Project Title: Big Data Analysis with IBM Cloud Databases

Phase 1: Problem Definition and Design Thinking

In this part you will need to understand the problem statement and create a document on

what have you understood and how will you proceed ahead with solving the problem. Please

think on a design and present in form of a document.

Problem Definition: The project involves delving into big data analysis using IBM

Cloud Databases. The objective is to extract valuable insights from extensive datasets,

ranging from climate trends to social patterns. The project includes designing the analysis

process, setting up IBM Cloud Databases, performing data analysis, and visualizing the

results for business intelligence.

Design Thinking:

1. Data Selection: Identify the datasets to be analyzed, such as climate data or social

media trends.

2. Database Setup: Set up IBM Cloud Databases for storing and managing large

datasets.

3. Data Exploration: Develop queries and scripts to explore the datasets, extract

relevant information, and identify patterns.

4. Analysis Techniques: Apply appropriate analysis techniques, such as statistical

analysis or machine learning, to uncover insights

5. Visualization: Design visualizations to present the analysis results in an

understandable and impactful manner.

6. Business Insights: Interpret the analysis findings to derive valuable business

intelligence and actionable recommendations.

Phase1: <https://github.com/balaramyak13/Cloud/blob/main/CAD_Phase1.docx>

Phase 2:Innovation

In this section we need to put our design into innovation to solve the problem. We have

to consider incorporating advanced machine learning algorithms for predictive analysis or

anomaly detection in the big data.

Algorithm used in big data analysis:

Logistic Regression:

Logistic regression is a supervised machine learning algorithm mainly used

for classification tasks where the goal is to predict the probability that an instance of

belonging to a given class. It is used for classification algorithms its name is logistic

regression. it’s referred to as regression because it takes the output of the linear

regression function as input and uses a sigmoid function to estimate the probability for the

given class. The difference between linear regression and logistic regression is that linear

regression output is the continuous value that can be anything while logistic regression

predicts the probability that an instance belongs to a given class or not.

Type of Logistic Regression:

On the basis of the categories, Logistic Regression can be classified into three types:

1. Binomial: In binomial Logistic regression, there can be only two possible types of the

dependent variables, such as 0 or 1, Pass or Fail, etc.

1. Multinomial: In multinomial Logistic regression, there can be 3 or more possible

unordered types of the dependent variable, such as “cat”, “dogs”, or “sheep”

1. Ordinal: In ordinal Logistic regression, there can be 3 or more possible ordered types

of dependent variables, such as “low”, “Medium”, or “High”.

Visualization methods:

Scatter Plot:

Scatter plots are used to observe relationships between variables and uses dots to represent

the relationship between them. The scatter() method in the matplotlib library is used to

draw a scatter plot.

Histogram:

A histogram is basically used to represent data in the form of some groups. It is a type of

bar plot where the X-axis represents the bin ranges while the Y-axis gives information

about frequency. The  hist()  function is used to compute and create a histogram. In

histogram, if we pass categorical data then it will automatically compute the frequency of

that data i.e. how often each value occurred.

Line Chart :

Line Chart is used to represent a relationship between two data X and Y on a different axis.

It is plotted using the plot() function.

3D Scatter Plot :

A 3D Scatter Plot is a mathematical diagram, the most basic version of three-

dimensional plotting used to display the properties of data as three variables of a

dataset using the cartesian coordinates.To create a 3D Scatter plot,

Matplotlib’s mplot3d toolkit is used to enable three dimensional plotting.Generally

3D scatter plot is created by using ax.scatter3D() the function of the matplotlib

library which accepts a data sets of X, Y and Z to create the plot while the rest of the

attributes of the function are the same as that of two dimensional scatter plot.

Pie chart:

A pie chart is a pictorial representation of data in the form of a circular chart or pie where

the slices of the pie show the size of the data. A list of numerical variables along with

categorical variables is needed to represent data in the form of a pie chart. The arc length of

each slice and consequently the area and central angle it forms in a pie chart is proportional to

the quantity it represents.

Line Plot with seaborn:

Line Plot in Seaborn plotted using the  lineplot()  method.  In this, we can pass only

the data argument also.

Contour plot:

A contour plot is a graphical technique for representing a 3-dimensional surface by plotting

constant z slices, called contours, on a 2-dimensional format. That is, given a value for z,

lines are drawn for connecting the (x,y) coordinates where that z value occurs.

Steps to be followed in the cloud database :

Step 1: Data Collection and Preparation

Data Sources Identification: Identify the sources of the data you plan to analyze. This

could include internal databases, external APIs, or third-party data providers.

Data Extraction and Integration: Extract data from various sources and integrate it

into a unified format suitable for analysis.

Data Cleaning: Cleanse the data to handle missing values, outliers, and inconsistencies.

Data Transformation: Prepare the data for analysis by performing tasks like normalization,

aggregation, or feature engineering.

Step 2: IBM Cloud Setup

IBM Cloud Account Creation: If not already done, create an IBM Cloud account.

Select Database Service: Choose the appropriate IBM Cloud Database service based on

your data requirements (e.g., IBM Db2, IBM Cloudant, or IBM Db2 on Cloud).

Provision Database: Set up the database instance on IBM Cloud, configure security

settings, and ensure proper access control.

Step 3: Data Loading and Storage

Data Ingestion: Load the prepared data into the IBM Cloud Database. Depending on the

volume, you may need to implement data ingestion pipelines.

Data Security: Implement encryption and access controls to protect sensitive data.

Data Backup and Recovery: Establish backup and recovery mechanisms to safeguard

data.

Dataset selection:

I am select the database consisting of Customer id,Total\_bill,tip,sex,smoker,day,time,size

and phone number and further details about the customers of the hotel.

Dataset Link:

<https://github.com/balaramyak13/Cloud/blob/main/Customers-200.csv>

Libraries used in ibm cloud database(python):

import numpy as np

import pandas as pd

from matplotlib import pyplot as plt

import seaborn as sns

import plotly.express as px

from sklearn.model\_selection import train\_test\_split

from sklearn.preprocessing import StandardScaler

from sklearn.linear\_model import LogisticRegression

from sklearn.metrics import confusion\_matrix

from sklearn.metrics import accuracy\_score

Steps in cloud database to work with datasets:

1. Download the CSV files from any websites.

2. Start a New Database Database -&gt; New Database

3. Start the import Database -&gt; Import

4. Select the file to import (start with articles.csv)

5. Give the table a name that matches the file name (articles, journals, licences,

languages publishers), or use the default

6. Since the first row has column headings, check the “First row contains column

names”- box

7. Under “Fields separated by”, check “Comma”. Ensure ‘Ignore trailing

Separator/Delimiter’ is left unchecked.

8. Also, under “Fields enclosed by”, ensure that “Double quotes if necessary” is left

checked.

9. Press OK

10. When asked if you want to modify the table, click OK

11. Set the data types for each field and INTEGER for fields with numbers:

12. Click OK

Phase 2: <https://github.com/balaramyak13/Cloud/blob/main/CAD_Phase2.pdf>

Phase 3: Development Part 1

 In this part you will begin building your project.

 Start building the big data analysis solution using IBM Cloud Databases.

 Create an IBM Cloud account, choose the appropriate database service (e.g.,

Db2, MongoDB), and set up a database instance.

 Develop queries or scripts to explore and analyze the selected dataset. Perform basic

data cleaning and transformation as needed.

The coding is given in the below link:

Phase 3: <https://github.com/balaramyak13/Cloud/blob/main/CAD_Phase3.docx>

<https://github.com/balaramyak13/Cloud/blob/main/Big_Data_Analysis_Part1.ipynb>

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Phase 3: Development Part 2

In this part you will continue building your project.

 Continue building the big data analysis solution by applying advanced analysis

techniques and visualizing the results.

 Apply more complex analysis techniques, such as machine learning algorithms, time

series analysis, or sentiment analysis, depending on the dataset and objectives.

 Create visualizations to showcase the analysis results. Use tools like Matplotlib, Plotly,

or IBM Watson Studio for creating graphs and charts.

The coding is given in the below link:

Phase 4: <https://github.com/balaramyak13/Cloud/blob/main/CAD_Phase4.docx>

<https://github.com/balaramyak13/Cloud/blob/main/Big_Data_Analysis_Part2.ipynb>

The readme file gives a detailed information about the Big Data Analysis in

a dataset by logistic regression and using some visualization methods,

Readme file:<https://github.com/balaramyak13/Cloud/blob/main/README.md>