

# ANALYTICS FOR HOSPITAL'S HEALTH-CARE DATA

## PROJECT REPORT

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# 1.INTRODUCTION

## 1.1 Project Description

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.

## 1.2 Goal

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.

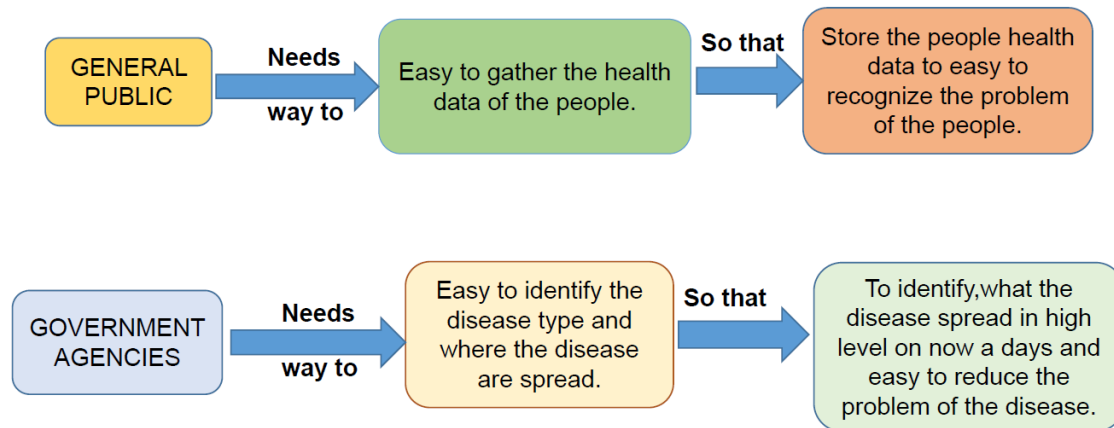
# 2. LITERATURE SURVEY

## 2.1 References

TITLE	AUTHOR	ALGORITHM	DESCRIPTION
Big data analytics in hospital health care	Ashwin Belle Raghuram Thiagarajan S. M. Reza Soroushmehr	Data analytics	Leverage legions of disparate, structured and unstructured data sources is going to play a vital role in health care. Have patents to some of the methodologies surveyed in this paper.

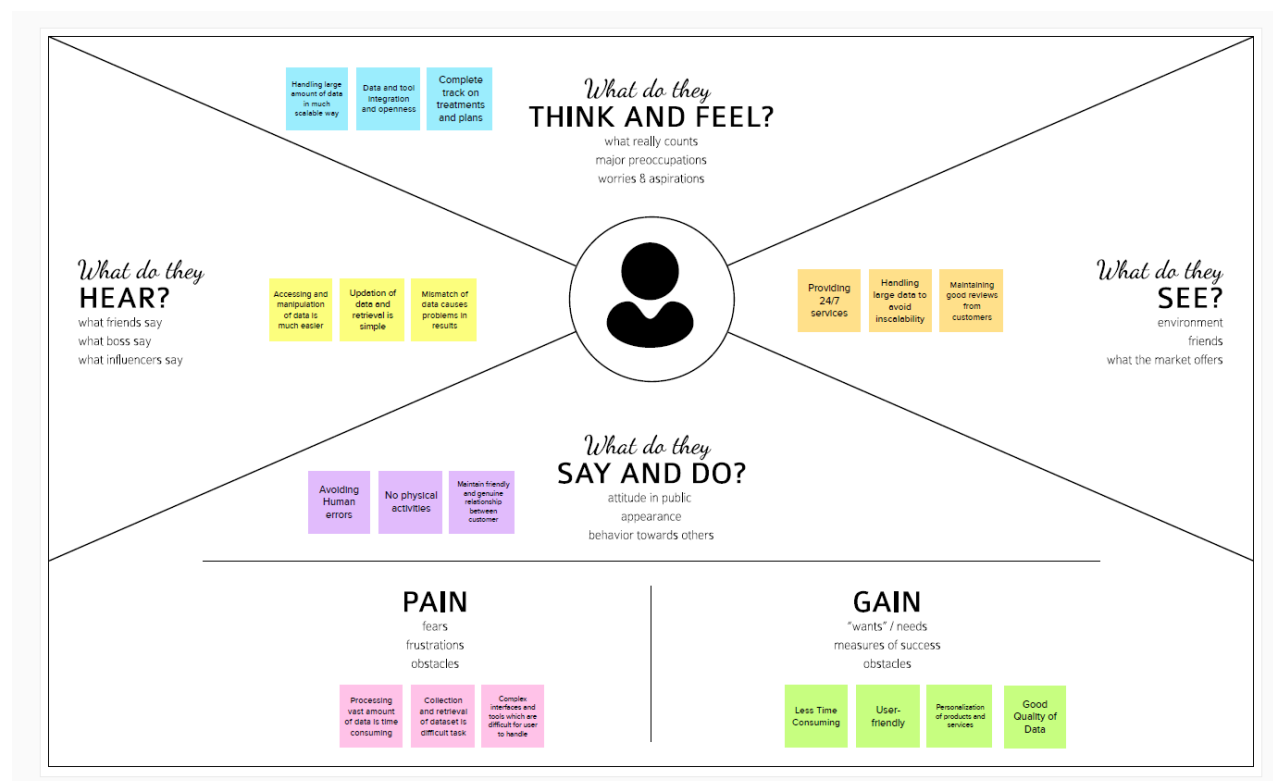
TITLE	AUTHOR	ALGORITHM	DESCRIPTION
The role of big data analysis in hospital management system	Dhivyalakshmi.S	Data analytics	Helpful in tracing and handling the population health more competently and successfully. It improves the ability to deliver preventive care. Four main security models approach was introduced.
Data Analytics in Medical Data	M.S.Simi	Data Analytics	The aim of this research work is to give a review on the foundation benchmarks in analytics of infertility, and present the findings and results of past researches on utilizing data analytics procedures to analyze electronic health records.

## 2.2 PROBLEM STATEMENT DEFINITION



## 3. IDEATION PHASE

### 3.1 Empathy Map Canvas



### 3.2 Ideation & Brainstorming



### 3.3 Proposed Solution

### i) Problem Statement (Problem to be solved)

To predict the length-of-stay for each patient at time of admission.

## ii)Idea / Solution description

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.

### iii) Novelty / Uniqueness

The most important aspect of this work was how the patient diagnoses played a more important role than age when predicting the length-of-stay. The prediction model would become more accurate with this optimization, as there were sufficient admission records in the dataset to support reasonable diagnoses model training.

#### iv) Social Impact / Customer Satisfaction

Predicting length of stay (LOS) is beneficial to patients and the health service. Once the patient knows the length of stay they can be prepared in all the ways. They can be ready with hospital expenditure once they know the LOS.

### v)Business Model (Revenue Model)

As it is an efficient method for predicting patient stay it will be sold large in market which leads to huge profit.

## vi) Scalability of the Solution

This system provides the prediction of LOS which yield a more reliable estimate of the LOS.

### 3.4 Problem Solution fit

Define CS, fit into CC	<b>1. CUSTOMER SEGMENT(S)</b> <b>CS</b> <ul style="list-style-type: none"> <li>Patients</li> <li>Hospital Management</li> </ul>	<b>6. CUSTOMER CONSTRAINTS</b> <b>CC</b> <p>The main challenge for overseers of such plans is making hospital financiers look beyond obvious financial ramifications. For instance, some of the strategies suggested will eliminate unnecessary use of tests, surgical procedures or other hospital services. This may lead to diminished income for the company</p>	<b>5. AVAILABLE SOLUTIONS</b> <b>AS</b> <p>There are few length of Stay prediction model available which lacks in predicting some exceptional case where the length of stay may extend.</p>	Explore AS, differentiate

Focus on J&P, fit into BE, understand RC	<b>2. JOBS-TO-BE-DONE / PROBLEMS</b> <p>Hospitals face many challenges from within and outside of the health sector which indirectly affect the patients and staff.</p>	<b>9. PROBLEM ROOT CAUSE</b> <b>RC</b> <p>Most problems hospitals face lie in financial issues, which are not limited to budget cuts from government funding, medical care reimbursement delays</p>	<b>7. BEHAVIOUR</b> <b>BE</b> <p>Developing a model which predicts the length of stay of unexceptional cases with better accuracy.</p>	Focus on J&P, fit into BE, understand RC

Identify strong TR & EM	<b>3. TRIGGERS</b> <b>TR</b> <p>To accurately predict the length of stay</p>	<b>10. YOUR SOLUTION</b> <b>SL</b> <p>Our solution includes using algorithms like Fuzzy Logic, Tree Bagger, Random Forest, and Decision Trees to predict the length of stay more accurately. Gives frequent update about the bed availability.</p>	<b>8. CHANNELS of BEHAVIOUR</b> <b>CH</b> <p>8.1 ONLINE Should Have To Check The Possibilities of Emergency Occupancy 8.2 OFFLINE Check the Availability of Beds in Hospital.</p>
	<b>4. EMOTIONS: BEFORE/AFTER</b> <b>EM</b> <p>Before : Patients often get frustrated and depressed. After: They feel better and get new beginning</p>		

## 4.REQUIREMENT ANALYSIS

### 4.1 Functional Requirements

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 in real time by the hospitals
FR-6	Concise	These dashboards are clear, intuitive, and customizable and interactive in manner

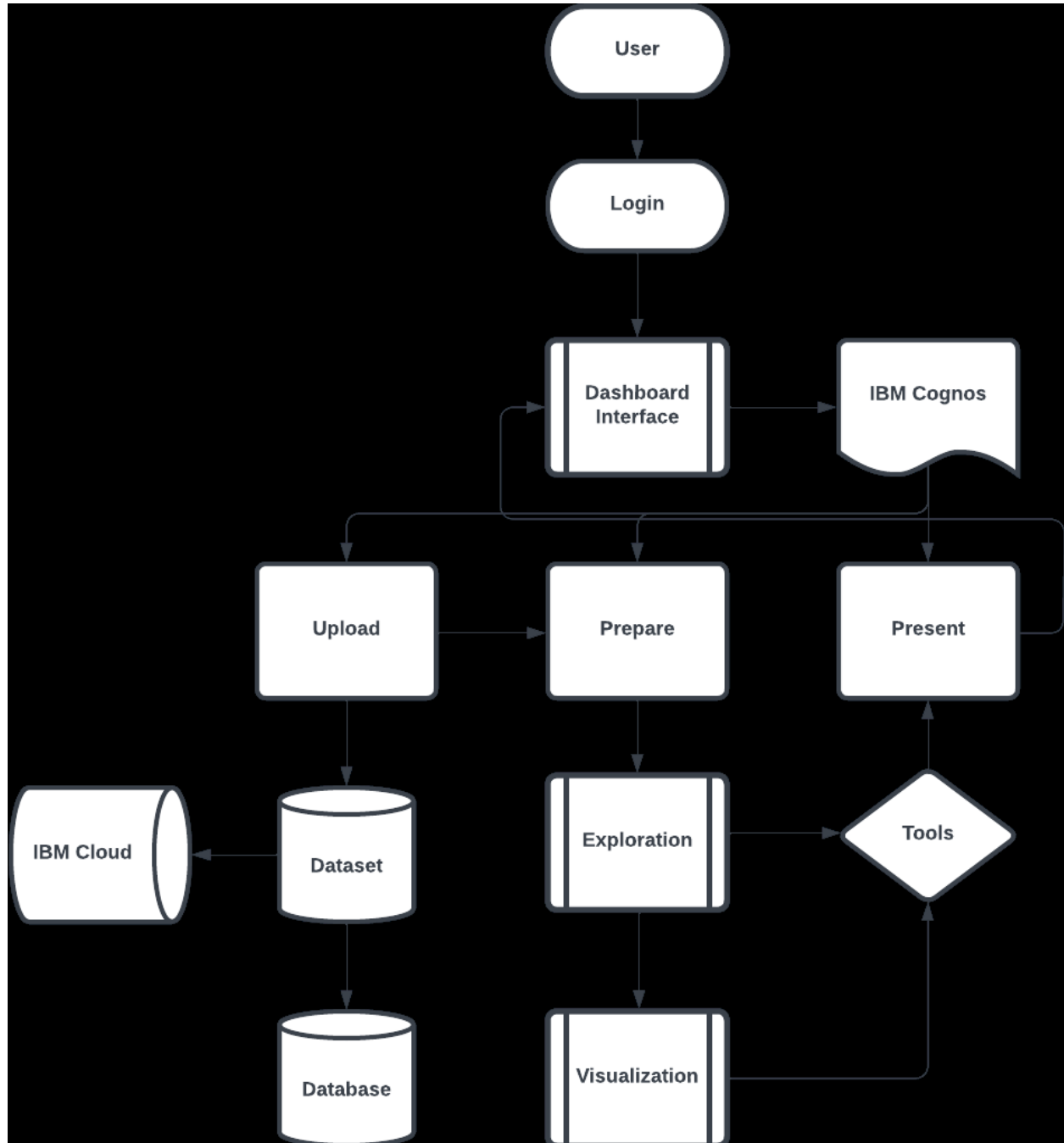


## 4.2 Non Functional Requirements:

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.

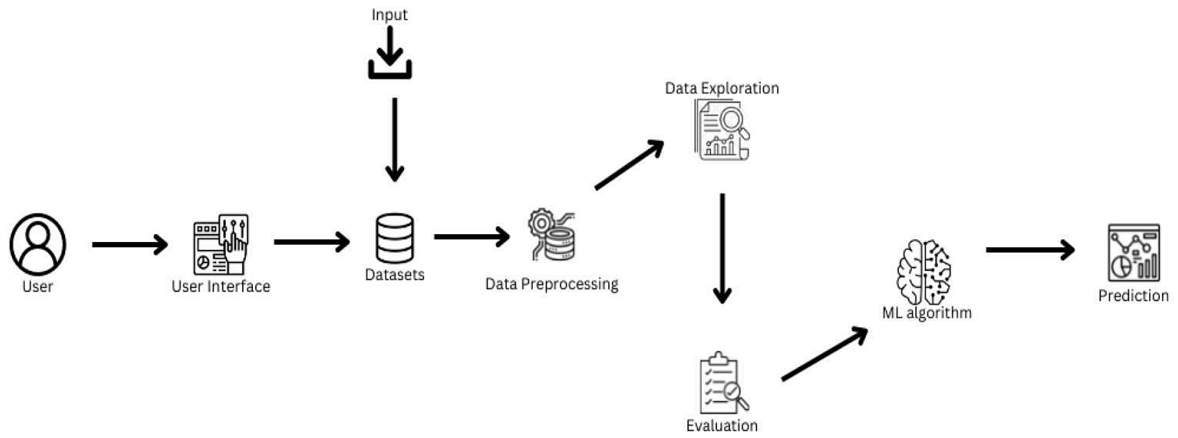
## 5.PROJECT DESIGN

### 5.1 Data Flow Diagrams

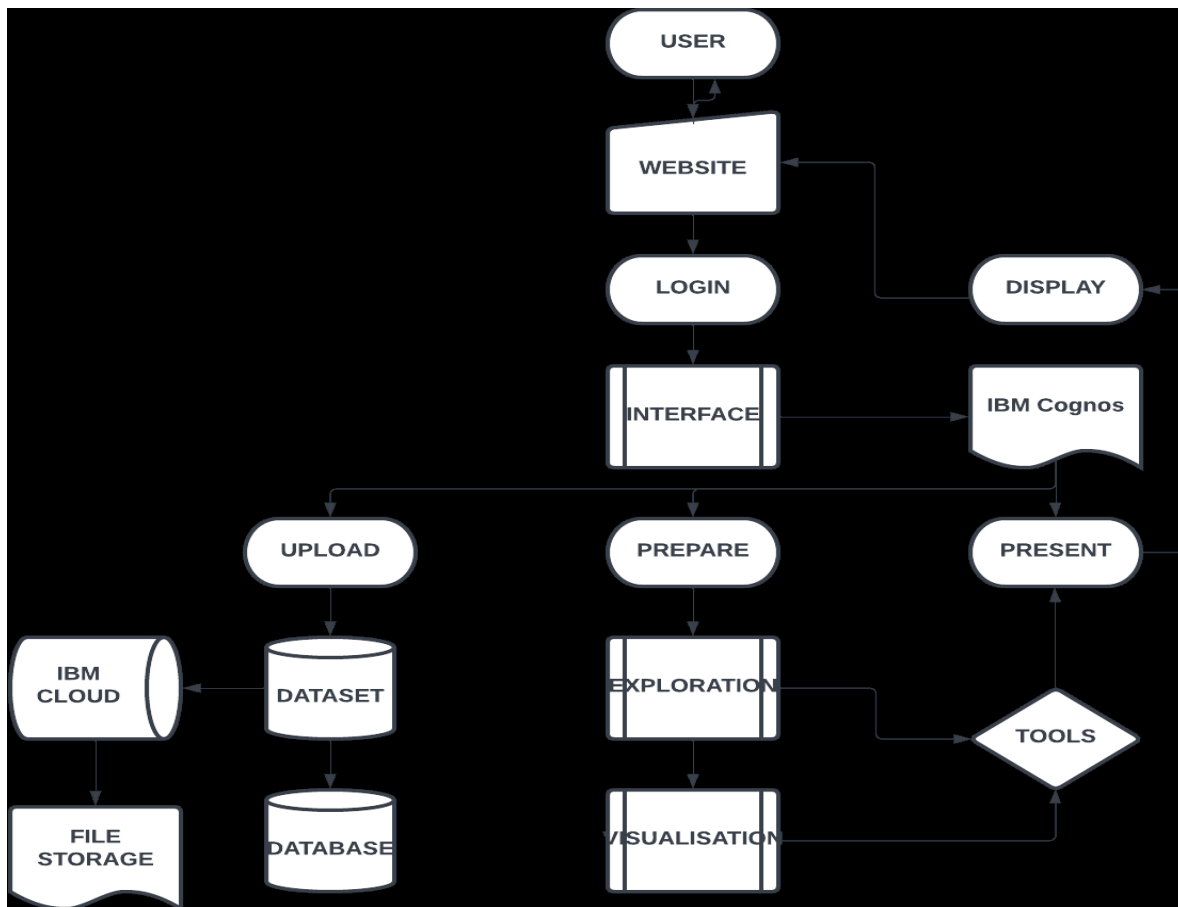


## 5.2 Solution & Technical Architecture

### Solution Architecture



### Technical Architecture



## 5.3 User Stories

<b><u>Sprint-1:</u></b> 1. Data Collection 2. Data Preparation <b><u>Sprint-2:</u></b> 1. Data Exploration	<b><u>Sprint-3:</u></b> 1. Dashboard Creation <b><u>Sprint-4:</u></b> 1. Report Creation 2. Story Creation
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## 6.PROJECT PLANNING & SCHEDULING

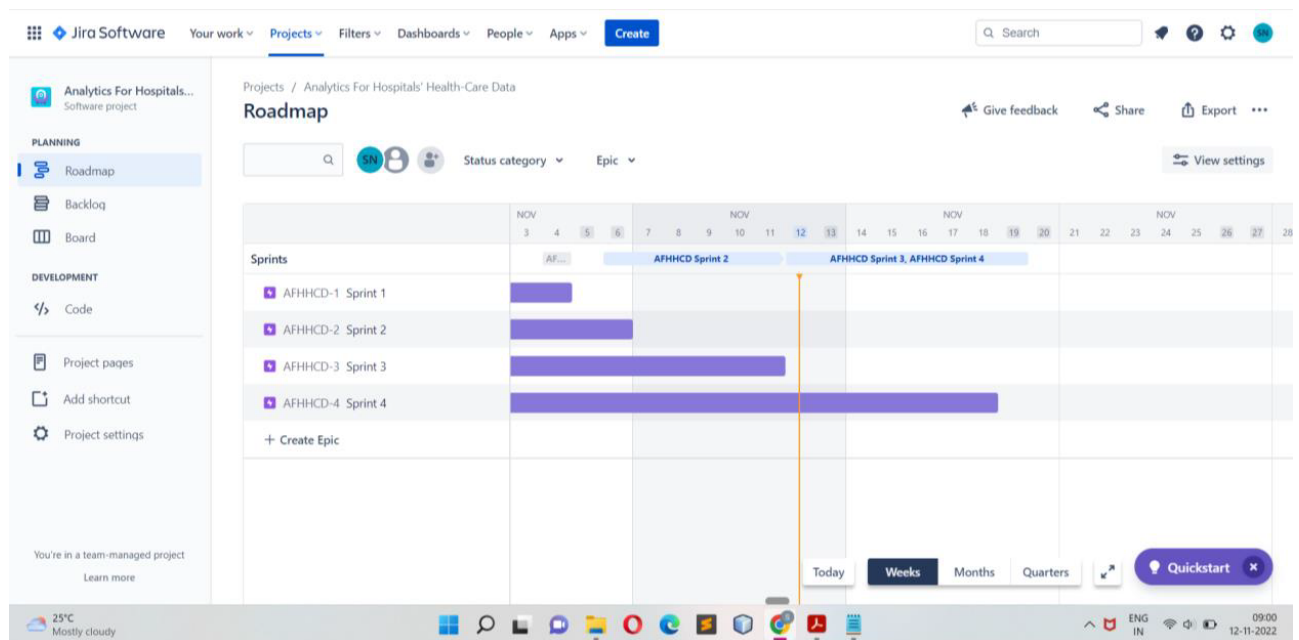
### 6.1 Sprint Planning & Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Team Members
Sprint-1	Registration	USN-1	As a health care provider I can create account in IBM cloud and the data are collected.	2 Members
Sprint-2	Analyze	USN-2	As a health care provider all the data that are collected is cleaned and uploaded in the database or IBM cloud.	2 Members
Sprint-3	Dashboard	USN-3	As a health care provider I can use my account in my dashboard for uploading dataset.	2 Members
Sprint-4	Visualization	USN-4	As a health care provider I can prepare data for Visualization	2 Members

## 6.2 Sprint Delivery Schedule

Sprint	Total story points	Duration	Sprint Start Date	Sprint End Date
Sprint 1	20	6 days	24 Oct 2022	29 Oct 2022
Sprint 2	20	6 days	31 Oct 2022	05 Nov 2022
Sprint 3	20	6 days	07 Nov 2022	12 Nov 2022
Sprint 4	20	6 days	14 Nov 2022	19 Nov 2022

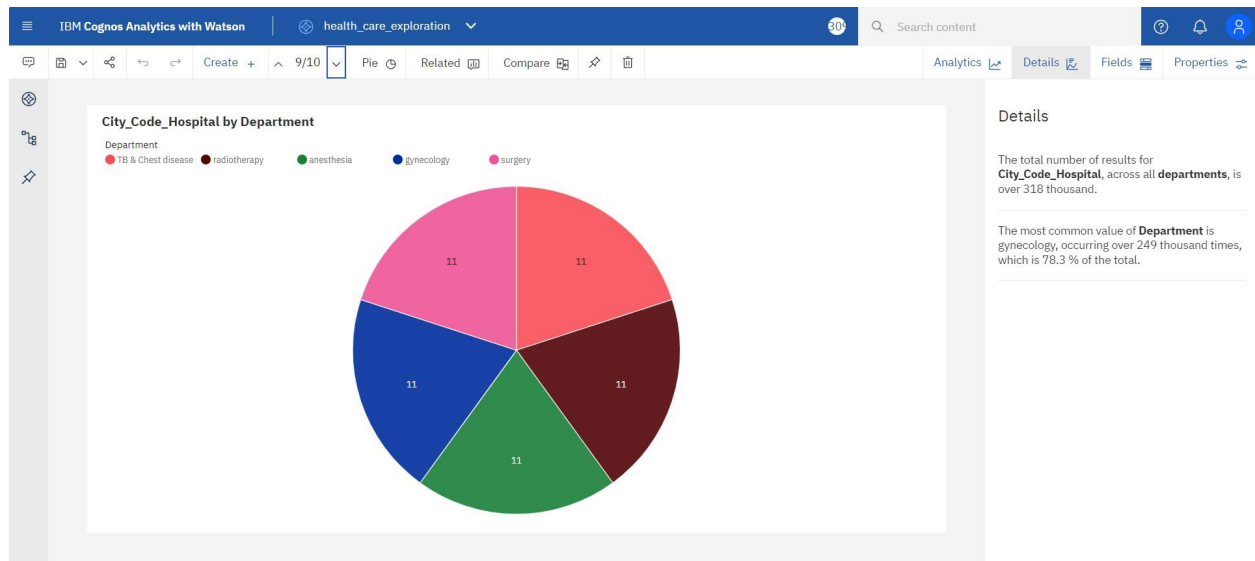
## 6.3 Reports from JIRA



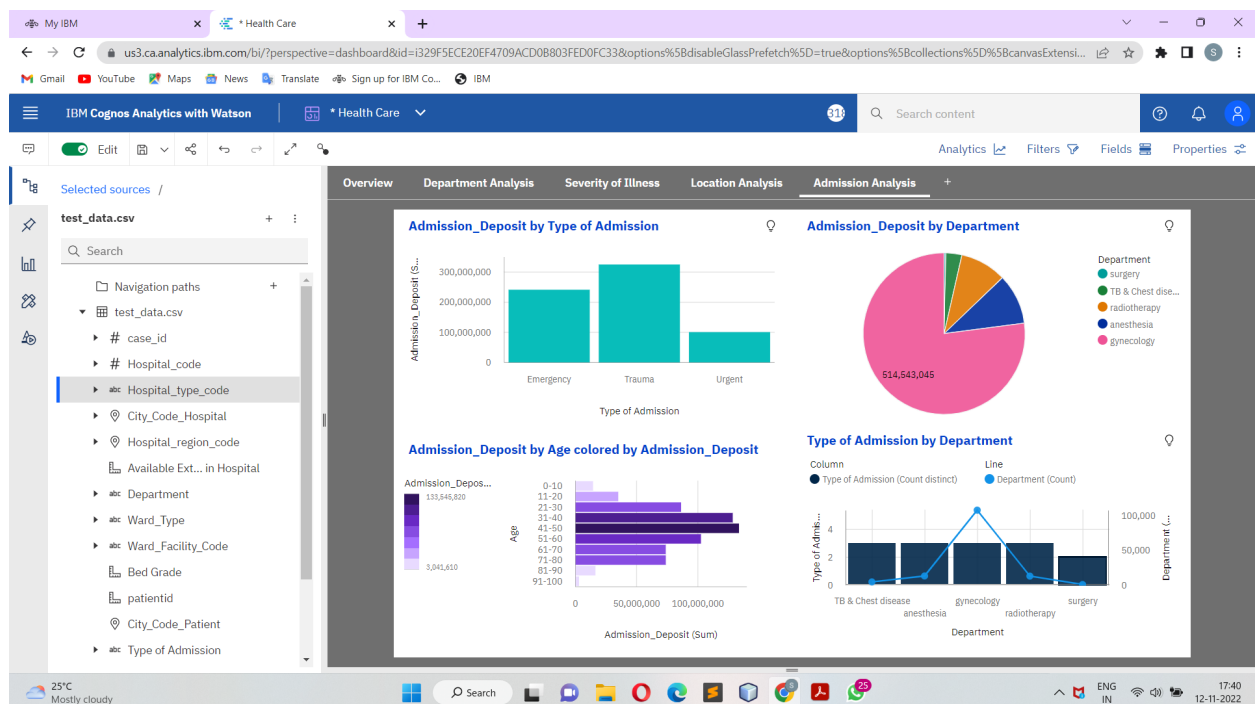


## 7.CODING AND SOLUTINING

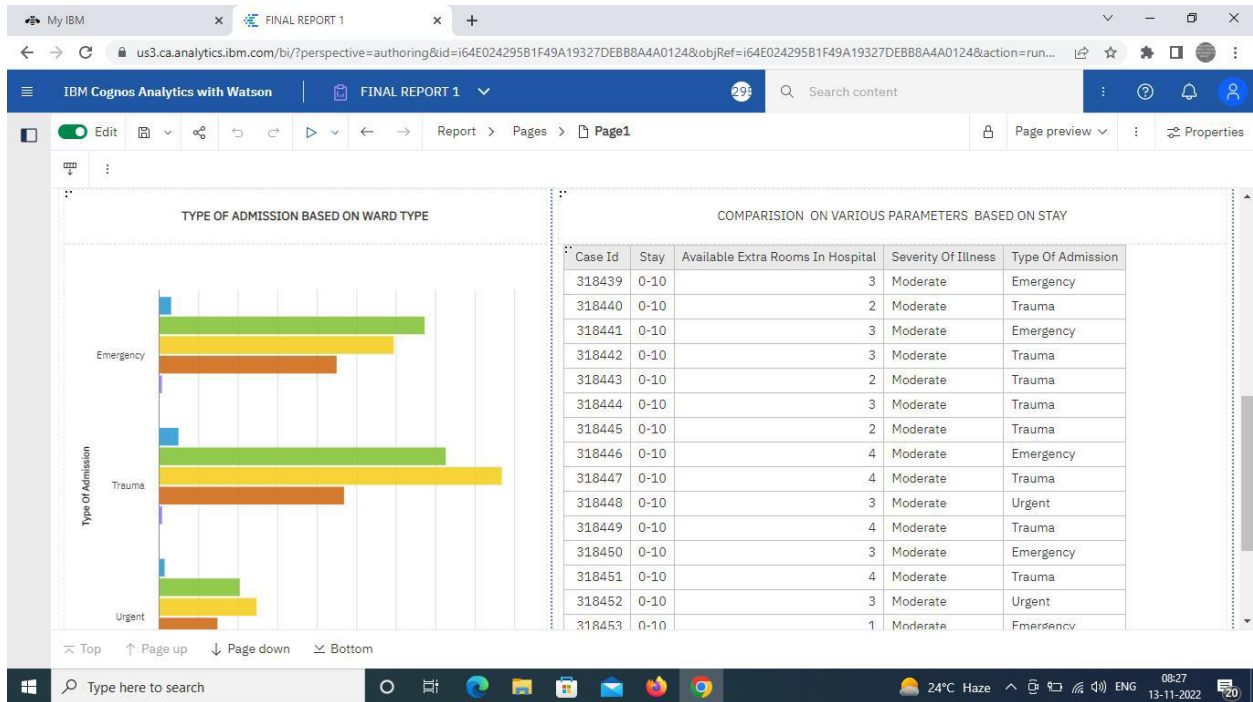
### 7.1 Data Exploration



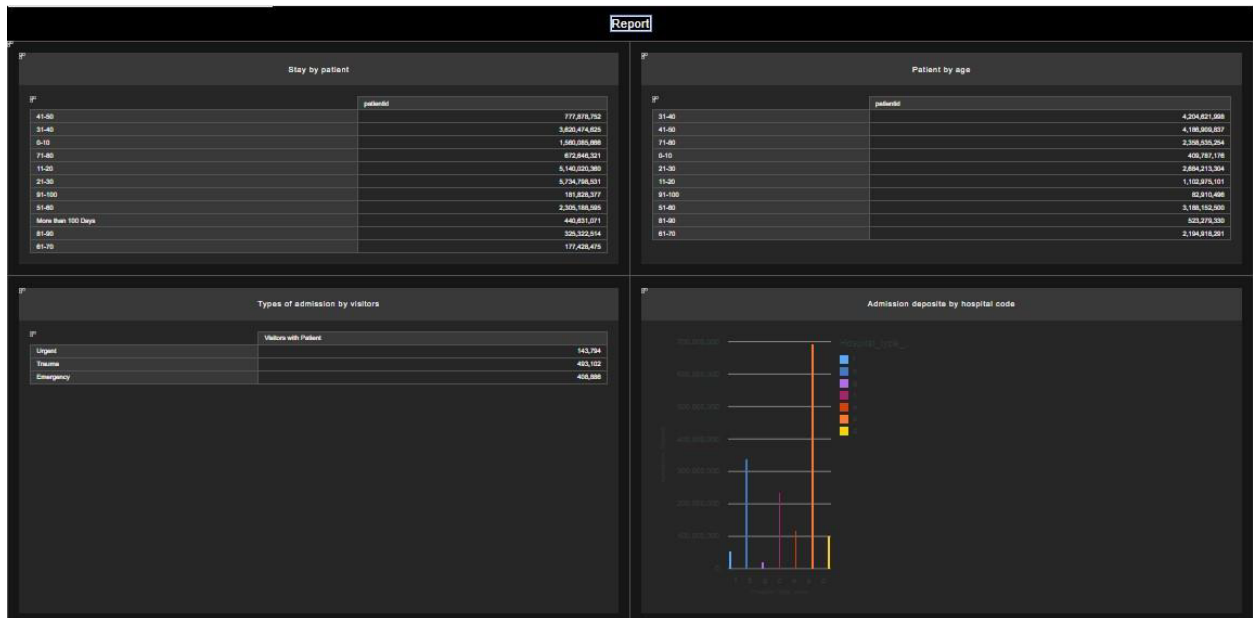
### 7.2 Dashboard Creation



## 7.3 Report Creation



## 7.4 Story Creation





## 8. Testing

### 8.1 Test Cases

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

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	2	0	0	2
Client Application	3	0	0	3
Security	2	0	0	2
Outsource Shipping	2	0	0	2
Exception Reporting	2	0	0	2
Final Report Output	2	0	0	2
Version Control	0	0	0	0

### 8.2 User Acceptance Test

Resolution	Severity1	Severity2	Severity3	Severity4	Subtotal
By Design	5	5	3	0	13
Duplicate	0	0	0	0	0
External	7	5	1	0	13
Fixed	11	8	7	5	31
Not Reproduced	1	0	0	0	1
Skipped	0	0	0	0	0
Won'tFix	0	0	0	0	0
Totals	24	18	11	5	58

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

## **9.RESULTS**

### **9.1 Performance Metrics**

S.No.	Parameter	Screenshot / Values
1.	Dashboard design	12 / 5
2.	Data Responsiveness	The final output from IBM Cognos With Watson further converted into PDF or Story file, so it can be viewed by all devices.
3.	Amount Data to Rendered (DB2 Metrics)	0 KB.
4.	Utilization of Data Filters	The Utilization of data Filters like Ascending, Descending, Format and so on.
5.	Effective User Story	12
6.	Descriptive Reports	12 / 5

## **10. ADVANTAGES AND DISADVANTAGES**

### **10.1 Advantages**

- Personal Health data records
- Alert
- Risk management
- Medical imaging
- High quality healthcare
- Effective management of population health

## 10.2 Disadvantages

Replacing Medical Personnel

Data Safety

Quality of Data Input

Privacy

## 11.CONCLUSION

Thus, the goal 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 is achieved using IBM COGNOS ANALYTICS.

## 12.FUTURE SCOPE

This 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.

## 13.APPENDIX

<b>Github</b>	<a href="https://github.com/IBM-EPBL/IBM-Project-29407-1660125194">https://github.com/IBM-EPBL/IBM-Project-29407-1660125194</a>
<b>Demo Link</b>	<a href="https://drive.google.com/drive/folders/1qrAYnJpLDM0-Mqc9WgKIS_bNffmRSQxS?usp=sharing">https://drive.google.com/drive/folders/1qrAYnJpLDM0-Mqc9WgKIS_bNffmRSQxS?usp=sharing</a>

