors; unauthorized access
NFR-3	Reliability	This dashboard will be consistent and reliable to the users and helps the user to use in effective, efficient and reliable manner.
NFR-4	Performance	This dashboard can

		scan the backend users and analyzing the frequency in which they visit the dashboard helps understand how useful and helpful the data displayed is for tasks.
NFR-5	Availability	The dashboard can available to meet user's demand in timely manner and it is also helps to provide necessary information to the user's dataset
NFR-6	Scalability	The layers used in the dashboard are a hosted feature layer, feature layer view, or hosted tile layer.

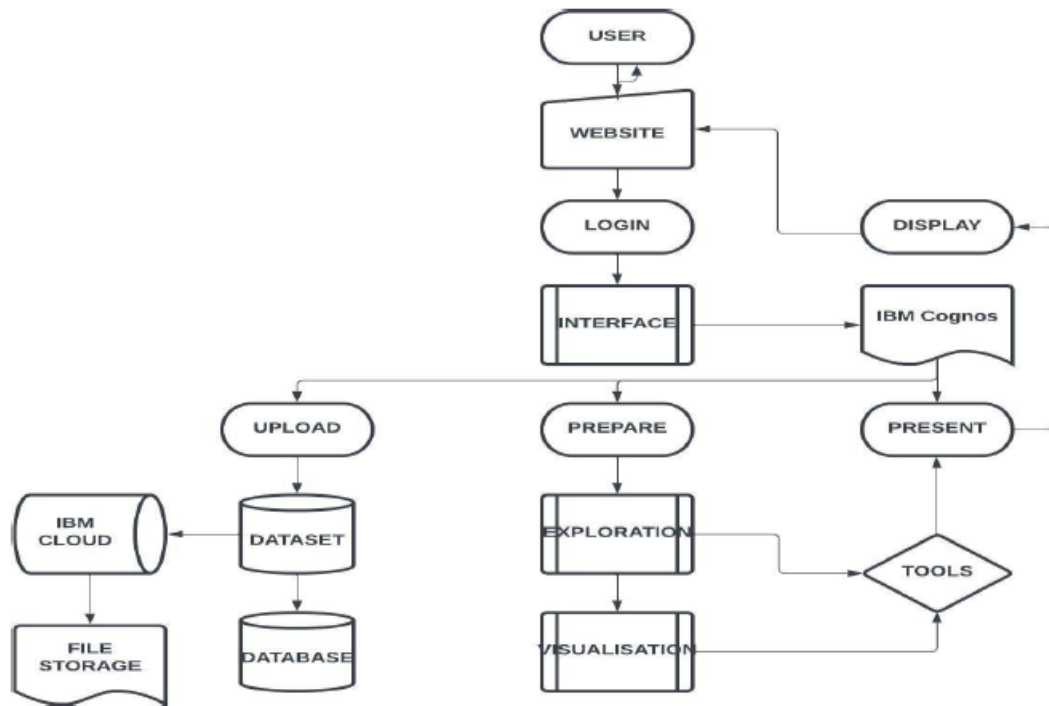
## CHAPTER 5

### PROJECT DESIGN

#### 5.1 DATA FLOW DIAGRAMS



## 5.2 SOLUTION & TECHNICAL ARCHITECTURE



## 5.3 USER STORIES

User type	Functional requirement (epic)	User story number	User story/task	Acceptance criteria	Priority	Release
Customer	Registration	USN-1	As a user i an login to my dashboard	I can access dashboard	High	Sprint-1
	Collect data	USN-1	As a user i can provide my details	I can view my data	Medium	Sprint-1
Admin	Collect data	USN-2	As an analyst i collect the data		High	Sprint-2
	Analyze	USN-2	As an analyst i analyze the given dataset	I can analyze the dataset	High	Sprint-2
	Upload data	USN-3	As an analyst i can upload datasets	I can upload the dataset	Medium	Sprint-3
	Prediction	USN-6	As an analyst i will predict the length of stay of patient	I can predict the length of stay	High	Sprint-4
Visualization	Prepare data	USN-4	As an admin i prepare the data for visualization	I can prepare the data with visualization techniques.	High	Spint-3
	Dashboard	USN-5	As an admin i present the data that is visualized	I can present the result	High	Sprint-4

## CHAPTER 6

### PROJECT PLANNING & SCHEDULING

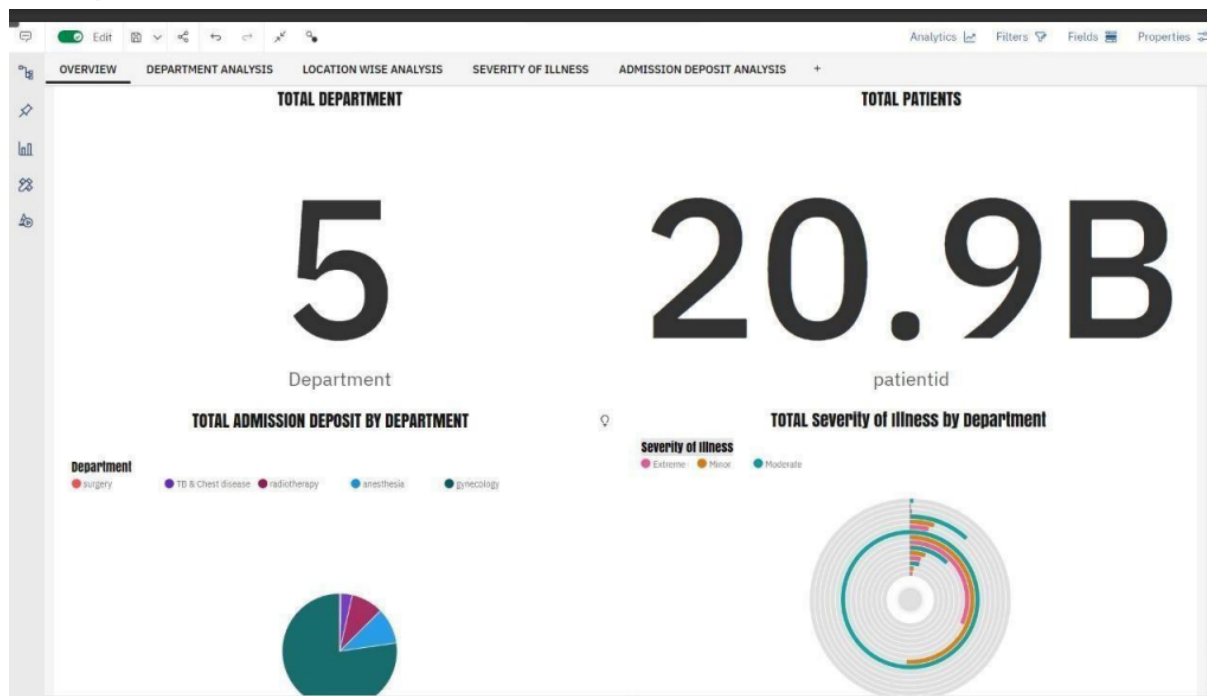
## 6.1 SPRINT PLANNING & ESTIMATION

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	10	High	MDINESH KUMAR S.SARATH
Sprint-1	Data uploading	USN-2	As a user, I will be uploading my data into the cognos analytics	10	High	MDINESH KUMAR

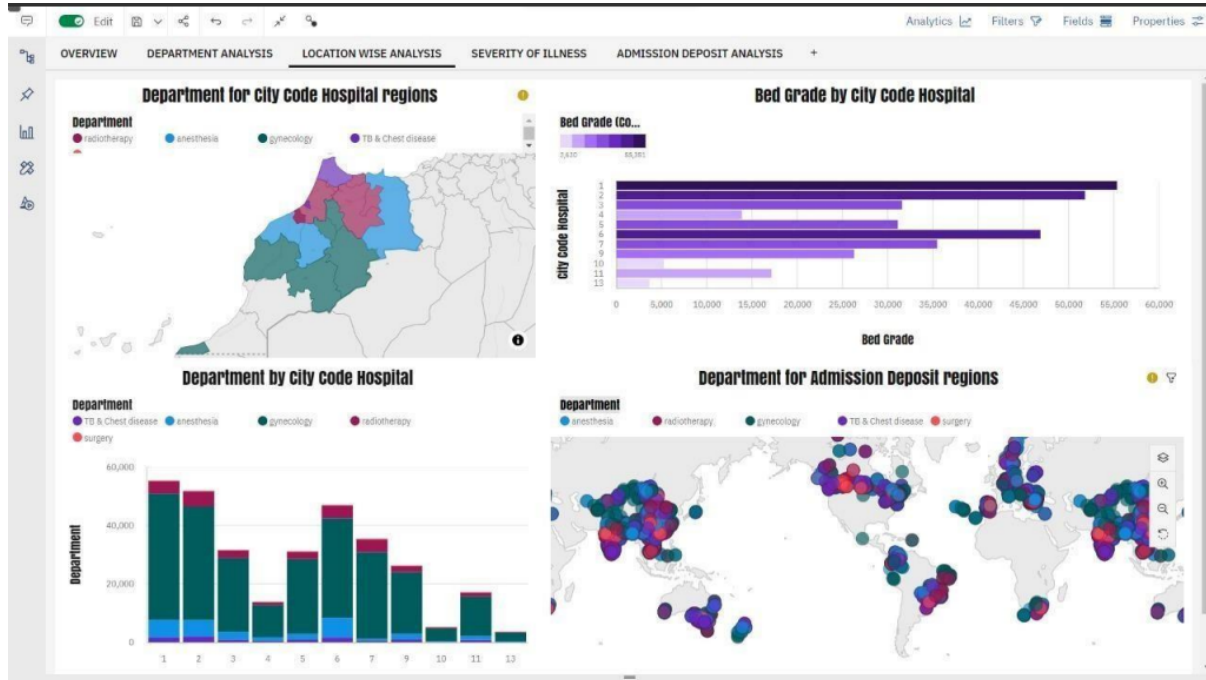
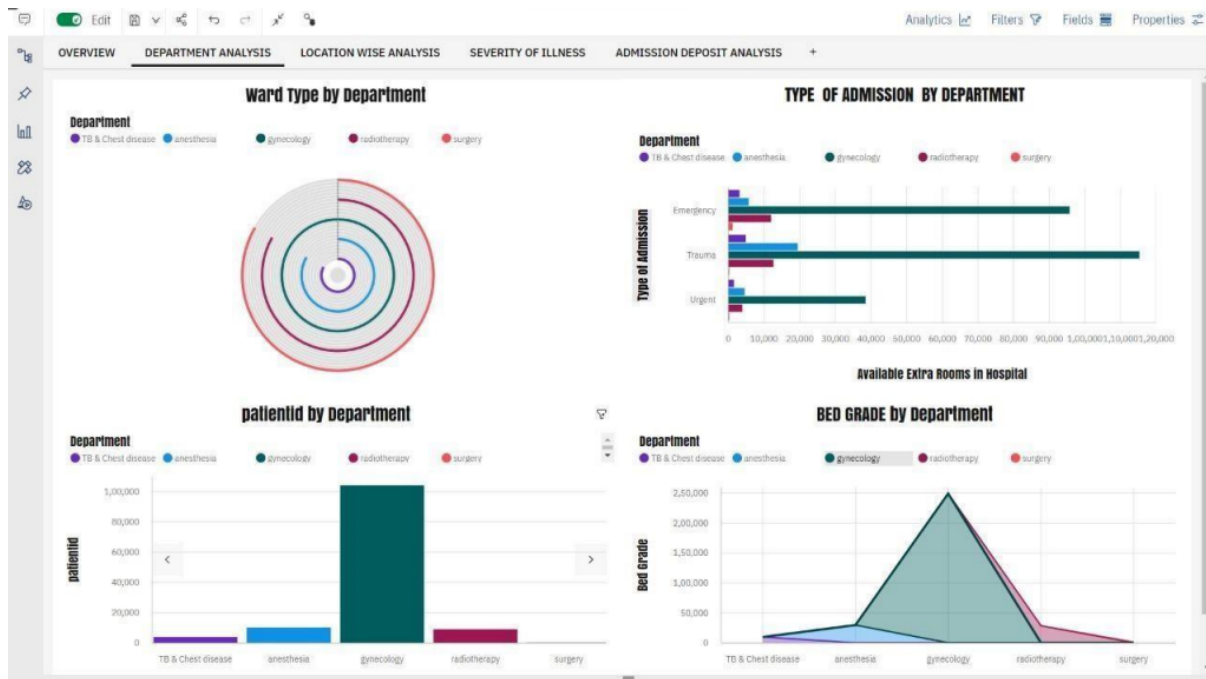
Sprint-2	Data Analysis	USN-3	As a user, I will be performing analysis on the data for making predictions	5	High	MDINESH KUMAR E.JAGADEESH
Sprint-2	Dashboards	USN-4	As a user, I will be making visualizations and interactive dashboards from the data	10	High	MDINESH KUMAR
Sprint-3	Story	USN-5	As a user, I will be making stories from the data and the dashboards	20	High	MDINESH KUMAR R.LINGESH PRABHU
Sprint-4	Report	USN-6	As a user, I will be making a report from the analysis and dashboards	20	High	MDINESH KUMAR C.KISHORE KUMAR

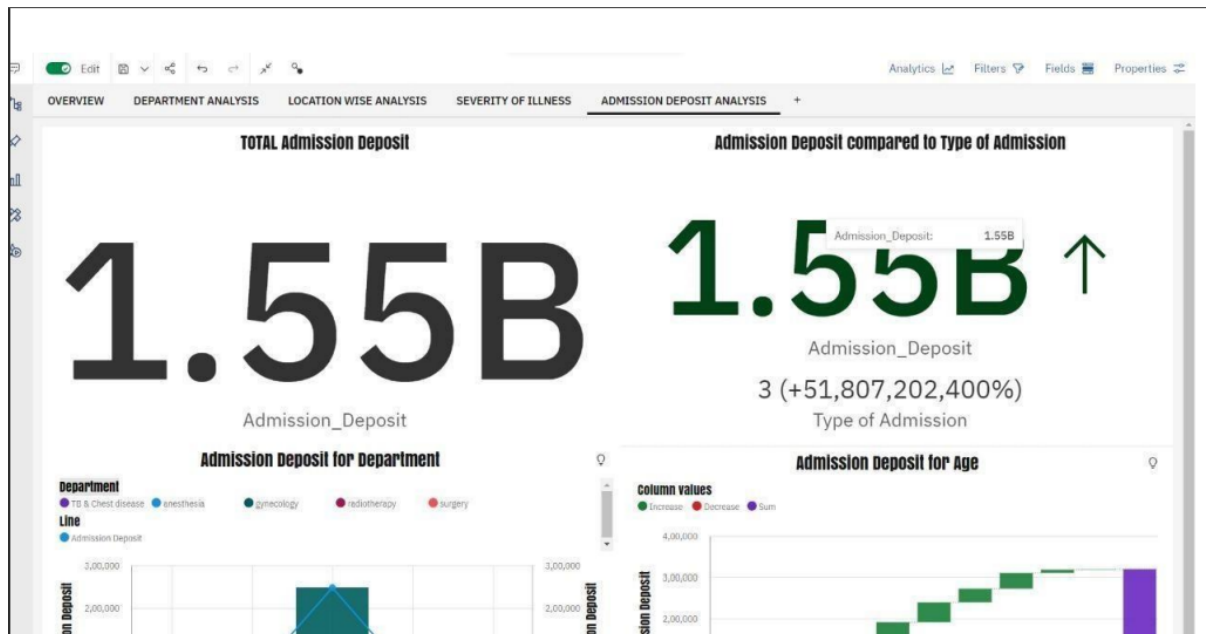
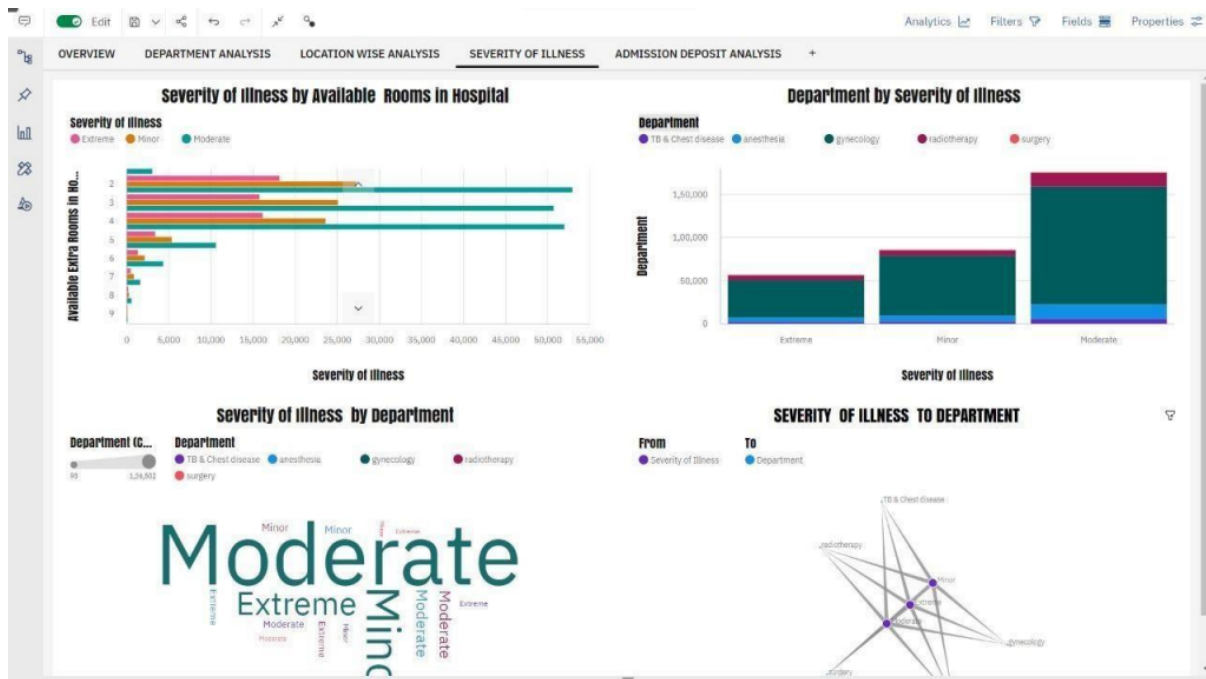
## 6.3 REPORTS FROM KAGGLE

### Burnup chart





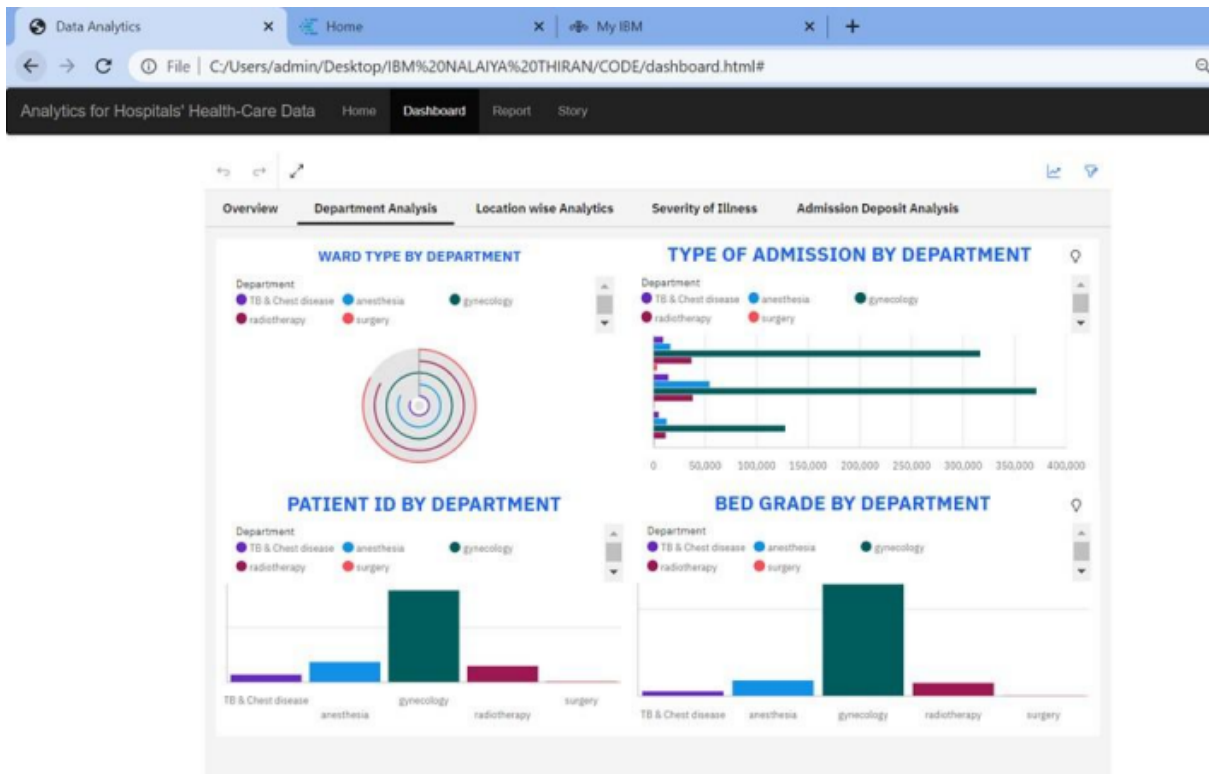


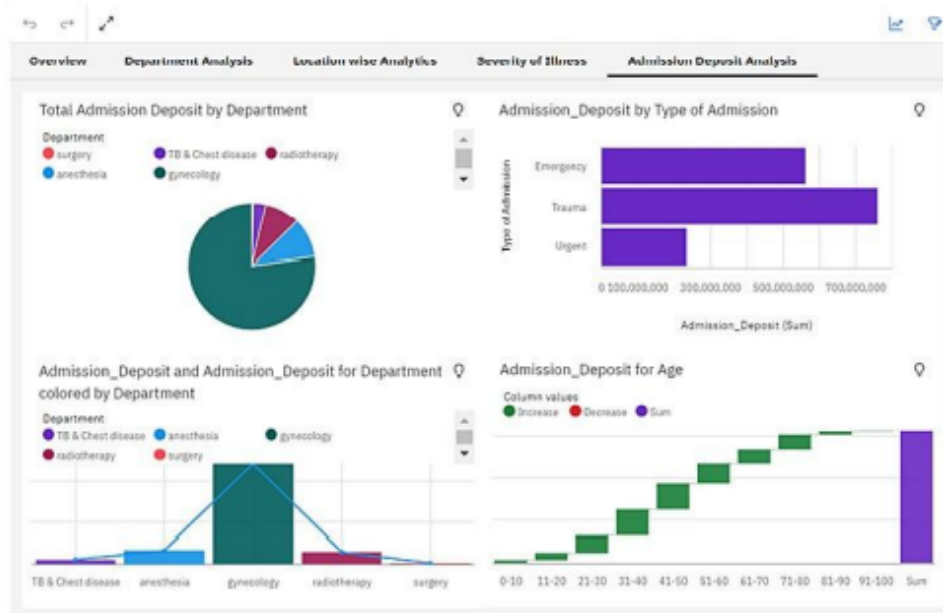


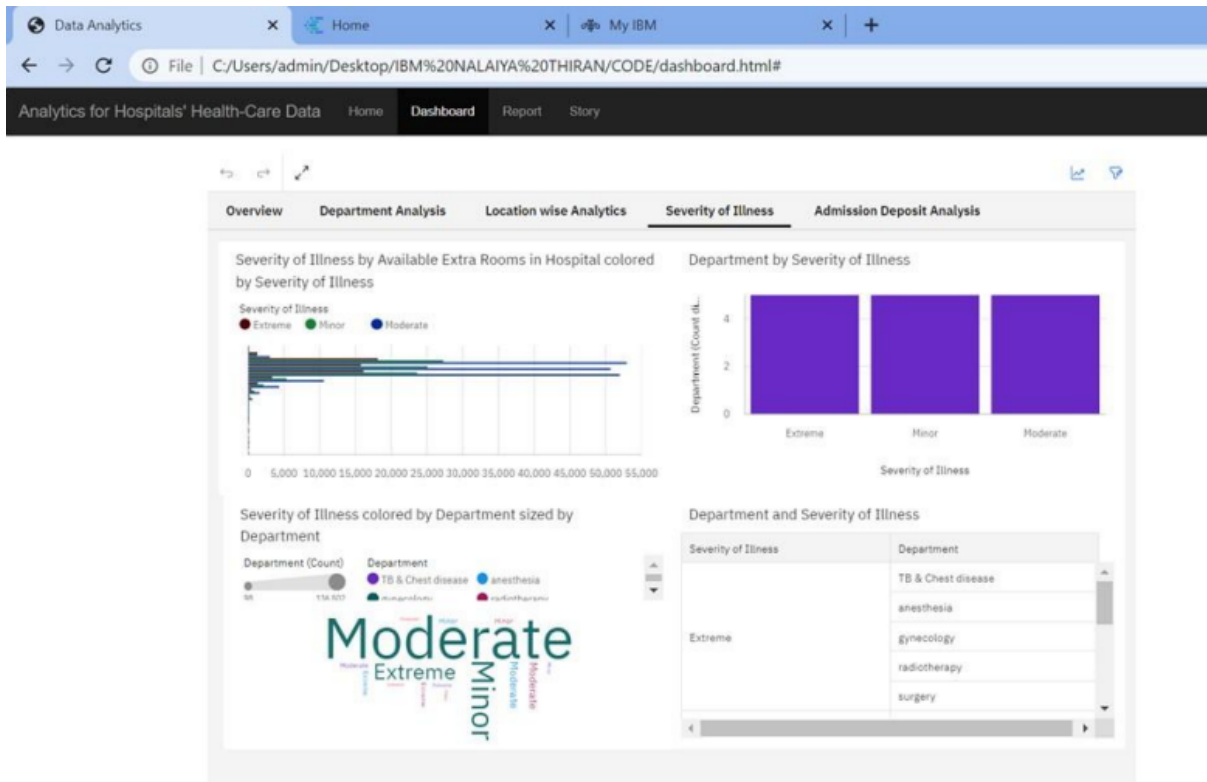
# CHAPTER 7

## CODING & SOLUTIONING

### 7.1 FEATURE







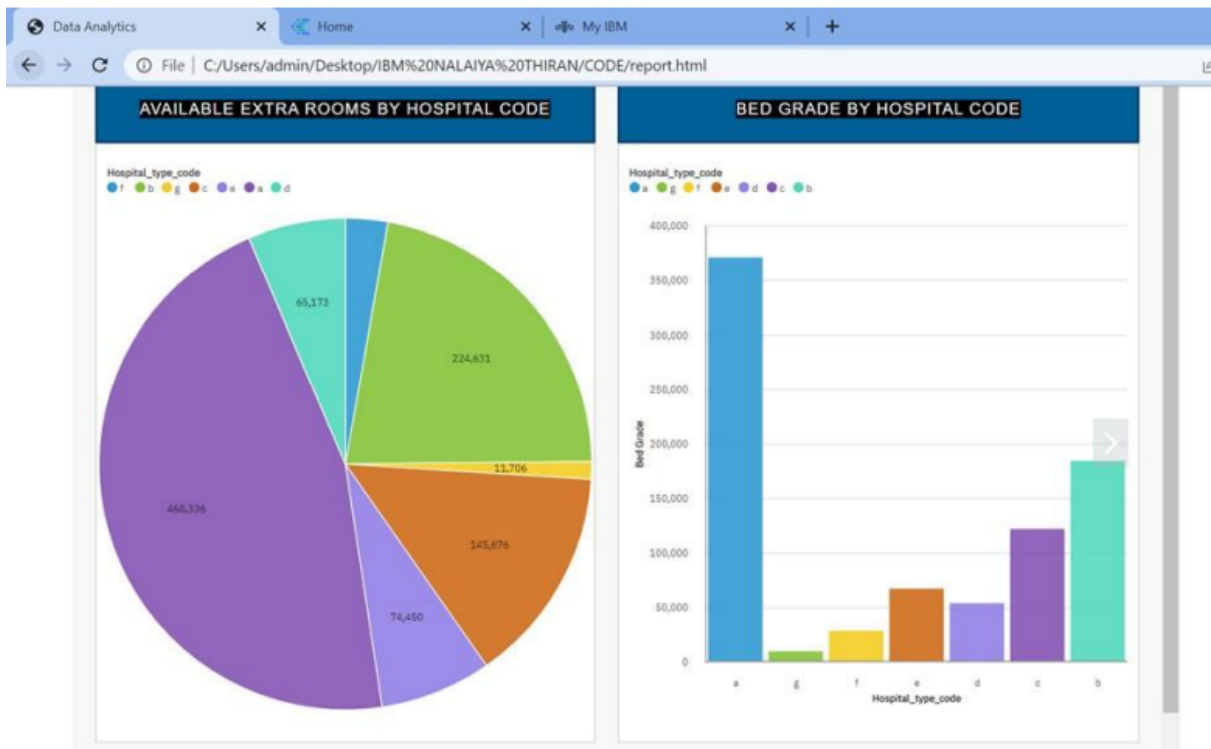
## 7.2 FEATURE 2

Analytics for Hospitals' Health-Care Data

TOTAL NUMBER OF PATIENT BY TYPE OF ADMISSION		TOTAL NUMBER OF PATIENT BY SEVERITY OF ILLNESS	
	patientid		patientid
Urgent	3,208,577,326	Extreme	3,698,539,732
Trauma	9,992,095,510	Moderate	11,571,687,485
Emergency	7,735,854,876	Minor	5,666,300,495

AVAILABLE EXTRA ROOMS BY HOSPITAL CODE	BED GRADE BY HOSPITAL CODE
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Data Analytics Health Care Data Analytics My IBM

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### ANALYTICS FOR HOSPITAL HEALTH CARE DATA

#### STAY BY PATIENT BASED ON AGE

	patientid
31-40	4,204,621,998
41-50	4,186,909,837
71-80	2,358,759,679
0-10	409,787,176
21-30	2,684,213,304
11-20	1,102,975,101
91-100	82,910,496
51-60	3,188,152,500
81-90	523,279,330
61-70	2,194,918,291

#### PATIENT BY AGE

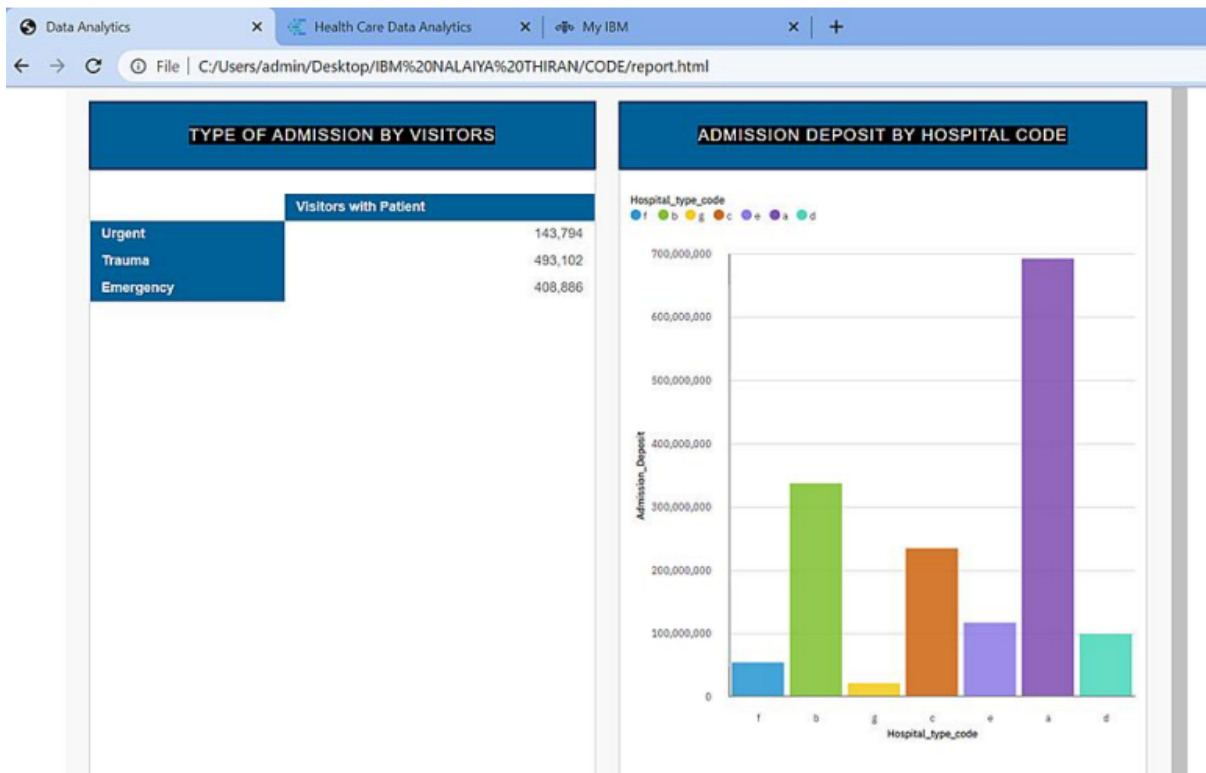
	patientid
31-40	4,204,621,998
41-50	4,186,909,837
71-80	2,358,759,679
0-10	409,787,176
21-30	2,684,213,304
11-20	1,102,975,101
91-100	82,910,496
51-60	3,188,152,500
81-90	523,279,330
61-70	2,194,918,291

#### TYPE OF ADMISSION BY VISITORS

	Visitors with Patient
Urgent	143,794

#### ADMISSION DEPOSIT BY HOSPITAL CODE

Hospital\_type\_code



## CHAPTER 8

### TESTING

#### 8.1 TEST CASES

- verify user is able to see home page
- verify user is able to see dashboard page
- verify user is able to navigate to story page
- verify

## 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	8	5	0	3	16
Duplicate	1	0	5	0	6
External	0	3	2	1	6
Fixed	13	4	3	16	36
Not Reproduced	0	1	0	0	1
Skipped	0	1	0	1	2
Won't Fix	1	4	2	1	8
Totals	23	18	12	22	75

### 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	9	0	0	9
Client Application	43	0	0	43
Security	1	0	0	1
Outsource Shipping	1	0	0	1

Exception Reporting	9	0	0	9
Final Report Output	10	0	0	10
Version Control	1	0	0	1

## CHAPTER 9

## RESULTS

### 9.1 PERFORMANCE METRICS



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).

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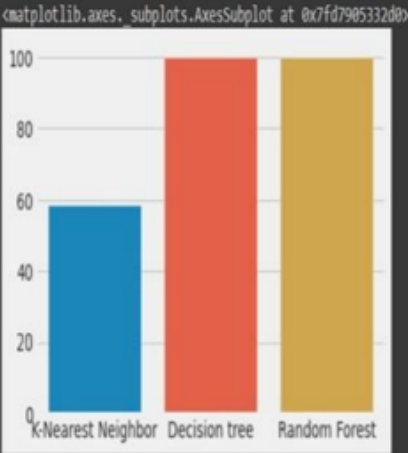
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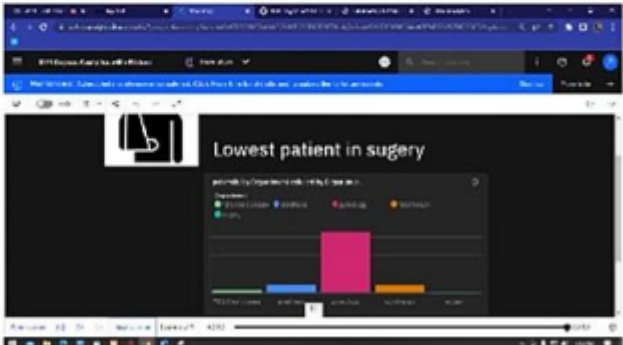
Section	Total Cases	Not Tested	Fail	Pass
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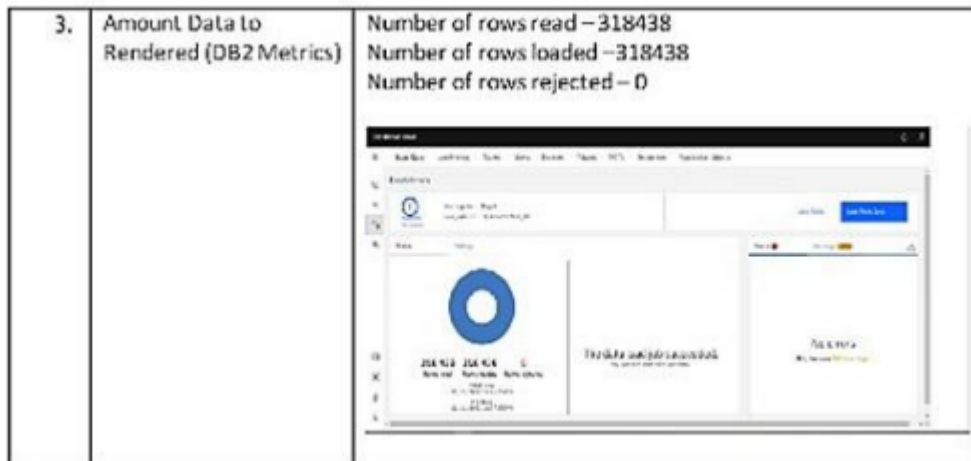
Exception Reporting	9	0	0	9
Final Report Output	10	0	0	10
Version Control	1	0	0	1

```
[ ] sns.barplot(x= ['K-Nearest Neighbor','Decision tree','Random Forest'],y= [acc_knn, acc_decision_tree,acc_random_forest])
```





4.	Utilization of Data Filters	<p>We created filters for Dashboards which is perfectly working.</p>  <p>The screenshot shows a web application interface with a sidebar menu on the left. The main content area displays a dashboard with several data visualizations. A large card on the left shows the number '32' with the label 'Completed tasks'. To its right is a filter panel with a dropdown menu set to 'All' and a list of items. Further right is a bar chart showing data for different categories, with a prominent value of '367K' displayed above the bars.</p>
5.	Effective User Story	<p>Number of Scene Added – 7 Animations are perfectly displayed. Images are perfectly rendered.</p>  <p>The screenshot shows a scene titled 'Lowest patient in surgery'. It features a dark background with a central bar chart. The chart has three bars of different colors (blue, red, and orange) representing data for different categories. A legend on the right side of the chart identifies the categories. The scene is part of a larger application, as indicated by the browser window and sidebar menu visible in the background.</p>
6.	Descriptive Reports	<p>Number of Visualizations / Graphs – 6</p>



## 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

## **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 healthcare. 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 before 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 data, 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 violets privacy

### **MAN POWER:**

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

## **CHAPTER 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 continues 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-centered healthcare depends on knowing what patients want and need. Data analytics holds the key to unlocking this vital information.

## **CHAPTER 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 particular 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.