ANALYTICS FOR HOSPITALS'HEALTH-CARE DATA

TEAM ID: PNT2022TMID41523

TEAM LEADER

M.SUBA– 621119104020

TEAM MEMBERS

S.PRIYA JENCY - 621119104014

SB.SNEHA - 621119104017

Bachelor of Engineering

In

Computer Science & Engineering

TEAM MEMBER

C.MAGIMAI ILAKKIYA MARY - 621119205004

Bachelor of Technology

In

Information Technology

IDHAYA ENGINEERING COLLEGE FOR WOMEN

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PROJECT REPORT

TEAM ID	**PNT2022TMID41523**
PROJECT NAME	**Analytics For Hospitals' Health-Care Data**

TEAM MEMBERS:

Team leader : SUBA M

Team member 1 : MAGIMAI ILAKKIYA MARY C

Team member 2 : PRIYA JECY S

Team member 3 : SNEHA SB

CHAPTER 1

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 findtrends 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

Health care management is the planning, administration, and management of all health care systems, hospitals, and other medical facilities. Health care management roles are crucial to the overall operations of the health care system.

Covid-19 recently, one of the most neglected areas to concentrate on has come under scrutiny due to the pandemic: healthcare management. While data science has many applications in healthcare administration,

If one wants to increase the effectiveness of healthc are management in a hospital, patient length of stay is one crucial indicator to track and forecast. At the time of admission, this metric aids hospitals in identifying patientswho are at high LOS-risk (patients who will stay longer). Once identified, patients at high risk for LOS can have their treatment plans improved to reduce LOS and reduce the risk of infection in staff or visitors. Additionally, prior awareness of LOS might help with planning logistics like room and bed allotment.

1.2.Purpose

In healthcare, data analytics are crucial. According to the Harvard Business School, it aids healthcare organisations in the evaluation and training of practitioners, the identification of scan anomalies, and the forecasting of disease outbreaks. Additionally, data analytics can improve business intelligence and cut expenses for healthcare firms. Hospital data analytics can review patient records and any medication prescribed to identify improper dosages or prescriptions and notify doctors and patients, reducing human error and hospital costs. As a result, better insights are gained, and healthcare professionals are able to make wise decisions.

CHAPTER 2

2.LITERARTURE SURVEY

The healthcare sector is widely considered as one of the most important industries in information technology (Wager 2005). More and more, information technology has been considered as a practice that facilitates healthcare performance through using data and information efficiently within the healthcare sectors. Therefore, Wager et al (2005) said that in order to understand the relation between information technologies and healthcare, we first need to understand what are the technologies used in healthcareThe healthcare sector is widely considered as one of the most important industries in information technology (Wager 2005).

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Therefore, Wager et al(2005) said that in order to understand the relation between information technologies and healthcare, we first need to understand what are the technologies used in healthcareIn the mid-80,’s information technology changed the healthcare industry and brought many benefits when they used microcomputers, which were a small in shape, fast and very powerful for that time. Moreover, this allowed hospitals to develop clinical applications for various medical care settings. As a result, hospitals started to purchase and adopt information

systems in the healthcare industries, and after that, challenges began to emerge when professionals tried to integrate data among these systems (Wager et al 2005).

The healthcare industry has generated large amount of data generated from record keeping, compliance and patient related data. In today's digital world, it is mandatory that these data should be digitized. To improve the quality of healthcare by minimizing the costs, it's necessary that large volume of data generated should be analysed effectively to answer new challenges. Similarly government also generates petabytes of data every day. It requires a technology that helps to perform a real time analysis on the enormous data set. This will help the government to provide value added services to the citizens. Big data analytics helps in discovering valuable decisions by understanding the data patterns and the relationship between them with the help of machine learning Algorithms (1).This paper provides an overview of big data analytics in healthcare and government systems. It describes about big data generated by these systems, data characteristics, security issues in handling big data and how big data analytics helps to gain a meaningful insight on these data set.

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TITLE :Historical Review of Health Policy Making AUTHOR : Ravi Duggal

Health policy making and health planning in India is not a post-independence phenomenon. In fact, the most comprehensive health policy and plan document ever prepared in India was on the eve of Independence in 1946. This was the 'Health Survey and Development Committee Report' popularly referred to as the Bhore Committee. This Committee prepared a detailed plan of a National Health Service for the country, which would provide a universal coverage to the entire population free of charges through a comprehensive state run salaried health service.

Such a well-studied and minutely documented plan has not as yet been prepared in Independent India. Health services in India today in terms of accessibility are as inadequate and underdeveloped as they were during the time of the Bhore Committee. The analysis of the health situation by the Bhore Committee in the early forties would hold good if a similar enquiry were undertaken today, over half a century later. Instead of the National Health Service that the Bhore Committee had envisaged, which would be available to one and all irrespective of their ability to pay, further commodification of health care services took place strengthening the operation of market forces in this sector. The enclave pattern of development of the health sector continues even today - the poor, the villagers, women and other underprivileged sections of society, in other words the majority, still do not have access to affordable basic health care of any credible quality ventricular tachycardia(3.4%)which includes cardiogenic shock (1.4%)to hypotension (0.3%).

Disadvantages

To put more Extensive effort into building these predictive models.

2.1.EXISTING PROBLEM

- The already existing model istrained with minimal parameters
- Low accuracy in prediction
- No feature extractiondone
- High complexity

2.2.PROBLEM STATEMENT AND DEFINITION

• The aim is to accurately predictthe Length of Stay for each patienton 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.

2.3.REFERENCES

[1] Data analytics for the sustainable use of resources in hospitals: Predicting the length of stay for patients with chronic diseases
httP-s://www.sciencedirect.com/science/article/P-iilS0378720619301594

[2] Robust Length of Stay Prediction Model for Indoor Patients

httP-s://www.researchgate.net/P-ublication/355174497 Robust Length of Stay : Predicti on Model _for_Indoor_Patients

[3] Predicting length of stay in hospitals intensive care unit using general admission features
http-s://www.sciencedirect.com/science/article/P-iilS2090447921001349

[4]] Using Data Analytics to Improve Hospital Quality Performance

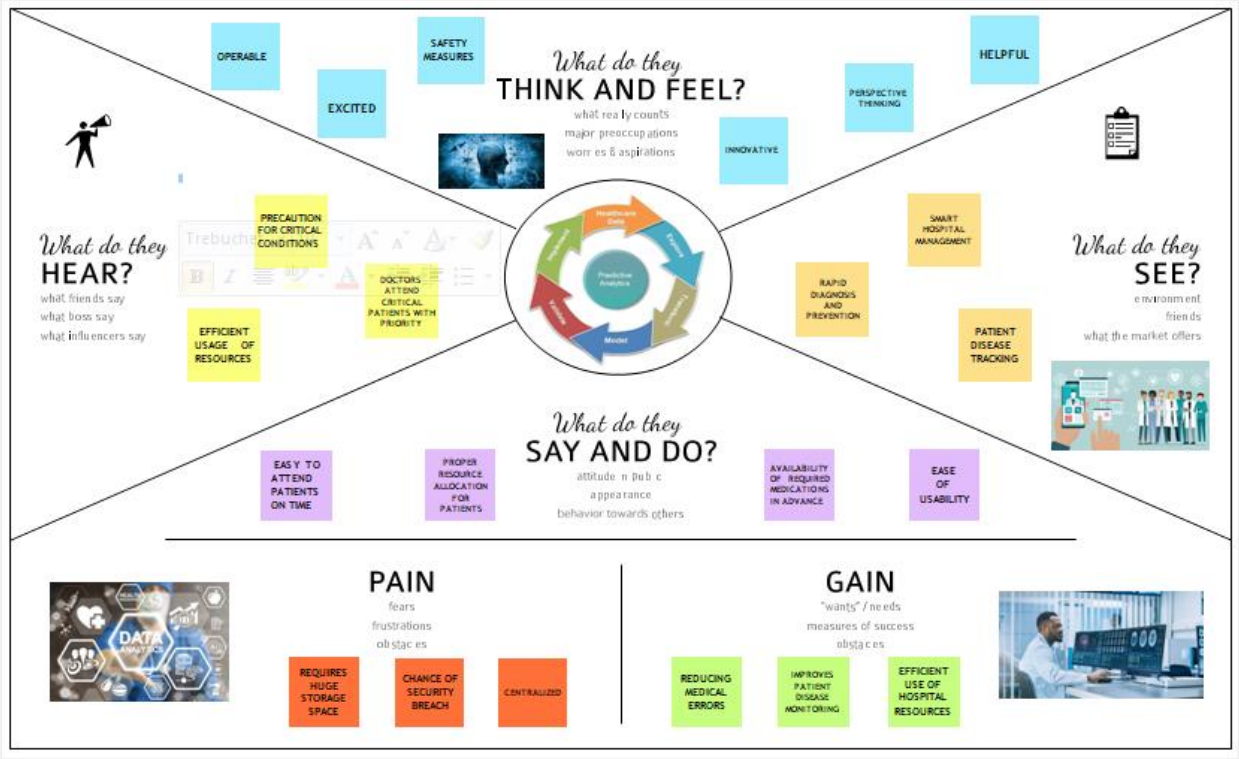
htt ps:// jou rnals.lww.com/ jhmonline/ Fulltext/ 2020/08000/Using_Data Analytics_to Improve Hospital_Qualtiy.9.aspx

[5] Big Data analytics on Diabetic Retinopathy Study (DRS) on real-time data set identifying survival time and length of stay
https://www.sciencedirect.com/science/article/pii/S1877050916304926

CHAPTER 3

3.IDEATION & PROPOSED SOLUTION

3.1.EMPATHY MAP CANVAS

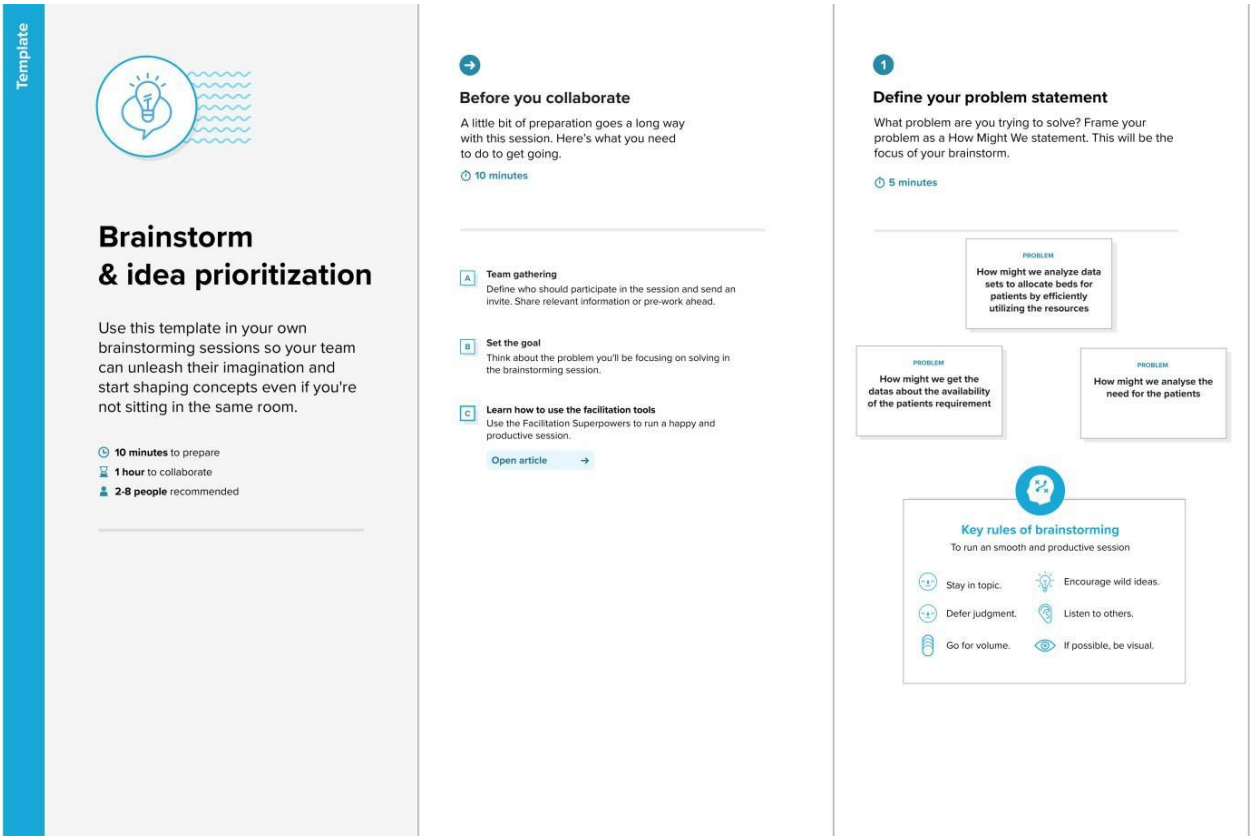


3.2.IDEATION & BRAINSTORMING

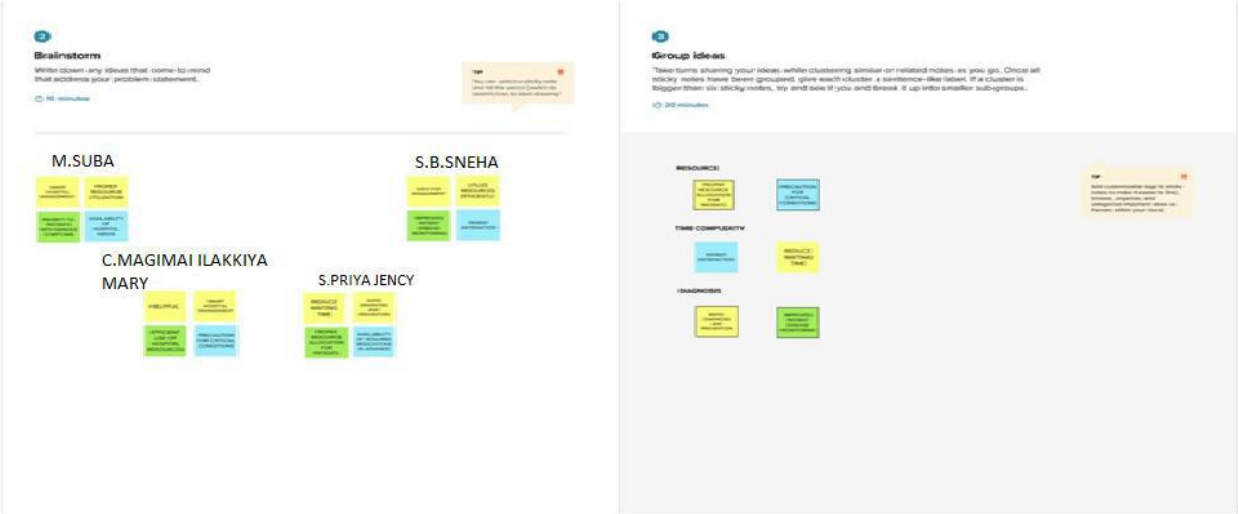
Brainstorm & Idea Prioritization Template:

Reference: https://www.mural.co/templates/empathy-map-canvas

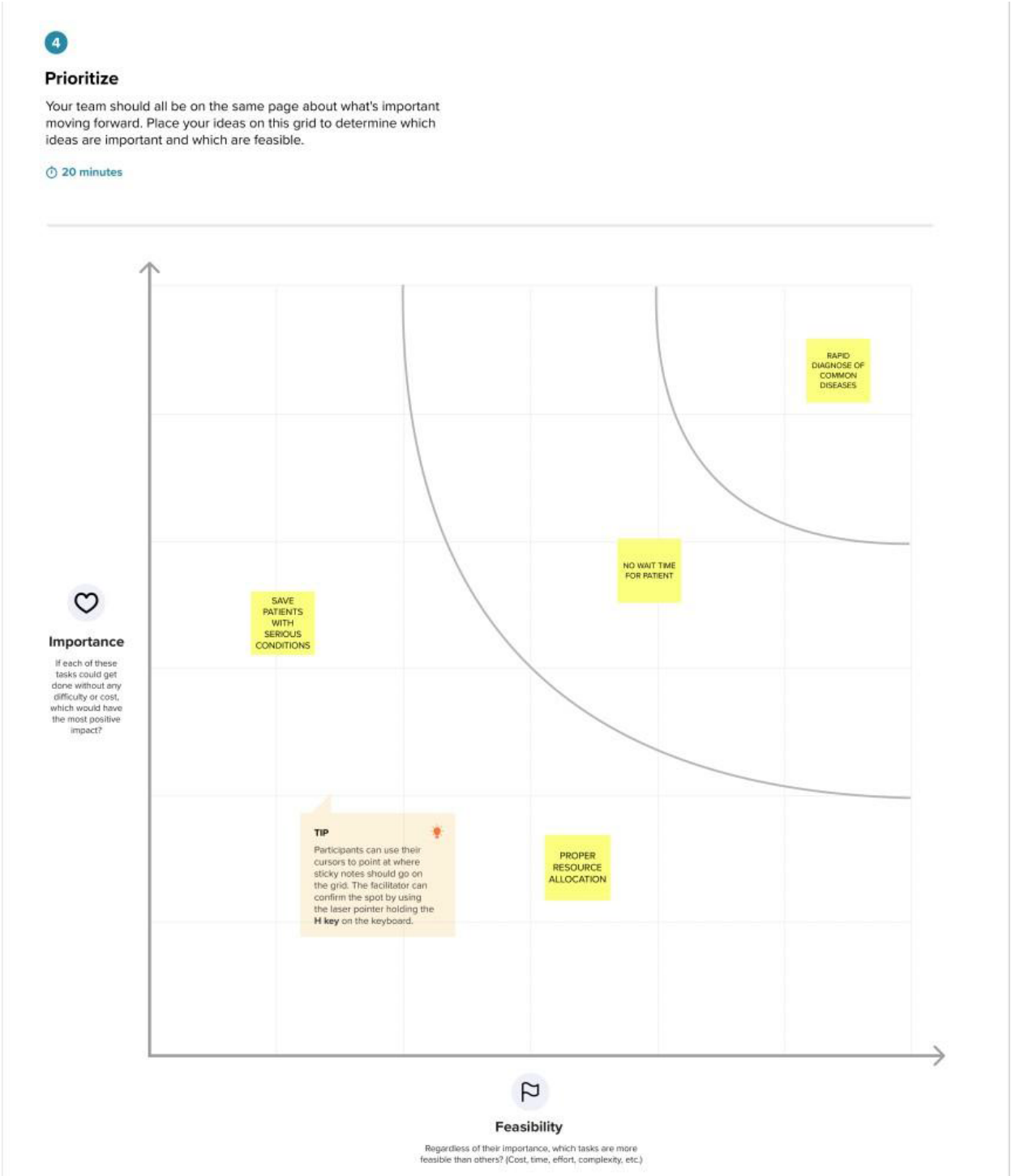
Step-1: Team Gathering, Collaboration and Select the Problem Statement



Step-2: Brainstorm, Idea Listing and Groupin



Step-3: Idea Prioritization



3.3.PROPOSED SOLUTION

Project team shall fill the following information in proposed solution template.

S.No.	Parameter	Description
1	ProblemStatement(Problemtobesolve)	During the covid-19 pandemic, we have faced one of thedifficulttimesofourlife.Everyoneseekstosurvivefrom thegreat disaster. At the time of pandemic, noone get to knowabout which hospital has vacant beds(free beds) to admitthemselves or others infected by covid. This situation madethedeathratehigher.
2	Idea/Solutiondescription	Predictive analytics can create patient journey dashboards anddisease trajectories that helps us to know about the patient'speriodofstay.Itimproveseffectiveallocation ofbedsandotherresources,treatmentdelivery,improvesefficiencies,andsoon.

3	Novelty/Uniqueness	Healthcare data frequently resides in several locations. TheCollected data should be stored in central system(like centralizedstorage). This data becomes accessible and usable when it iscombinedintoasingle,centralsystem,suchasanenterprisedatawarehouse (EDW). Uniqueness of our project is that we can ableto use data for different things such as which medicine is moreeffective and for understanding behavioural pattern of particulardisease.
4	SocialImpact/CustomerSatisfaction	effectiveuseofresourceEnhanced diagnosisImprovedTreatment enhancing the overall quality oftreatmentandlifeofpatients
5	BusinessModel(RevenueModel)	With the gathered data, redirecting the patients to particularhospitalbasedonthevacancy,leadingretailersusedmethodslikemarket-basket analysis to discover insights about consumerpurchase behaviour and used these insights to optimize thephysical store experience, target relevant ads and streamline thesupplychain, amongotherstrategicinitiatives.

6	ScalabilityoftheSolution	A variety of institutions must store, evaluate, and take action onthe massive amounts of data being produced by the health caresectorasitexpandsquickly.Indiaisavast,culturallyvariednationwith a sizable population that is increasingly able to accesscentralisedhealthcareservices.

3.4.PROBLEM SOLUTION FIT

CHAPTER 4

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.

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 comprehensive overview of patient's L 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

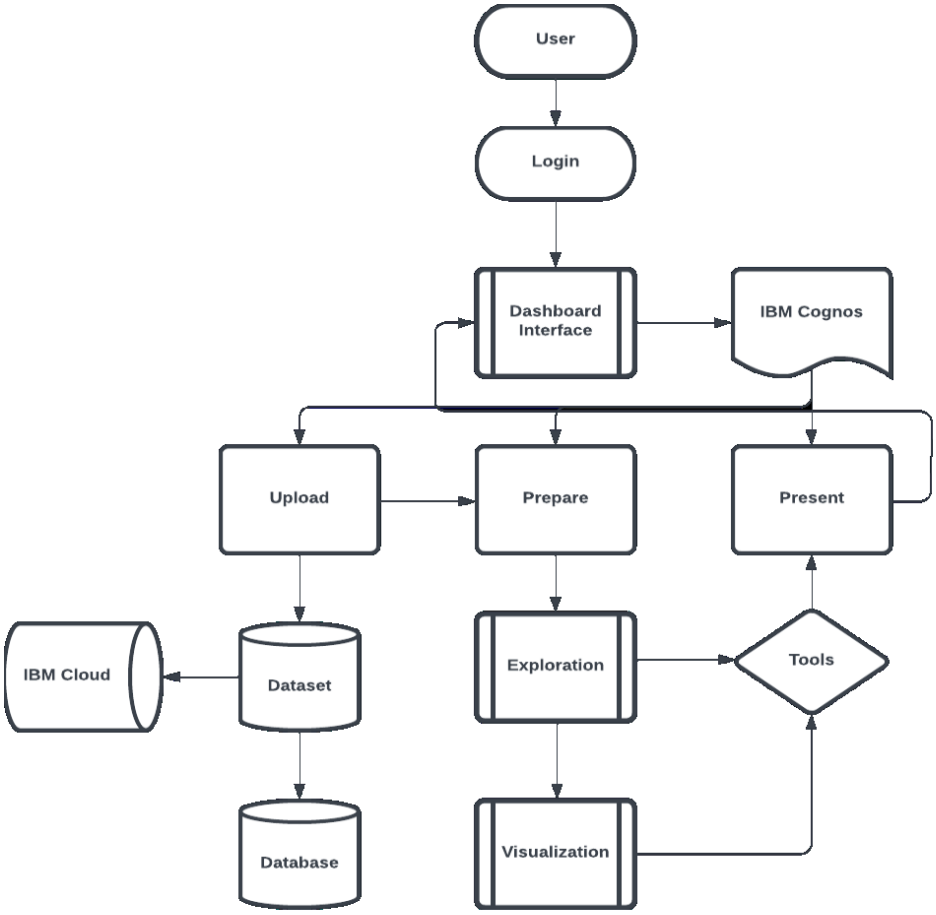
		user’s demand in timely manner and it is also helps to provide necessary information to the user’s dataset
NFR-6	**Scalability**	The layers used in the dashboard are a hosted feature layer, feature layer view, or hosted tile layer

CHAPTER 5

5.PROJECT DESIGN

5.1.DATA FLOW DIAGRAM

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.



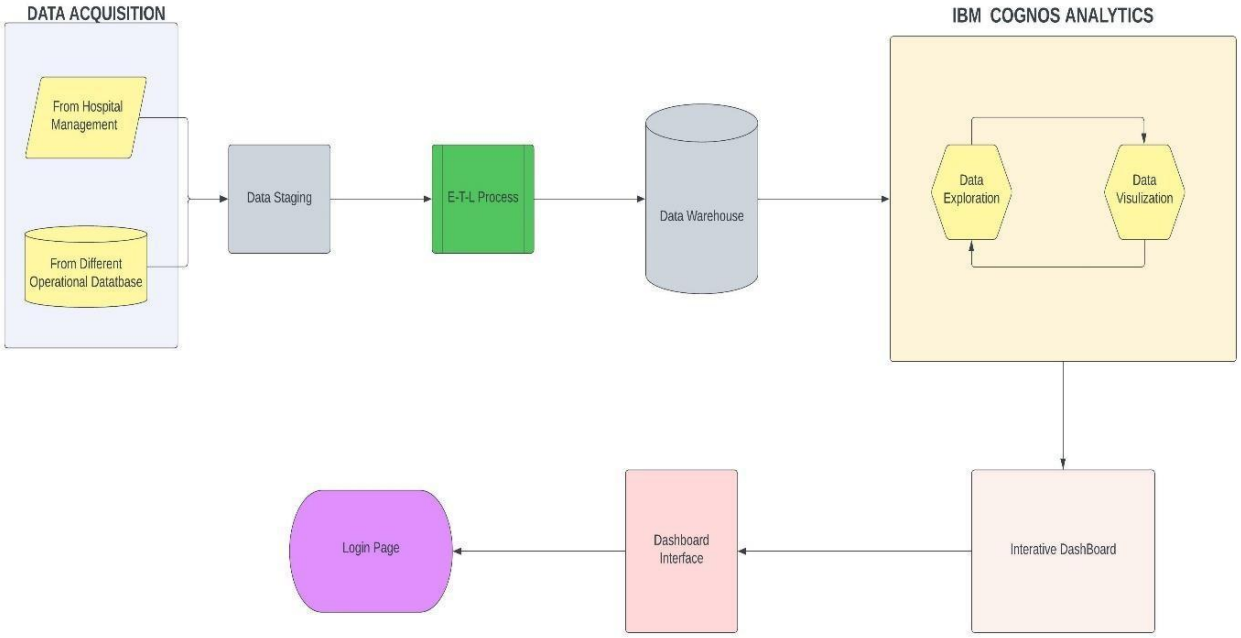
5.2.User Stories

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

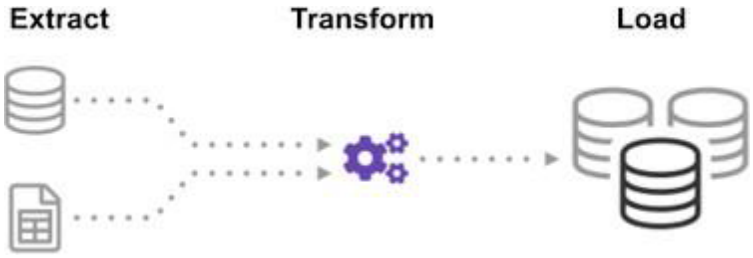
User Type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Release
Customer (Mobile user)	Registration	USN-1	As a user, I can register for the dashboard by entering my email, and password, and confirming my password.	I can access my account in the dashboard	High	Sprint-1
		USN-2	As a user, I will receive a confirmation email once I have registered for the dashboard	I can receive a confirmation email & click confirm	High	Sprint-1
		USN-3	As a user, I can register for the dashboard through Social Media	I can register & access the dashboard with Social Media Login	Low	Sprint-2
		USN-4	As a user, I can register for the dashboard through Gmail	I can register and access dashboard with Gmail	Medium	Sprint-2
	Login	USN-5	As a user, I can log into the application by entering email & password	I can login to the account in my email login.	High	Sprint-2
	Dashboard	USN-6	As a user ,I can use my account in my dashboard for uploading dataset.	I can login to the account for uploading dataset.	Medium	Sprint-3
Customer (Web user)	Website	USN-7	As a user ,I can use my dashboard in website	I can login into the dashboard by visiting website.	Medium	Sprint-3
Customer Care Executive		USN-8	As a user ,I can contact Customer care Executive for my login.	I can contact customer executive for my login.	High	Sprint-4
Administrator		USN-9	As a user ,I can contact administrator for my queries.	I can contact administrator for solving my queries.	High	Sprint-4
Exploration	Dashboard	USN-10	As a user, I can prepare data by using Exploration Techniques.	I can prepare data by using Exploration Techniques.	High	Sprint-3
Presentation	Dashboard	USN-11	As a user, I can Present data in my dashboard.	I can present data by using my account in dashboard.	High	Sprint-4
Visualization	Dashboard	USN-12	As a user, I can Prepare Data by using Visualization Techniques.	I can prepare data by using Visualization Techniques.	High	Sprint-3

SOLUTION AND TECHNICAL ARCHITECTURE

5.3.SOLUTION ARCHITECTURE



ETL PROCESS (DATAINTEGRATIONPROCESS)



CHAPTER 6

6.PROJECT PLANNING AND SCHEDULING

6.1.Sprint Delivery Plan I

Project Planning Phase

Project Planning Template (Product Backlog, Sprint Planning, Stories, Story points).

Product Backlog, Sprint Schedule, and Estimation

Sprint	Functional Requirement (Epic)	User Story Number	User Story / Task	Story Points	Priority	Team Members
Sprint-1	Retrieve Data	USN-1	As a user, I should get clearer clinical context for AIDS patient's unique case	10	Medium	M.Suba C.Magimai illakkiya mary
Sprint-1	Visualize the data	USN- 2	As a user,I need nicely visualized dashboard of number of beds occupied and number of free beds in hospital.	20	High	M.Suba C.Magimai illakkiya mary S.Priya jency SB.Sneha
Sprint-2	Track of patient visit of Hospital	USN-3	Tracking a patient Health care over years of visit and Screening of data they have in hospital.	10	Medium	M.Suba C.Magimai illakkiya mary S.Priya jency SB.Sneha
Sprint -2	Dashboard	USN - 4	As a user , I want the interactive dashboard to analyze the data. Have the data in terms of Graph.	20	High	M.Suba C.Magimai illakkiya mary S.Priya jency SB.Sneha
Sprint-3	Detailed EHR's of patient	USN-5	Provided greater details in the EHR's of individual patient with clear idea of what to do.	10	Medium	C.Magimai illakkiya mary S.Priya jency SB.Sneha
Sprint- 3	Story Creation	USN-6	As a user , I need the story animation of the data set with insights	20	High	M.Suba C.Magimai illakkiya mary S.Priya jency SB.Sneha
Sprint-4	Predict LOS	USN-7	As a user, I want the flawless system to predict the length of stay of the patients	20	High	M.Suba C.Magimai illakkiya mary S.Priya jency SB.Sneha

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	6 Days	24 Oct 2022	29 Oct 2022	20	29 Oct 2022
Sprint-2	20	6 Days	31 Oct 2022	05 Nov 2022	20	05 Nov 2022
Sprint-3	20	6 Days	07 Nov 2022	12 Nov 2022	20	12 Nov 2022
Sprint-4	20	6 Days	14 Nov 2022	19 Nov 2022	20	19 Nov 2022

Project Planning Phase

Milestones & Tasks

MILESTONES	TASKS
MILESTONE-1	COLLECTION OF DATA
MILESTONE-2	UPLOADING THE REQUIRED DATASON THE PLATFORM (IBM COGNOS)
MILESTONE-3	EXPLORATION AND VISUALIZATIONOF DATA

MILESTONE-4	CREATING THE INTERACTIVEDASHBOARD.
MILESTONE-5	DISPLAY THE INSIGHTS IN THEDASHBOARD

MILESTONE-6	PREPARE A STANDARDIZED DATASET AND USING THE DATA REQUIRED WITH THE HELP OF PYTHON PROGRAM

MILESTONE-7	USAGE OF VARIOUS ALGORITHM TO OBTAIN THE DESIRED RESULT WITH MORE ACCURACY USING GOOGLE COLAB.
MILESTONE-8	DISPLAY THEM IN THE REQUIREDFORMAT
MILESTONE-9	DEPLOYED IN THE GITHUB

PROJECT DEVELOPMENT PHASE

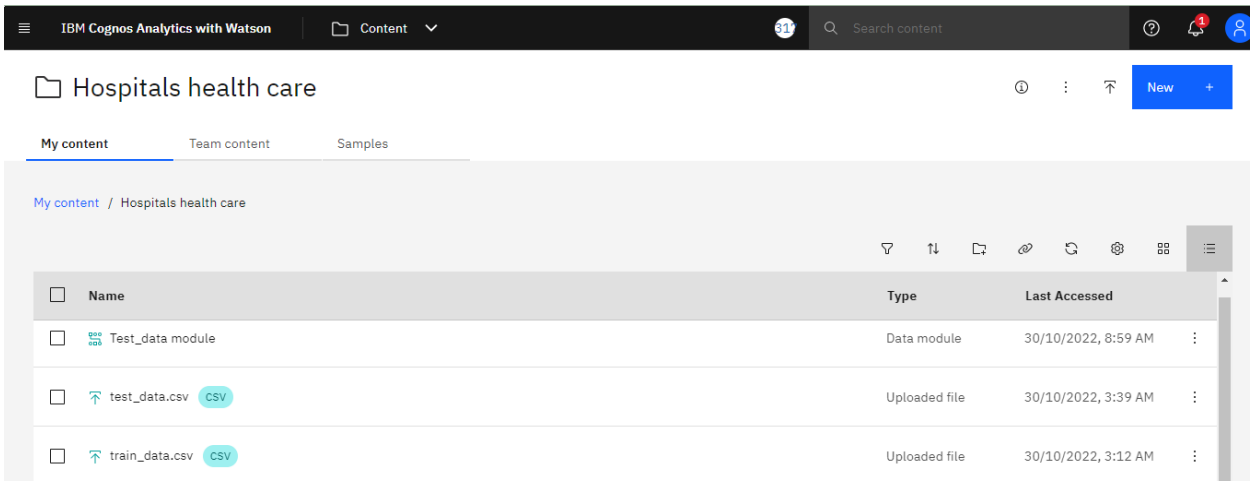
Sprint Delivery Plan I

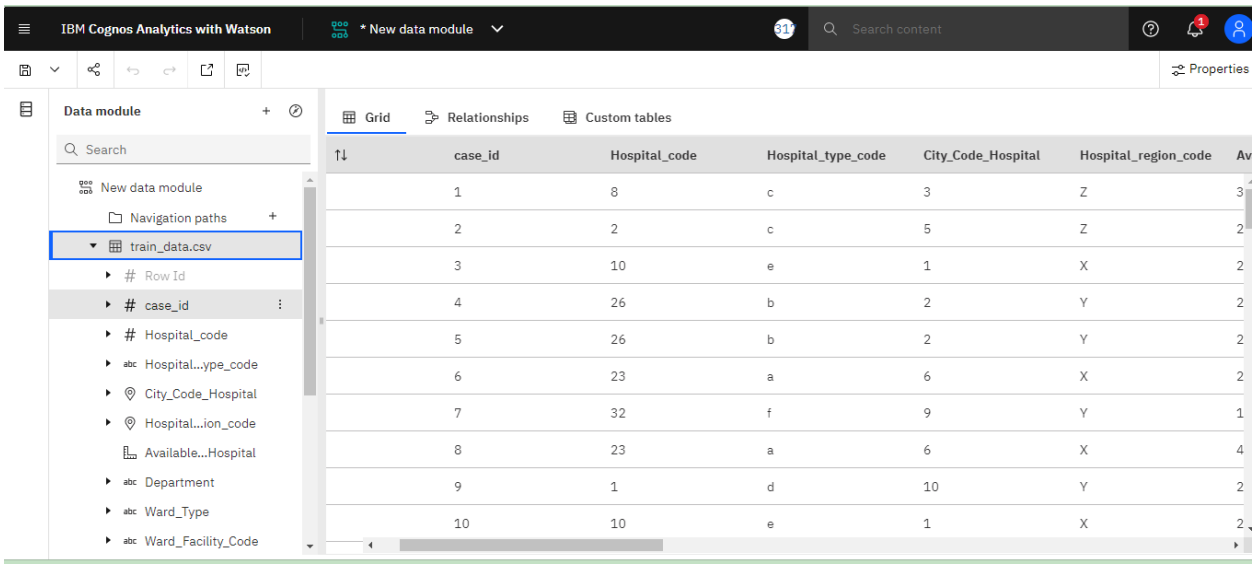
Importing Data Sets of Analytics for Hospitals Health Care Data Using Cognos Analysis:

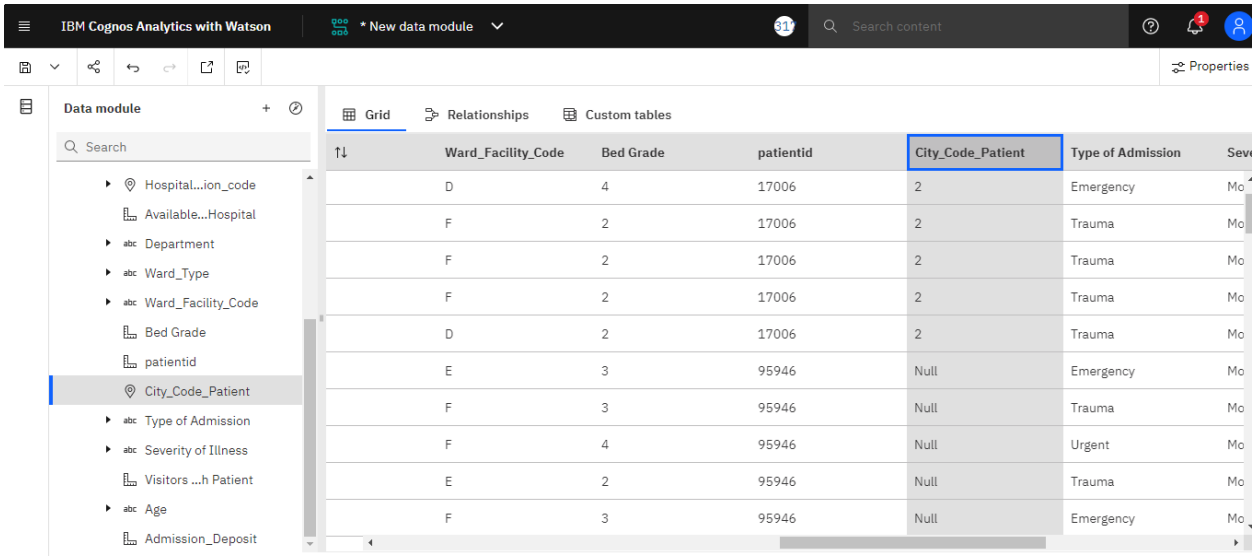
USN-1:

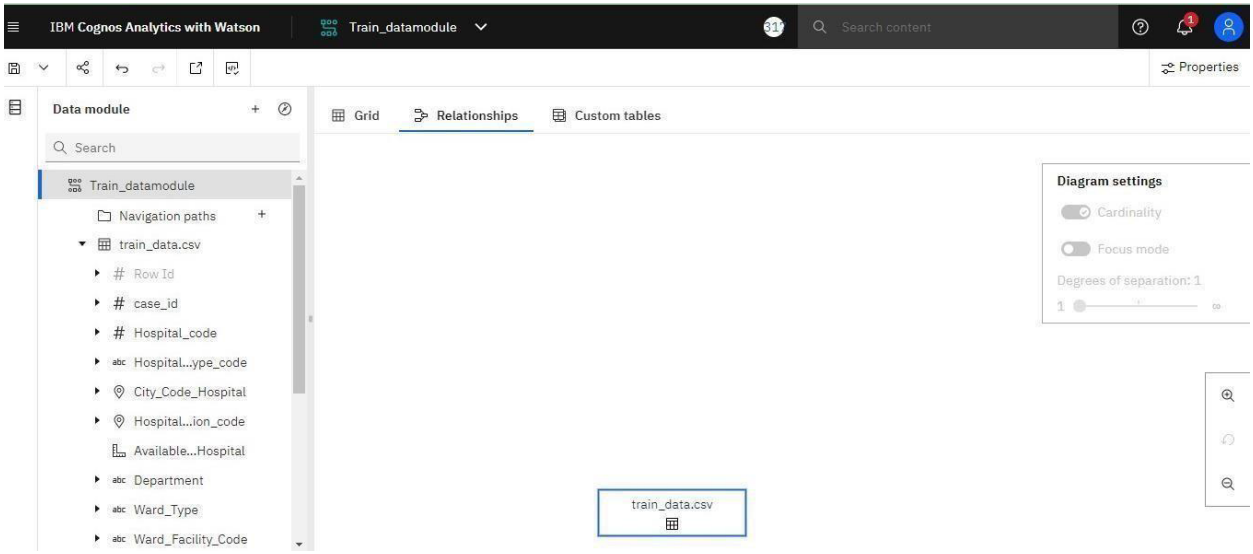
As a User I can enter the details of the patients working in our organization of the details.

Uploading the dataset of test_data.csv and train_data.csv file to IBM Cognos Analytics.




IBM Cognos Analytics with Watson
* New data module
Search content
Properties
Data module
Search
New data module
Navigation paths
train_data.csv
Row Id
case_id
Hospital_code
Hospital...ype_code
City_Code_Hospital
Hospital...ion_code
Available...Hospital
Department
Ward_Type
Ward_Facility_Code
Grid
Relationships
Custom tables
case_id Hospital_code Hospital_type_code City_Code_Hospital Hospital_region_code
1 8 c 3 Z
2 2 c 5 Z
3 10 e 1 X
4 26 b 2 Y
5 26 b 2 Y
6 23 a 6 X
7 32 f 9 Y
8 23 a 6 X
9 1 d 10 Y
10 10 e 1 X


IBM Cognos Analytics with Watson
* New data module
Search content
Properties
Data module
Search
Hospital...ion_code
Available...Hospital
Department
Ward_Type
Ward_Facility_Code
Bed Grade
patientid
City_Code_Patient
Type of Admission
Severity of Illness
Visitors ...h Patient
Age
Admission_Deposit
Grid
Relationships
Custom tables
Ward_Facility_Code Bed Grade patientid City_Code_Patient Type of Admission
D 4 17006 2 Emergency
F 2 17006 2 Trauma
F 2 17006 2 Trauma
F 2 17006 2 Trauma
D 2 17006 2 Trauma
E 3 95946 Null Emergency
F 3 95946 Null Trauma
F 4 95946 Null Urgent
E 2 95946 Null Trauma
F 3 95946 Null Emergency



Data Analysis

Analysation of health data:

FIVE TYPES OF HEALTHCARE DATA ANALYTICS:

Exploratory Data Analysis

TEAM ID : PNT2022TMID41523

Exploratory Data Analysis:

Required libraries:

In [1]:
```
import pandas as pd
import numpy as np
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
```

In [2]:
```
df= pd.read_csv("C:/Users/vp/OneDrive/Desktop/Healthcare_Data/train_data.csv")
```

In [3]:
```
df
```

In [3]:
```
df
```

Out[3]:

	case_id	Hospital_code	Hospital_type_code	City_Code_Hospital	Hospital_region_code	Available Extra Rooms in Hospital	Department	Ward_Type	Ward_Facility_Code	Grade	Bed patient Id	City_Code_Patient	Admission	Type of	Severity of Illness	Visitors with Patient	Age	A
0	1	8	c	3	Z	3	radiotherapy	R	F	2.0	31397	7.0	Emergency	Extreme	2	51-60		
1	2	2	c	5	Z	2	radiotherapy	S	F	2.0	31397	7.0	Trauma	Extreme	2	51-60		
2	3	10	e	1	X	2	anesthesia	S	E	2.0	31397	7.0	Trauma	Extreme	2	51-60		
3	4	26	b	2	Y	2	radiotherapy	R	D	2.0	31397	7.0	Trauma	Extreme	2	51-60		
4	5	26	b	2	Y	2	radiotherapy	S	D	2.0	31397	7.0	Trauma	Extreme	2	51-60		
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
318433	318434	6	a	6	X	3	radiotherapy	Q	F	4.0	86499	23.0	Emergency	Moderate	3	41-50		
318434	318435	24	a	1	X	2	anesthesia	Q	E	4.0	325	8.0	Urgent	Moderate	4	81-90		
318435	318436	7	a	4	X	3	gynecology	R	F	4.0	125235	10.0	Emergency	Minor	3	71-80		
318436	318437	11	b	2	Y	3	anesthesia	Q	D	3.0	91081	8.0	Trauma	Minor	5	11-20		
318437	318438	19	a	7	Y	5	gynecology	Q	C	2.0	21641	8.0	Emergency	Minor	2	11-20		

318438 rows × 18 columns

In [4]:
```
df.head()
```

In [3]:
```
df
```

Out[3]:

	case_id	Hospital_code	Hospital_type_code	City_Code_Hospital	Hospital_region_code	Available Extra Rooms in Hospital	Department	Ward_Type	Ward_Facility_Code	Grade	Bed patient Id	City_Code_Patient	Admission	Type of	Severity of Illness	Visitors with Patient	Age	A
0	1	8	c	3	Z	3	radiotherapy	R	F	2.0	31397	7.0	Emergency	Extreme	2	51-60		
1	2	2	c	5	Z	2	radiotherapy	S	F	2.0	31397	7.0	Trauma	Extreme	2	51-60		
2	3	10	e	1	X	2	anesthesia	S	E	2.0	31397	7.0	Trauma	Extreme	2	51-60		
3	4	26	b	2	Y	2	radiotherapy	R	D	2.0	31397	7.0	Trauma	Extreme	2	51-60		
4	5	26	b	2	Y	2	radiotherapy	S	D	2.0	31397	7.0	Trauma	Extreme	2	51-60		
...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...	...
318433	318434	6	a	6	X	3	radiotherapy	Q	F	4.0	86499	23.0	Emergency	Moderate	3	41-50		
318434	318435	24	a	1	X	2	anesthesia	Q	E	4.0	325	8.0	Urgent	Moderate	4	81-90		
318435	318436	7	a	4	X	3	gynecology	R	F	4.0	125235	10.0	Emergency	Minor	3	71-80		
318436	318437	11	b	2	Y	3	anesthesia	Q	D	3.0	91081	8.0	Trauma	Minor	5	11-20		
318437	318438	19	a	7	Y	5	gynecology	Q	C	2.0	21641	8.0	Emergency	Minor	2	11-20		

318438 rows × 18 columns

In [5]:
```
df.tail()
```

Out[5]:

	case_id	Hospital_code	Hospital_type_code	City_Code_Hospital	Hospital_region_code	Available Extra Rooms in Hospital	Department	Ward_Type	Ward_Facility_Code	Grade	Bed patient Id	City_Code_Patient	Admission	Type of	Severity of Illness	Visitors with Patient	Age	A
318433	318434	6	a	6	X	3	radiotherapy	Q	F	4.0	86499	23.0	Emergency	Moderate	3	41-50		
318434	318435	24	a	1	X	2	anesthesia	Q	E	4.0	325	8.0	Urgent	Moderate	4	81-90		
318435	318436	7	a	4	X	3	gynecology	R	F	4.0	125235	10.0	Emergency	Minor	3	71-80		
318436	318437	11	b	2	Y	3	anesthesia	Q	D	3.0	91081	8.0	Trauma	Minor	5	11-20		
318437	318438	19	a	7	Y	5	gynecology	Q	C	2.0	21641	8.0	Emergency	Minor	2	11-20		

In [6]:
```
df.info()
```

```
<class 'pandas.core.frame.DataFrame'>
RangeIndex: 318438 entries, 0 to 318437
Data columns (total 18 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  float64
 17  Stay                               318438 non-null  object
dtypes: float64(3), int64(6), object(9)
memory usage: 43.7+ MB
```

In [7]:
```
df.dtypes
```

Out[7]:
```
case_id                                int64
Hospital_code                          int64
Hospital_type_code                    object
City_Code_Hospital                     int64
Hospital_region_code                  object
Available Extra Rooms in Hospital      int64
Department                            object
Ward_Type                             object
Ward_Facility_Code                    object
Bed Grade                            float64
patientid                              int64
City_Code_Patient                    float64
Type of Admission                     object
Severity of Illness                   object
Visitors with Patient                  int64
Age                                   object
Admission_Deposit                    float64
Stay                                  object
dtype: object
```

In [8]:
```
df.shape
```

Out[8]:
```
(318438, 18)
```

Before Null Values checking :

In [22]:
```
df.isnull().sum().sum()
```

Out[22]:
```
4645
```

In [7]:
```
df.dtypes
```

Out[7]:
```
case_id                                int64
Hospital_code                          int64
Hospital_type_code                    object
City_Code_Hospital                     int64
Hospital_region_code                  object
Available Extra Rooms in Hospital      int64
Department                            object
Ward_Type                             object
Ward_Facility_Code                    object
Bed Grade                            float64
patientid                              int64
City_Code_Patient                    float64
Type of Admission                     object
Severity of Illness                   object
Visitors with Patient                  int64
Age                                   object
Admission_Deposit                    float64
Stay                                  object
dtype: object
```

In [8]:
```
df.shape
```

Out[8]:
```
(318438, 18)
```

In [26]:
```
df.describe()
```

Out[26]:

	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	65747.579472	7.251859	3.284099	4880.749392
std	91925.276847	8.633755	3.102535	1.168171	0.873146	37979.936440	4.745266	1.764061	1086.776254
min	1.000000	1.000000	1.000000	0.000000	1.000000	1.000000	1.000000	0.000000	1800.000000
25%	79610.250000	11.000000	2.000000	2.000000	2.000000	32847.000000	4.000000	2.000000	4186.000000
50%	159219.500000	19.000000	5.000000	3.000000	3.000000	65724.500000	8.000000	3.000000	4741.000000
75%	238828.750000	26.000000	7.000000	4.000000	3.000000	98470.000000	8.000000	4.000000	5409.000000
max	318438.000000	32.000000	13.000000	24.000000	4.000000	131624.000000	38.000000	32.000000	11008.000000

```
In [27]: df.isnull().sum()

Out[27]: case_id                                  0
         Hospital_code                            0
         Hospital_type_code                       0
         City_Code_Hospital                       0
         Hospital_region_code                     0
         Available Extra Rooms in Hospital        0
         Department                               0
         Ward_Type                                0
         Ward_Facility_Code                       0
         Bed Grade                              113
         patientid                                0
         City_Code_Patient                    4532
         Type of Admission                        0
         Severity of Illness                      0
         Visitors with Patient                    0
         Age                                      0
         Admission_Deposit                        0
         Stay                                     0
         dtype: int64
```

```
In [11]: df.corr()
```

Out[11]:

	case_id	Hospital_code	City_Code_Hospital	Available Extra Rooms in Hospital	Bed Grade	patientid	City_Code_Patient	Visitors with Patient	Admission_Deposit	
case_id	1.000000	-0.043023	-0.011352	0.042580	0.013702	-0.004150	0.065196	0.001309	-0.045972	
Hospital_code	-0.043023	1.000000	0.128294	-0.059638	-0.013739	0.002291	-0.015530	-0.028500	0.045446	
City_Code_Hospital	-0.011352	0.128294	1.000000	-0.045771	-0.049309	0.000750	-0.023988	0.018184	-0.034455	
Available Extra Rooms in Hospital	0.042580	-0.059638	-0.045771	1.000000	-0.115868	0.000921	-0.009681	0.096714	-0.143739	
Bed Grade	0.013702	-0.013739	-0.049309	-0.115868	1.000000	0.001645	-0.008105	0.088945	0.073833	
patientid	-0.004150	0.002291	0.000750	0.000921	0.001645	1.000000	0.002002	0.005889	-0.000877	
City_Code_Patient	0.065196	-0.015530	-0.023988	-0.009681	-0.008105	0.002002	1.000000	-0.012074	0.025837	
Visitors with Patient	0.001309	-0.028500	0.018184	0.096714	0.088945	0.005889	-0.012074	1.000000	-0.150358	
Admission_Deposit	-0.045972	0.045446	-0.034455	-0.143739	0.073833	-0.000877	0.025837	-0.150358	1.000000	

```
In [28]: df.isnull().sum().sum()

Out[28]: 4645
```

Work With Null Values :

```
In [32]: df['Bed Grade'].fillna(df['Bed Grade'].mean(),inplace=True)

In [33]: df['Bed Grade'].isnull().sum()

Out[33]: 0

In [34]: df.isnull().sum()

Out[34]: case_id                                  0
         Hospital_code                            0
         Hospital_type_code                       0
         City_Code_Hospital                       0
         Hospital_region_code                     0
         Available Extra Rooms in Hospital        0
         Department                               0
         Ward_Type                                0
         Ward_Facility_Code                       0
         Bed Grade                                0
         patientid                                0
         City_Code_Patient                    4532
         Type of Admission                        0
         Severity of Illness                      0
         Visitors with Patient                    0
         Age                                      0
         Admission_Deposit                        0
         Stay                                     0
         dtype: int64
```

```
In [35]: df["City_Code_Patient"].fillna(df["City_Code_Patient"].mean(), inplace=True)

In [36]: df["City_Code_Patient"].isnull().sum()

Out[36]: 0
```

After Cleaning Process :

Total Null Values Checking :

```
In [37]: df.isnull().sum()

Out[37]: case_id                                0
         Hospital_code                          0
         Hospital_type_code                     0
         City_Code_Hospital                     0
         Hospital_region_code                   0
         Available Extra Rooms in Hospital      0
         Department                             0
         Ward_Type                              0
         Ward_Facility_Code                     0
         Bed Grade                              0
         patientid                              0
         City_Code_Patient                      0
         Type of Admission                      0
         Severity of Illness                    0
         Visitors with Patient                  0
         Age                                    0
         Admission_Deposit                      0
         Stay                                   0
         dtype: int64
```

Total Null Values :

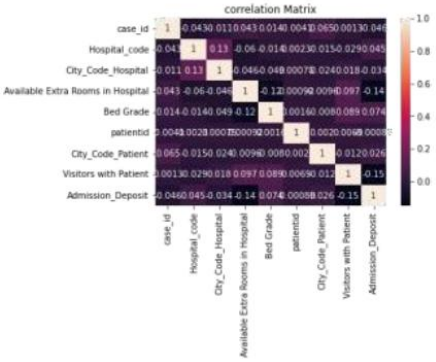
```
In [38]: df.isnull().sum().sum()

Out[38]: 0
```

```
In [39]: df.cov()
```

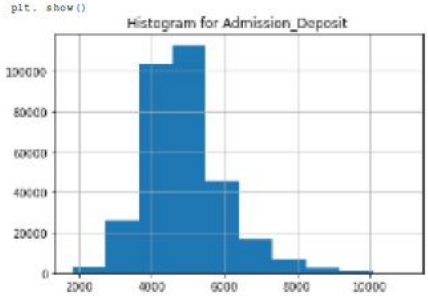
Out[39]:

	case_id	Hospital_code	City_Code_Hospital	Available Extra Rooms in Hospital	Bed Grade	patientid	City_Code_Patient	Visitors with Patient	Admission_Deposit
case_id	8.450257e+09	-34145.255936	-3237.513037	4572.484177	1099.464209	-1.448858e+07	28036.639476	212.260614	-4.592730e+06
Hospital_code	-3.414526e+04	74.541723	3.436541	-0.601495	-0.103516	7.511144e+02	-0.627298	-0.434073	4.264135e+02
City_Code_Hospital	-3.237513e+03	3.436541	9.625726	-0.165887	-0.133549	8.841958e+01	-0.348165	0.099525	-1.161750e+02
Available Extra Rooms in Hospital	4.572484e+03	-0.601495	-0.165887	1.364624	-0.118145	4.085839e+01	-0.052888	0.199302	-1.824827e+02
Bed Grade	1.099464e+03	-0.103516	-0.133549	-0.118145	0.762113	5.452883e+01	-0.033075	0.136962	7.004052e+01
patientid	-1.448858e+07	751.114364	88.419578	40.855395	54.528834	1.442476e+09	355.729931	461.576369	-3.620715e+04
City_Code_Patient	2.803664e+04	-0.627298	-0.348165	-0.052888	-0.033075	3.557299e+02	22.197075	-0.099496	1.312736e+02
Visitors with Patient	2.122606e+02	-0.434073	0.099525	0.199302	0.136962	4.615764e+02	-0.099496	3.111913	-2.882567e+02
Admission_Deposit	-4.592730e+06	426.413524	-116.175038	-182.482676	70.040518	-3.620715e+04	131.273639	-288.256679	1.181083e+06

In [40]:
```
sns.heatmap(df.corr(), annot=True)
plt.title("correlation Matrix")
plt.show()
```

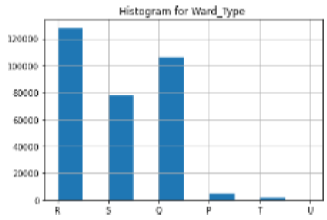


In [41]:
```
df["Admission_Deposit"].hist(bins=10)
plt.title("Histogram for Admission_Deposit")
plt.show()
```




```
df["Ward_Type"].hist(bins=10)
```

In [42]:
```
plt.title("Histogram for Ward_Type")
plt.show()
```



Sprint Delivery Plan II

Cleaning, Exploring data and creating model of Analytics for Hospitals Health Care Data Using Cognos Analysis:

USN-4,5

• As an Analyst I can create a Exploratory data analysis to identify the important factors of a patient data set.

• As a Data analyst, I create a predicted model by also preparing story card with using explored data.

• Create an Data Exploration of the dataset of test_data.csv and train_data.csv file to IBM Cognos Analytics first.

Creating Relationships

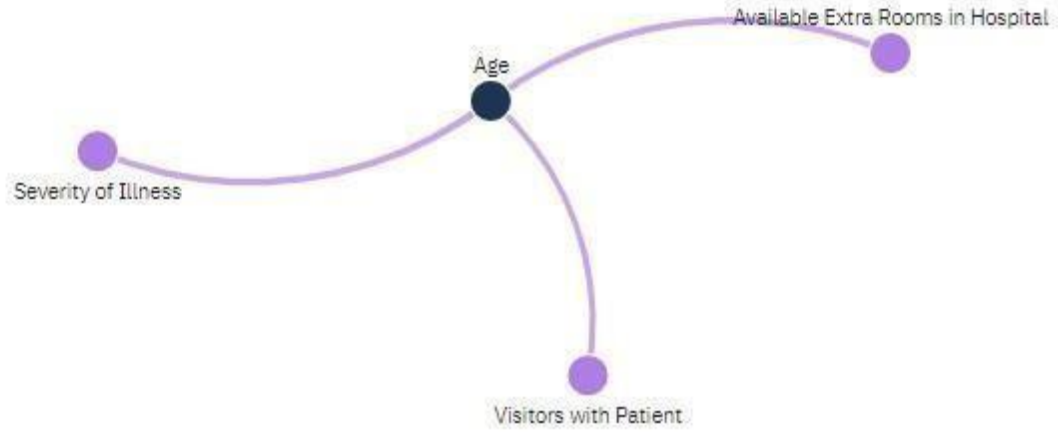
Explore data relationships

Test_data module

Reset to original

Age

Edit diagram

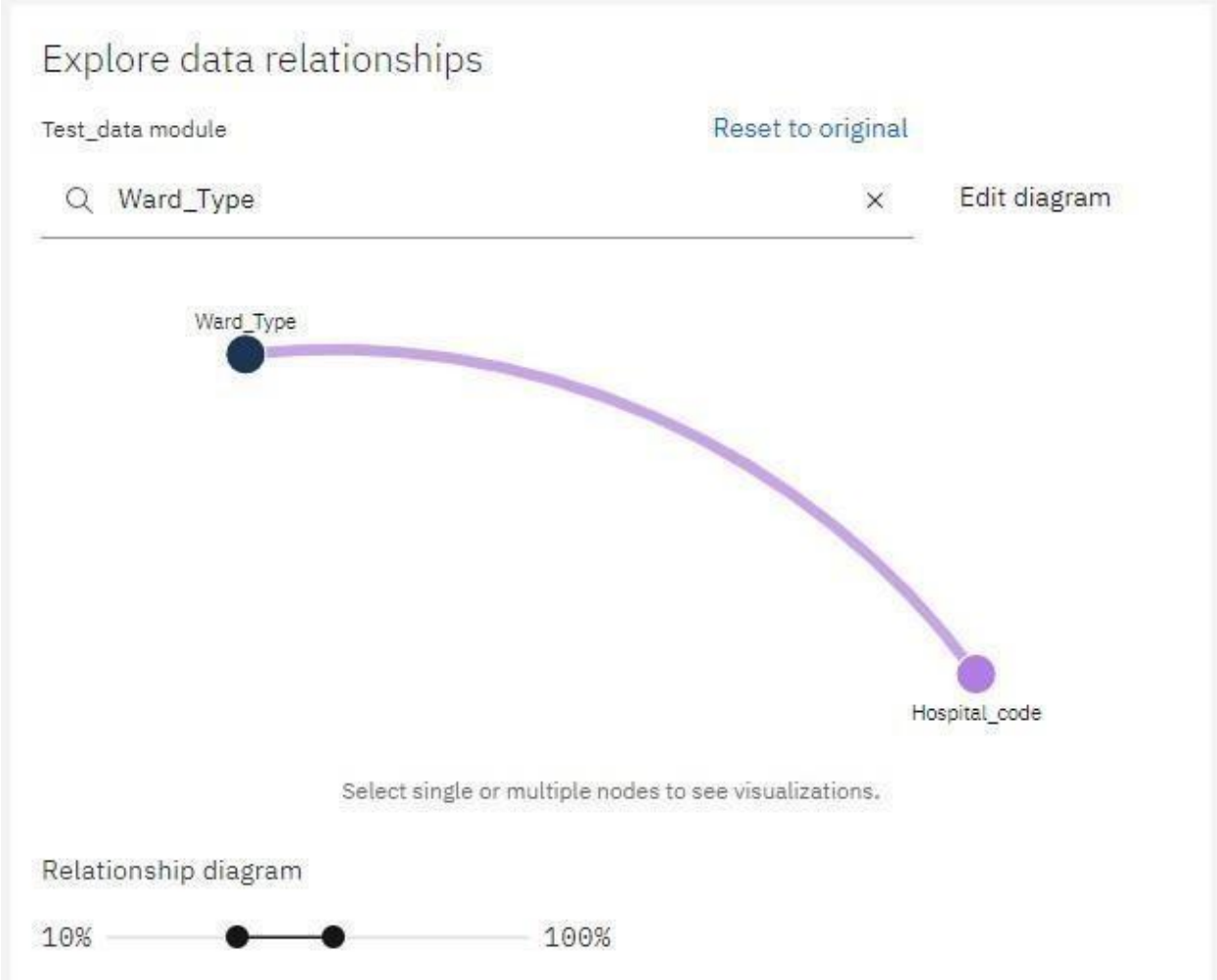


Select single or multiple nodes to see visualizations.

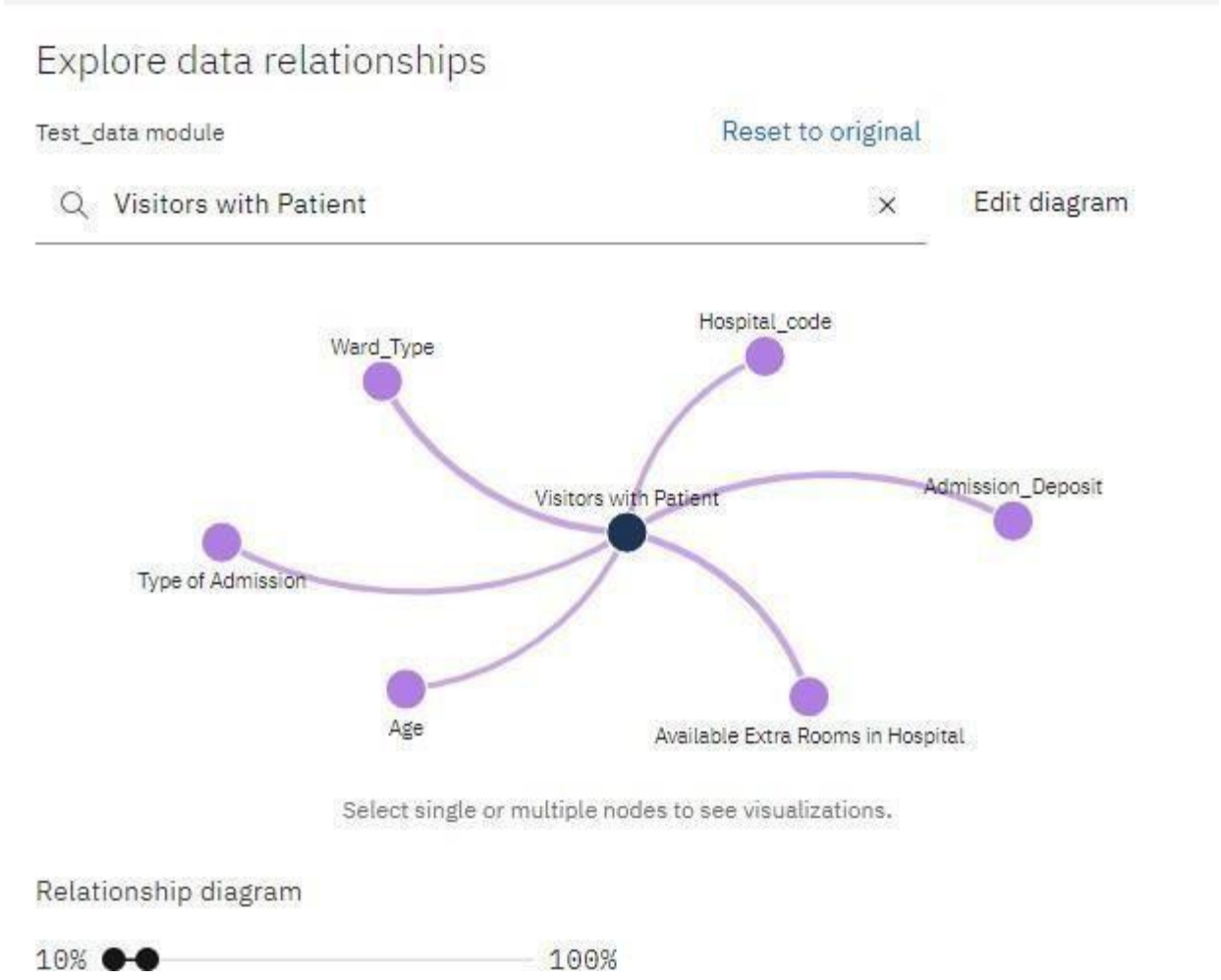
Relationship diagram

10% 100%

Ward_Type

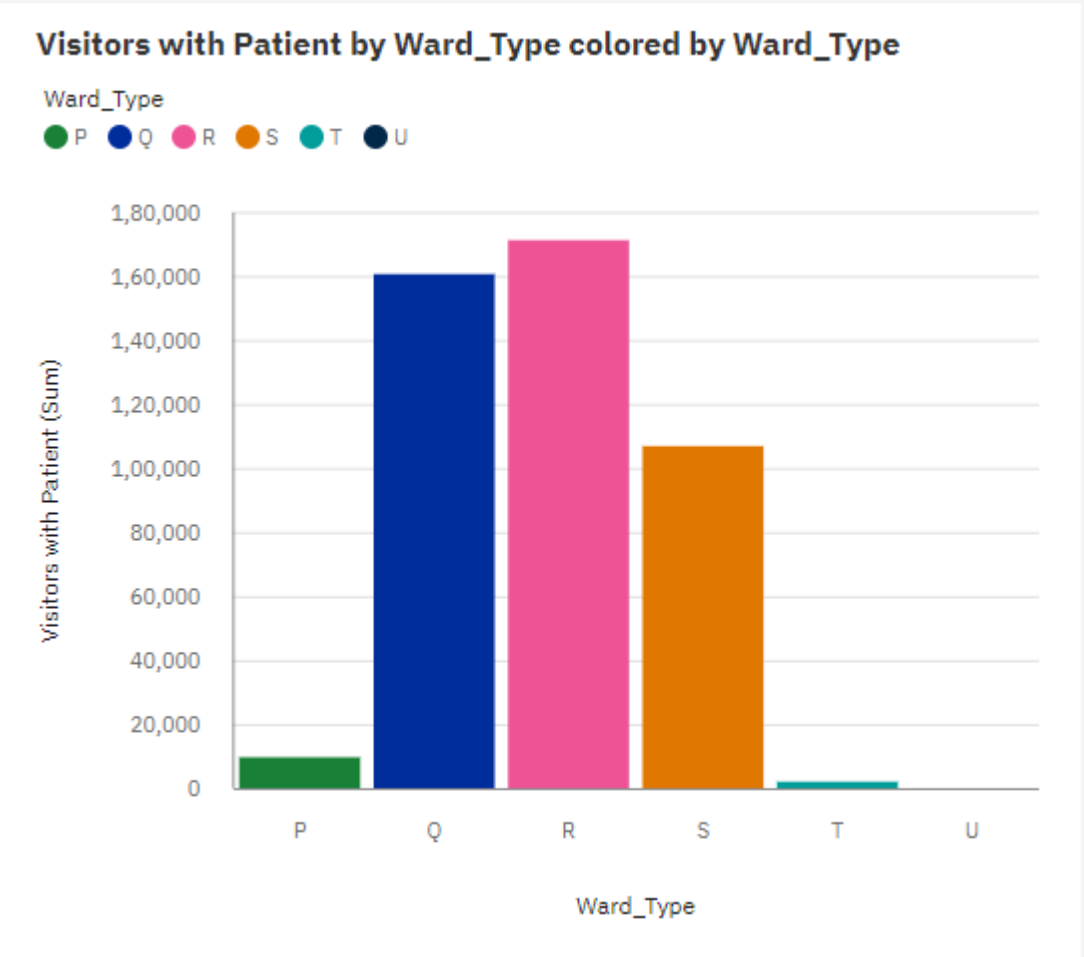

Explore data relationships
Test_data module
Reset to original
Ward_Type
Edit diagram
Ward_Type
Hospital_code
Select single or multiple nodes to see visualizations.
Relationship diagram
10%
100%

Visitors with patient



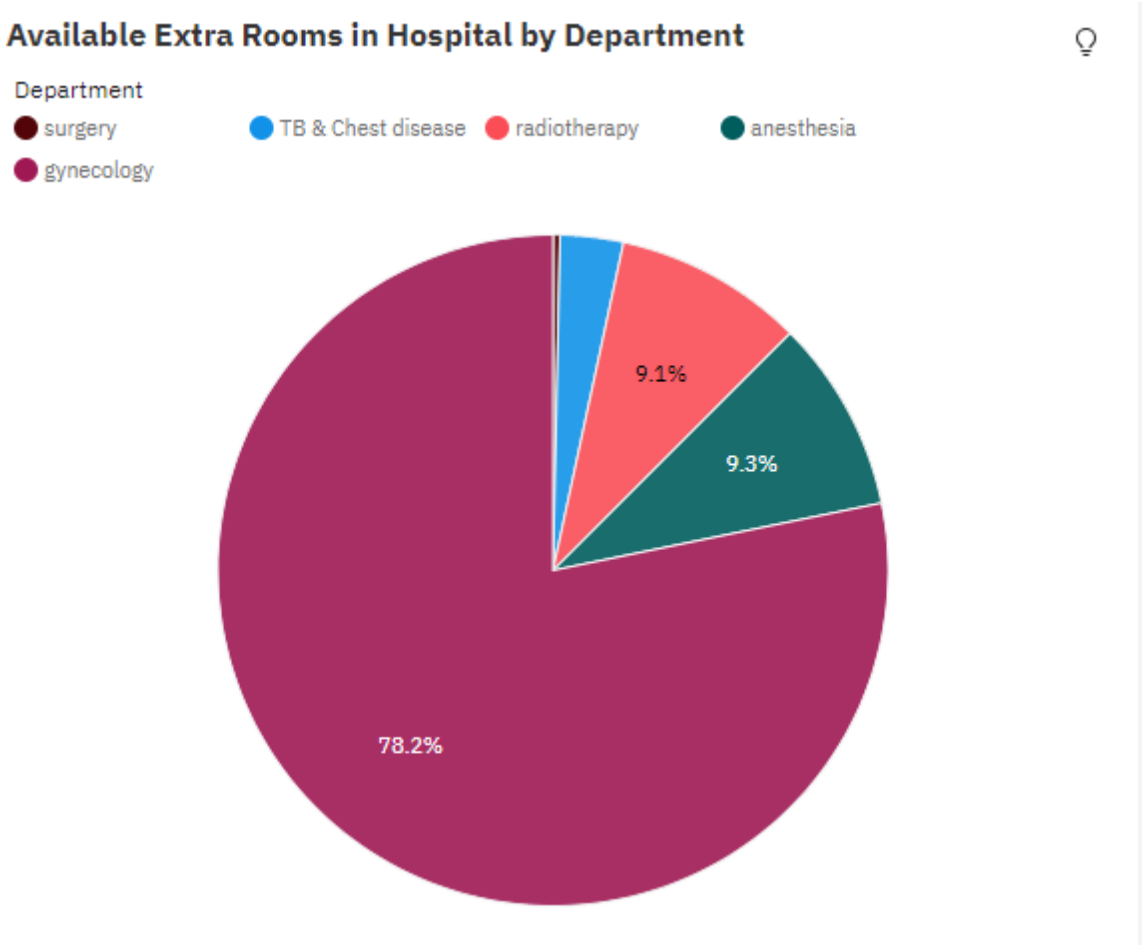
Create a Visualization type using test_data.csv IBM Cognos Analytics: Visitors with Patient by Ward_Type colored by Ward_Type

- Across all values of **Ward_Type** and **Ward_Type**, the sum of **Visitors with Patient** is over 450 thousand.
- For **Visitors with Patient**, the most significant values of **Ward_Type** are R, Q, and S, whose respective **Visitors with Patient** values add up to over 438 thousand, or 97.4 % of the total
- The summed values of **Visitors with Patient** range from 8 to over 171 thousand.
- **Visitors with Patient** is unusually high when the combinations of **Ward_Type** and **Ward_Type** are R and R and Q and Q.
- **Visitors with Patient** is unusually high when **Ward_Type** is R and Q

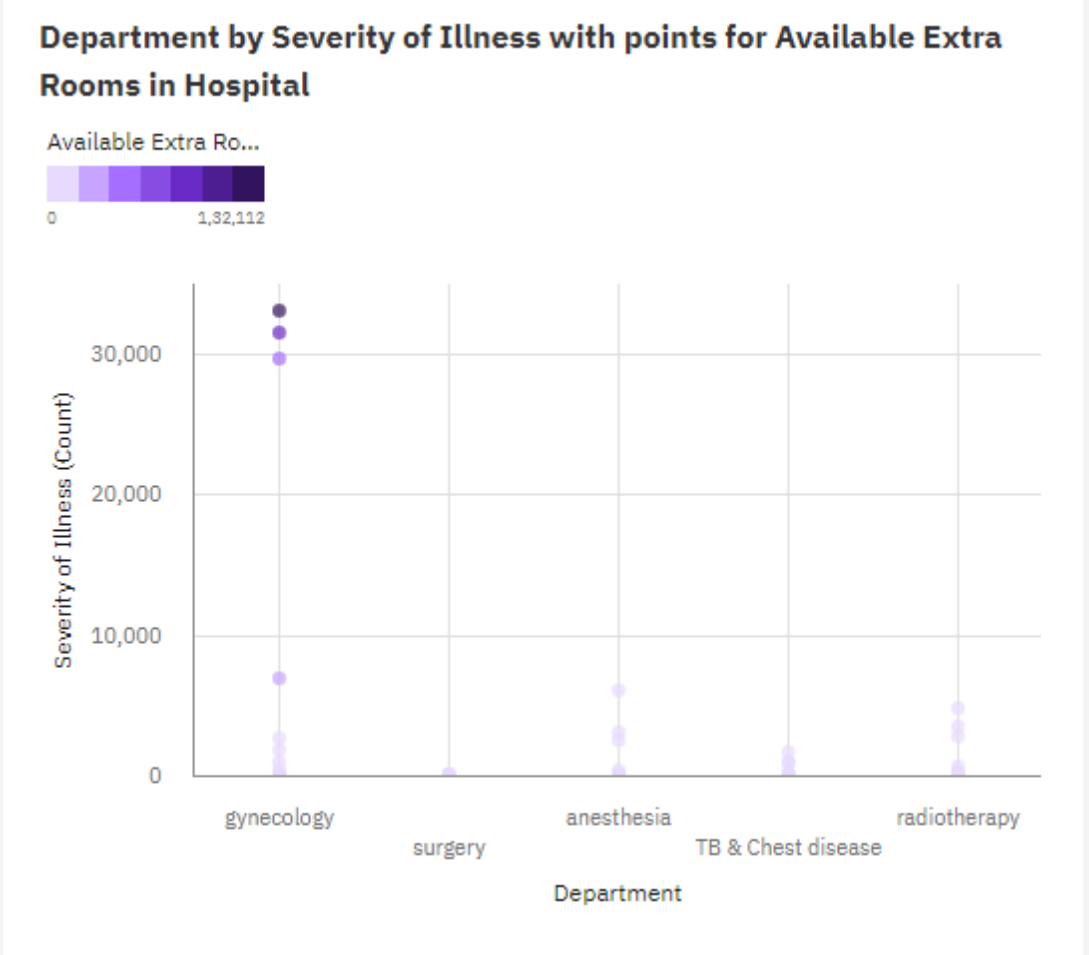


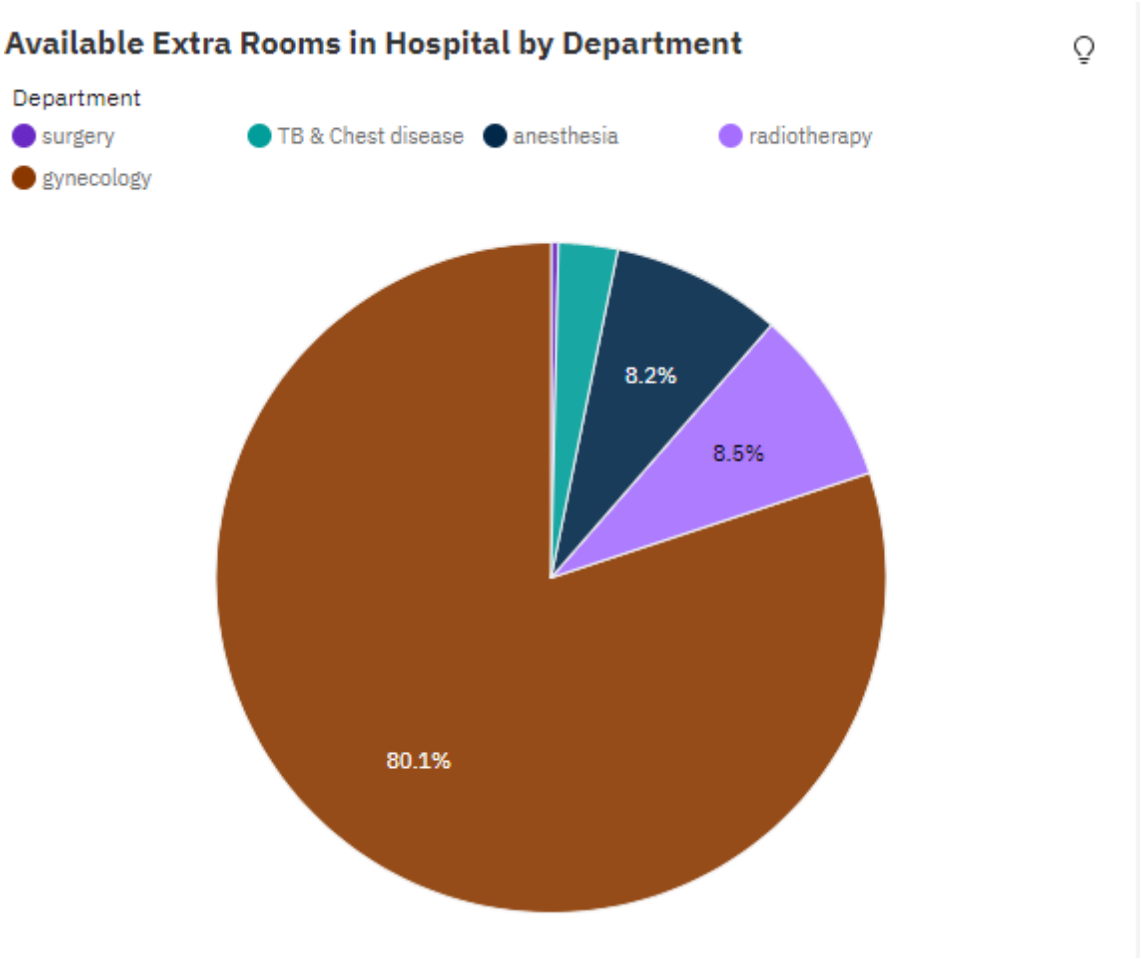
Available Extra Rooms in Hospital by Department:

- The total number of results for **Available Extra Rooms in Hospital**, across all **departments**, is over 137 thousand.
- The most common value of **Department** is gynecology, occurring over 107 thousand times, which is 78.2 % of the total.
- The count is unusually high when **Department** is gynecology.



Department by Severity of Illness with points for Available Extra Rooms in Hospital .




Available Extra Rooms in Hospital by Department
Department
surgery
TB & Chest disease
anesthesia
radiotherapy
gynecology
8.2%
8.5%
80.1%

CHAPTER 7

SOURCE CODE:

HOME PAGE ;_

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"></script>
  <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 : PNT2022TMID41523 </b></i></h4></center>


</div>
<table class="table table-bordered">


    <tbody>
      <tr>
        <td>Team Leader</td>
        <td>Suba M</td>


      </tr>
      <tr>
        <td>Team member</td>
        <td>Magimai ilakkiya mary C</td>
```

```
    </tr>
    <tr>
      <td>Team member</td>
      <td>priya jency S</td>

    </tr>
          <tr>
      <td>Team member</td>
      <td>Sneha SB</td>

   </tr>

   </tbody>
  </table>
</body>
</html>
```

ABOUT PAGE:

About.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"></script>
  <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 class="active"><a href="index.html">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="container">
<b>Analytics For Hospitals' Health-Care Data</b>
<br><br>

Recent Covid-19 Pandemic has raised alarms over one of the most overlooked areas to focus: HealthcareManagement.
```

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.

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.

Technical Architecture:

```
</div>

</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"></script>

  <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://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef=.my_folders%2Fsprint3&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view&amp;mode=dashboard&amp;subView=model000001848bea4a5e_00000000" width="1000" height="900" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
</div>

</body>
</html>
```

OUTPUT:

Analysis of dataset

Distrib tion of values

rl ospis l_cod e

```
train.Hospital_code.value_counts()
```

```
26    1S12S
2J    195J5
1<)   1682.5
5     1484 7
2B    13 J4 1
ıu.   1.2:5ʼ9'1
u     I24 8-d
17    1312
 <)    8828
!)     3SSS
12     8312
32     155
25     75:19
10     7:2.57
IS     6%.5
1 1    6226
24     5863
17     4J19
J      ,mis
1      411 -
n      3974
|      394 0
30     37e7
s      36Eld
31     3651
22     2140
s      2679
15     2119
20      9135
7       i;s.i
I a  ··  Hospi t al._code, dtype; int 6'1
```

18

```
plt:,fi sur e (fi c:si ze {10, 7))
train. HOspi ta l _co<ie. val ue_t OiJnt s() , plot (ki mi="bar ·, co _or = [ 'grl cen' 1>
```

Importing required Packages

In [72]:
```
import numpy as np
import pandas as pd
import matplotlib.pyplot as plt
import seaborn as sns
%matplotlib inline
sns.set_style("darkgrid")
plt.style.use("dark_background")
```

Importing the dataset

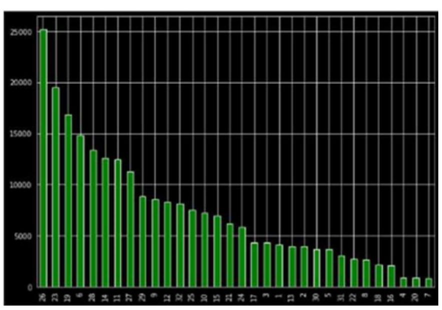
In [73]:
```
train = pd.read_csv('/content/input/training_data.csv')
test = pd.read_csv('/content/input/testing_data.csv')
Paramters_Description = pd.read_csv('/content/input/parameter_description.csv')
sample = pd.read_csv('/content/input/testing_target.csv')
```

Viewing dataset

In [74]:
```
train.head(5)
```

Out[74]:

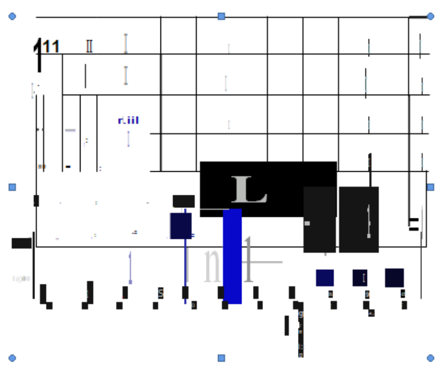
	case_id	Hospital_code	Hospital_type_code	City_Code_Hospital	Hospital_region_code	Available_Extra_Rooms_in_Hospital	Department	Ward_Type	Ward_Facility_Code	Bed_Grade
0	1	8	c	3	Z	3	radiotherapy	R	F	2.0
1	2	2	c	5	Z	2	radiotherapy	S	F	2.0
2	3	10	e	1	X	2	anesthesia	S	E	2.0
3	4	26	b	2	Y	2	radiotherapy	R	D	2.0
4	5	26	b	2	Y	2	radiotherapy	S	D	2.0



say

rain.s ay. lue_coun s()

2 -20 97
1 - S 9
11-4!1 II al
1-be /1458
11-80 Seidl
,_. thall 00 Days
2.179
: Stay, dtype: ini:64



Age

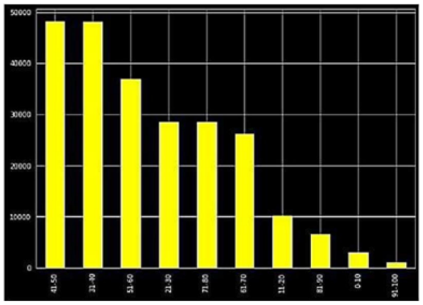
t rai s. ige.valu e_count s()

41-50 4 272
3! -dll <18 1 06
]6 %9
21-31 28555
7i -88 255 52
6 !-78 26!39
n-20 19141

```
!!l-98          557!1
fl, 1 ll        3038
1 - 10 0        9E.e
rIll..;nrIG: Ag;2, dsyp : in-::64
```

ITAge disrrillurioo

```
plt .fig1J ic( fi i;sh c (l ll, 7 ))
tr ain . Agc ,val uc_, 11 un tcs () ,111Gt ( ki mJa"ba r", c111 0r = [ 'Vc . 1 o,i' ])
```



Hospital_:type_code

```
train.Hospital_type_code.value_counts()
```

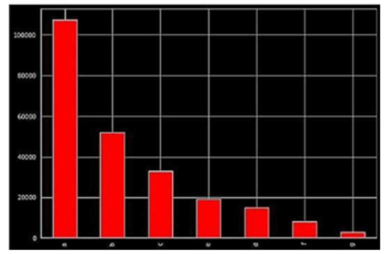
```
a        107545
b        SmiS
```

```
74677
6 8517
;;n ;;
1:387
6     5344
1     4268
7     1676
8     622
9     1<14
11    46
```

```
e        19105
d        USH
         166
S        :l7118
         rla.rrz: Hdxpit l+l! _:29-95
yp.z_ode, dtype : intl4
```

:1Hosp(rot_type:_ ode d'tser-lbUTIllen

```
p  . fi s uu ( fi ssi za+ t(l0, 7))
t ra i a.Hop i t d _ld•pe_ code. v lue _coun () . plot (k ind = 0;;i   o l :!" = [·Fhd · 1])
```



Hospital_region_code

```
train.Hospital_region_code.value_counts()
```

```
X     99565
Y     :un 4
Z     a5S21
rane:Hospital_re_co co.de_d_type: int6-l
```

r.l-kh pi tu (_region_code.d'tsbulio

```
plt.figure(fi ia e=(l0,7))
train. HDs pi tal _ r egi on_code. val uc _count s () . p!ot( kl nd   "bar",   color:   ("Vi olct'])
```

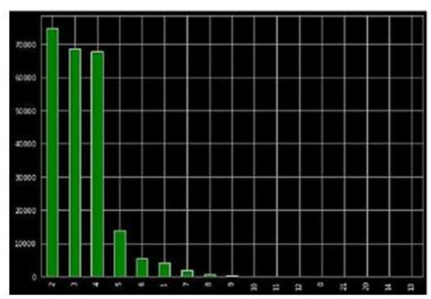
Availal11eExt ra_Rooms_in_Hospta l

```
train.Available_Extra_Rooms_in_Hospital.value_counts()
```

```
11    12
12    11
0     11
8     2
10    1
14    1
B
f-bi.ol ,wa-ll a bl _ ir.ra _Ro co, _i n_ftospi t,'l , d.ype: int
```

R'4vailable_Eri-..._flQOmS_tn_HDJ;pita(dhcri.bv,(o,n

```
plt .f igur e(fi g<i ze (lll , 7>)
t rai n. Avail abl c_b   tra_Room<_in_Ho, pit •1. Val u_c_count s ()  p l o t (ki nd<" ba r",  color     [·sr en' ])
```



Department

```
trai n. Depal tment ,v & i;   oonts () gyoecology
```

```
R     788
Q     77797
```

8.CHATER 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 naivigate to story page
- verify filters are working

8.2 USER ACCEPTANCE TESTING

1.Purpose of Document

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

Defect Analysis

This report showsthe 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	4	0	7
External	0	3	5	1	5
Fixed	13	4	3	18	32
Not Reproduced	0	1	0	1	2
Skipped	1	2	0	0	1
Won't Fix	0	5	2	1	8
Totals	23	14	13	26	75

3.Test Case Analysis

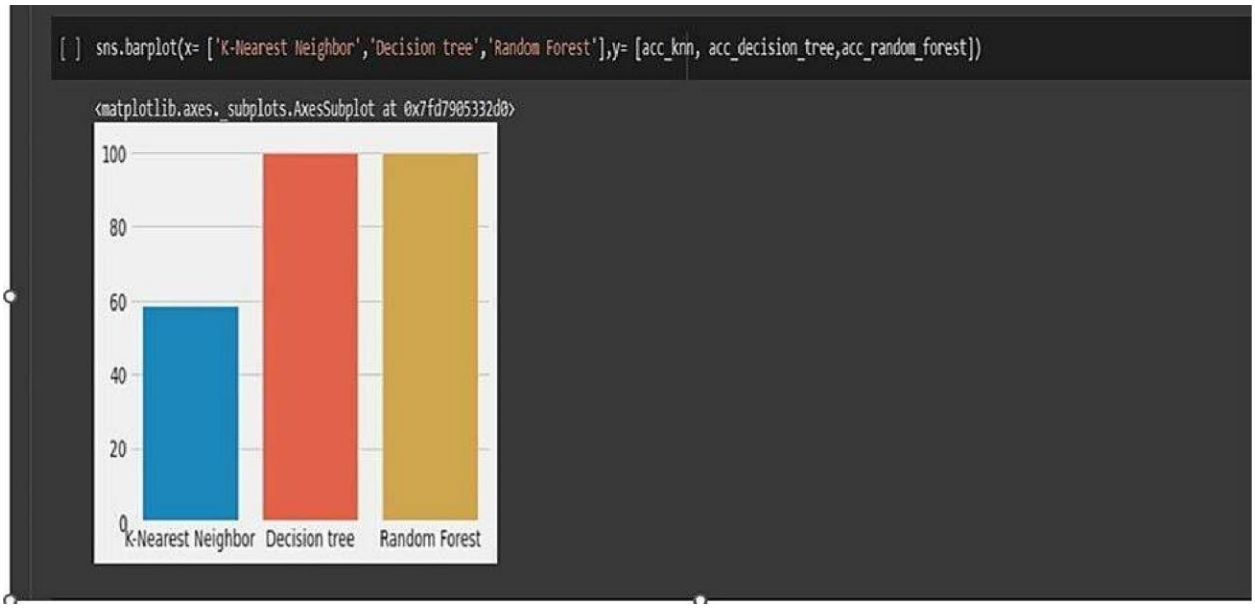
This report shows the number of test cases that have passed, failed,and untested

Section	Total Cases	Not Tested	Fail	Pass
Print Engine	6	0	0	6
Client Application	51	0	0	51
Security	1	0	0	1
Outsource Shipping	3	0	0	3
Exception Reporting	6	0	0	6
Final Report Output	2	0	0	2
Version Control				

CHAPTER 9

9.RESULT

9.1.PERFORMANCE METRICS:



10.PROS AND CONS:

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 inventoryand 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

CHAPTER 11

11.CONCLUSION

The impact of data analytics in healthcare has already made a substantial difference in the abiley of healthcare providers to offer patients high-quality car in an efficient, cost-effective manner. However, the role of data analytica in improving patientoutcomes and bethcare processes continues to grow and expand as more types of data become allcle and new tools are developed that make the results of the analytics clear and easy for healthcare professionals to access.

Realing the potential of data analytics to transform the healthcare industry begins by understanding how the technology can be applied to addres heathcare providers challenges Including stat recitment and the utilization operational efficiencies, and enhanced patent experiences Pre-centred that depends on knowing what patients want and need. Data analytics holds the hity to unlockingthis 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 profileswithin a system,then it can alert doctorsto trends in data that may havebeen 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 takingharmful drugcombinations.

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.

CHAPTER 13

13.APPENDIX

SOURCE CODE:

HOME PAGE ;_

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"></script>
  <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 : PNT2022TMID41523 </b></i></h4></center>


</div>
<table class="table table-bordered">


    <tbody>
      <tr>
        <td>Team Leader</td>
        <td>Suba M</td>


      </tr>
      <tr>
        <td>Team member</td>
        <td>Magimai ilakkiya mary C</td>
```

```
    </tr>
    <tr>
     <td>Team member</td>
     <td>priya jency S</td>

    </tr>
          <tr>
     <td>Team member</td>
     <td>Sneha SB</td>

   </tr>

   </tbody>
  </table>
</body>
</html>
```

ABOUT PAGE:

About.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"></script>
  <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 class="active"><a href="index.html">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="container">
<b>Analytics For Hospitals' Health-Care Data</b>
<br><br>

Recent Covid-19 Pandemic has raised alarms over one of the most overlooked areas to focus: HealthcareManagement.
```

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.

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.

Technical Architecture:

```
</div>

</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"></script>

  <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://us3.ca.analytics.ibm.com/bi/?perspective=dashboard&amp;pathRef=.my_folders%2Fsprint3&amp;closeWindowOnLastView=true&amp;ui_appbar=false&amp;ui_navbar=false&amp;shareMode=embedded&amp;action=view&amp;mode=dashboard&amp;subView=model000001848bea4a5e_00000000" width="1000" height="900" frameborder="0" gesture="media" allow="encrypted-media" allowfullscreen=""></iframe>
</div>

</body>
</html>
```

DEMO LINK:

https://youtu.be/Rgg04FdYY1A

Links GitHub

https://github.com/IBM-EPBL/IBM-Project-18081-1659678980