

## ABSTRACT

Advances in public health and medical care have enabled better pregnancy and birth outcomes. The rates of perinatal health indicators such as maternal mortality and morbidity; fetal, neonatal, and infant mortality; low birthweight; and preterm birth have reduced over time. However, they are still a public health concern, and considerable disparities exist within and between countries. For perinatal researchers who are engaged in unraveling the tangled web of causation for maternal and child health outcomes and for clinicians involved in the care of pregnant women and infants, artificial intelligence offers novel approaches to prediction modeling, diagnosis, early detection, and monitoring in perinatal health. Machine learning, a commonly used artificial intelligence method, has been used to predict preterm birth, birthweight, preeclampsia, mortality, hypertensive disorders, and postpartum depression. Real-time electronic health recording and predictive modeling using artificial intelligence have found early success in fetal monitoring and monitoring of women with gestational diabetes especially in low-resource settings. Artificial intelligence-based methodologies have the potential to improve prenatal diagnosis of birth defects and outcomes in assisted reproductive technology too. In this scenario, we envision artificial intelligence for perinatal research to be based on three goals: (1) availability of population-representative, routine clinical data (rich multimodal data of large sample size) for perinatal research; (2) modification and application of current state-of-the-art artificial intelligence for prediction and classification in health care research to the field of perinatal health; and (3) development of methods for explaining the decision-making processes of artificial intelligence models for perinatal health indicators. Achieving these three goals via a multidisciplinary approach to the development of artificial intelligence tools will enable trust in these tools and advance research, clinical practice, and policies to ensure optimal perinatal health.

## INTRODUCTION

The perinatal period represents a vital period for maternal and infant health. Progress in perinatal health has been made in the past decades worldwide, represented by the decreased maternal and neonatal mortality, low birthweight (LBW), and preterm birth (PTB) rates. Recent studies have shown that artificial intelligence (AI) has the potential to accelerate this progress. This review aims to present an overview of perinatal health indicators, summarize evidence on the current state of evidence for AI application in perinatal health, and discuss future directions for this field.

Artificial intelligence (AI) technologies have been developed to analyze a wide range of health data, including patient data from multi biotic approaches, as well as clinical, behavioral, environmental, and drug data, and from various data included in the biomedical literature (Hinton, 2018). AI can help professionals in making decisions, reducing medical errors, improving accuracy in the interpretation of various diagnoses, and thereby reducing the workload to which they are exposed (Makary and Daniel, 2016). Machine learning (ML) is the subfield of computer science and a branch of AI. These techniques provide the ability to infer meaningful connections between data items from various data sets that would otherwise be difficult to correlate (Darcy et al., 2016; Obermeyer and Emanuel, 2016). Due to the large quantity and complex nature of medical information, ML is recognized as a promising method for supporting diagnosis or predicting clinical outcomes (Bottaci et al., 1997; Frizzell et al., 2017).

There are different types of data used for health learning models, including electronic medical records, medical images, biochemical parameters, and biological markers (Ahmed et al., 2020). The type of data that is used depends on what one tries to diagnose through ML.

Most of these decision support systems remain complex black boxes, which means that their internal logic is hidden from the clinical team who cannot fully understand the rationale behind their predictions. Interpretability is important before any health-care team can increase reliance on ML systems (Carvalho et al., 2019). Therefore, the research community has focused on developing both interpretable models and explanatory methods in recent years.

## **1.1 PROJECT OVERVIEW**

Perinatal risks are conditions that affect an infant that originate during pregnancy, during the birth process, or very shortly following birth. Injuries/ Assaults. It is the health of women and babies before, during, and after birth. Some common complications of pregnancy include, but are not limited to, the following. High Blood Pressure, Gestational Diabetes, Infections, Preeclampsia, Preterm Labor, Depression & Anxiety, Pregnancy Loss/Miscarriage, Stillbirth, Other Complication Citations Perinatal conditions arise during the perinatal period, which spans from 22 completed weeks of gestation and ends 7 completed days after birth. Leading perinatal conditions include birth trauma and consequences of preterm birth. Pre-term birth, infection, hypertensive disease and intrapartum asphyxia are frequently cited as the most common contributors to perinatal mortality in low and middle income countries Care of the mother, safe delivery practices and prophylactic antibiotics to the new born will reduce the 1st week neonatal mortality.

## **1.2 PURPOSE**

Our goals of perinatal health project in high-risk contexts are often protective or promotive: to avoid negative outcomes, such as miscarriage, difficult labour, or birth defects, or to achieve positive outcomes, such as infant and maternal wellbeing and health. Healthy pregnancy and safe childbirth are the goals of perinatal care. Perinatal period covers pregnancy, delivery and postpartum. The care includes promoting full term babies, reducing pre-term births, stillbirths and maternal complications to ensure the health of mother and baby

## IDEATION AND PROPOSED SOLUTION

### 2.1 PROBLEM STATEMENT DEFINITION

Perinatal health refers to the health of women during pregnancy, childbirth and the post-partum period, whereas perinatal health refers to health from 22 completed weeks of gestation until 7 completed days after birth.

#### Signs & Symptoms

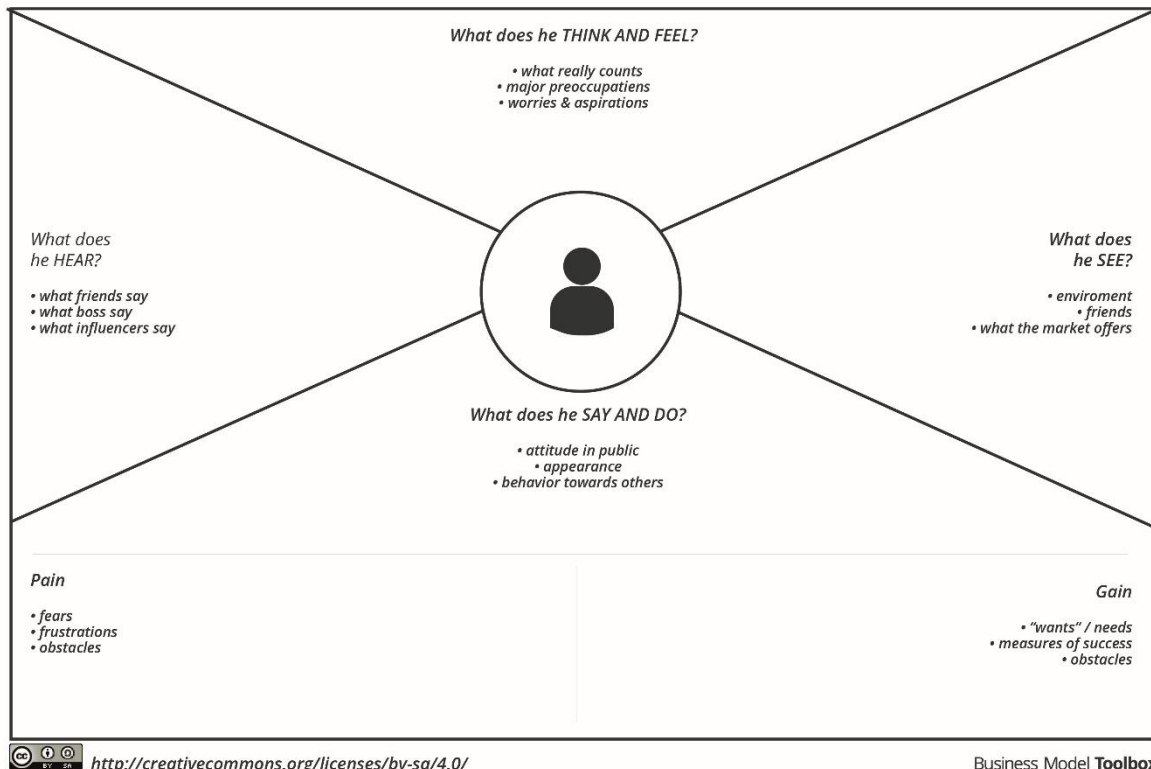
Abdominal pain (ongoing)  
Chest pain.  
Decreased or no fetal movement.  
Extreme fatigue.  
Fainting or lightheaded.  
Heart palpitations.  
Nausea and vomiting.  
Trouble breathing.

<b>Problem Statement (PS)</b>	<b>I am (patient)</b>	<b>I'm trying to</b>	<b>But</b>	<b>Because</b>	<b>Which makes me feel</b>
PS-1	P1: 25 years	Get solution to my problem	Take long time to cure my problem	Irregular periods	Depression, frustrated
PS-2	P2:35 years	To get treatment for my complication	Solution doesn't give permanent relief	Stressful living condition	Stress, low self esteem

## 2.2 EMPATHY MAP CANVAS

An empathy map is a simple, easy-to-digest visual that captures knowledge about a user's behaviours and attitudes. It is a useful tool to help teams better understand their users. Creating an effective solution requires understanding the true problem and the person who is experiencing it. The exercise of creating the map helps participants consider things from the user's perspective along with his or her goals and challenges.

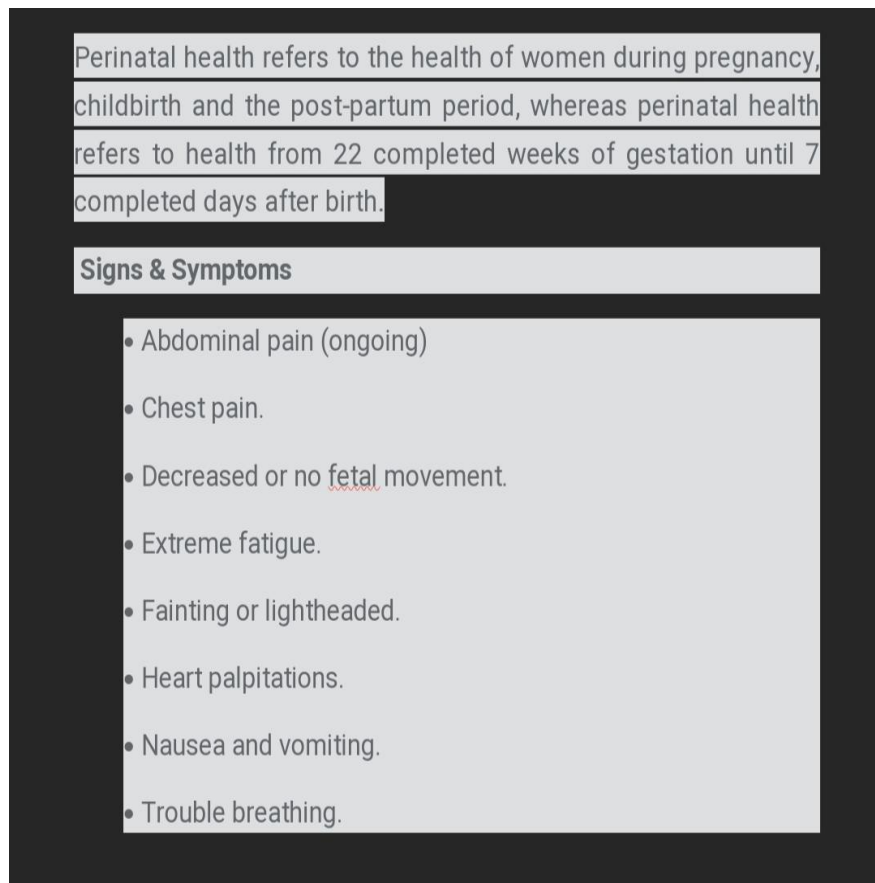
### Empathy Map



## 2.3 IDEATION AND BRAINSTORMING

Brainstorming provides a free and open environment that encourages everyone within a team to participate in the creative thinking process that leads to problem solving. Prioritizing volume over value, out-of-the-box ideas are welcome and built upon, and all participants are encouraged to collaborate, helping each other develop a rich amount of creative solutions. 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.

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

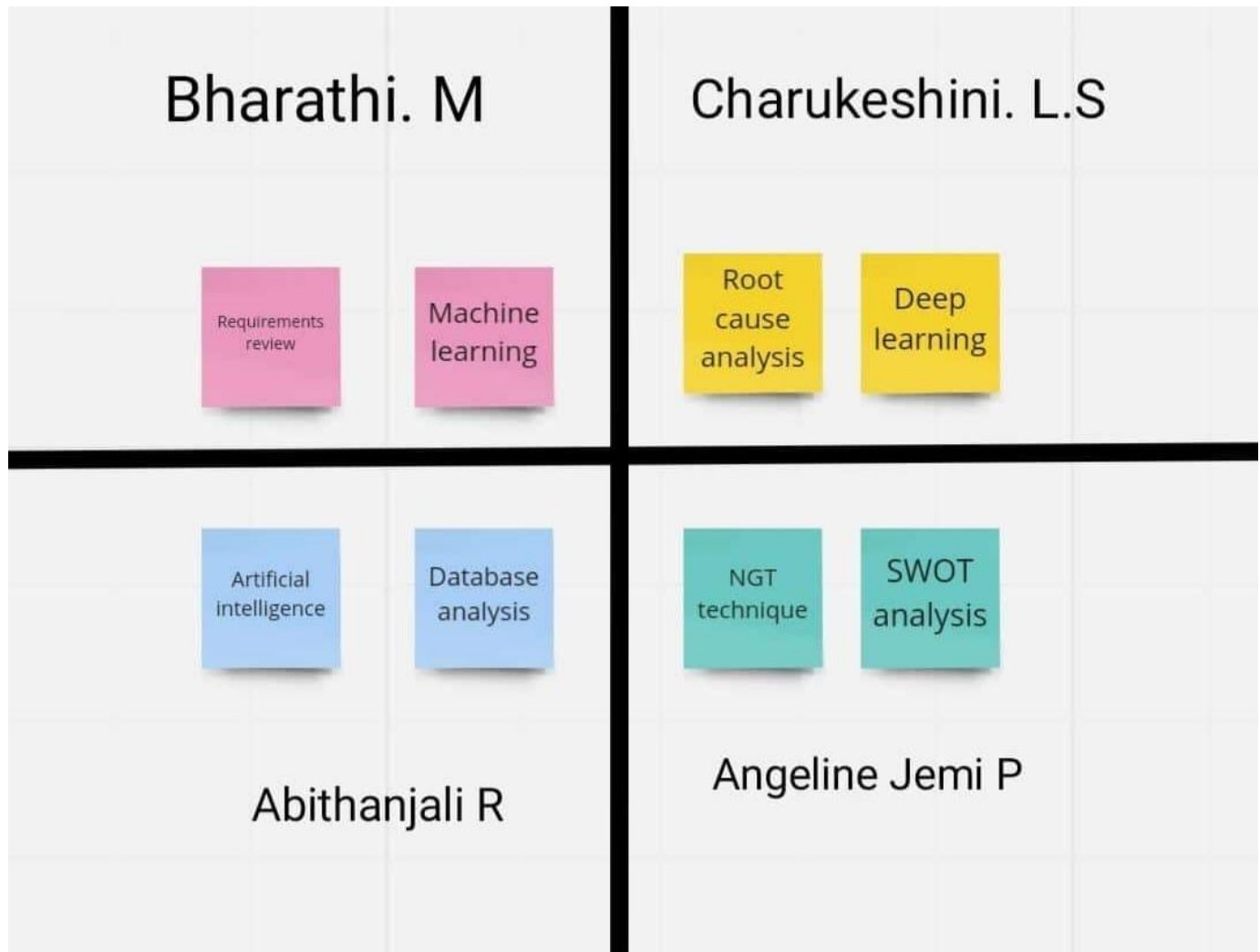


Perinatal health refers to the health of women during pregnancy, childbirth and the post-partum period, whereas perinatal health refers to health from 22 completed weeks of gestation until 7 completed days after birth.

**Signs & Symptoms**

- Abdominal pain (ongoing)
- Chest pain.
- Decreased or no fetal movement.
- Extreme fatigue.
- Fainting or lightheaded.
- Heart palpitations.
- Nausea and vomiting.
- Trouble breathing.

## Step-2: Brainstorm, Idea Listing and Grouping



### Step-3: Idea Prioritization





## 2.4 PROPOSED SOLUTION

S.No.	Parameter	Description
•	Problem Statement (Problem to be solved)	Perinatal health refers to the health of women during pregnancy, childbirth and the post-partum period, whereas perinatal health refers to health from 22 completed weeks of gestation until 7 completed days after birth
•	Idea / Solution description	To propose a framework for examining perinatal health and health care disparities among women with physical disabilities.
•	Novelty / Uniqueness	Existing perinatal health and health care frameworks do not address the needs and barriers faced by women with physical disabilities around the time of pregnancy. A new framework that addresses the perinatal disparities among women with physical disabilities is needed.
•	Social Impact / Customer Satisfaction	The main dependent variable was whether mothers with physical disabilities reported they “needed better care from the person who provided prenatal care.”
•	Business Model (Revenue Model)	The Maternal Mental Health Alliance’s <a href="#">Everyone’s Business Campaign</a> calls for all women across the UK to receive the mental health care they and their families need during pregnancy and postnatally
•	Scalability of the Solution	The proposed framework uses a life span perspective in a manner that directly addresses the multiple determinants specific to women with physical disabilities around the time of pregnancy. The framework is based on longitudinal and integrated perspectives that take into account women's functional status and environment over their life course

## REQUIRED ANALYSIS

### 3.1 FUNCTIONAL REQUIREMENTS

FR No.	Functional Requirement (Epic)	Sub Requirement (Story / Sub-Task)
FR-1	User Registration	Registration through Form Registration through Gmail Registration through Mobile number
FR-2	User Confirmation	Confirmation via Email Confirmation via OTP
FR-3	User details	Test results Queries Personal details
FR-4	Login confirmation	Enter password Enter user name and email

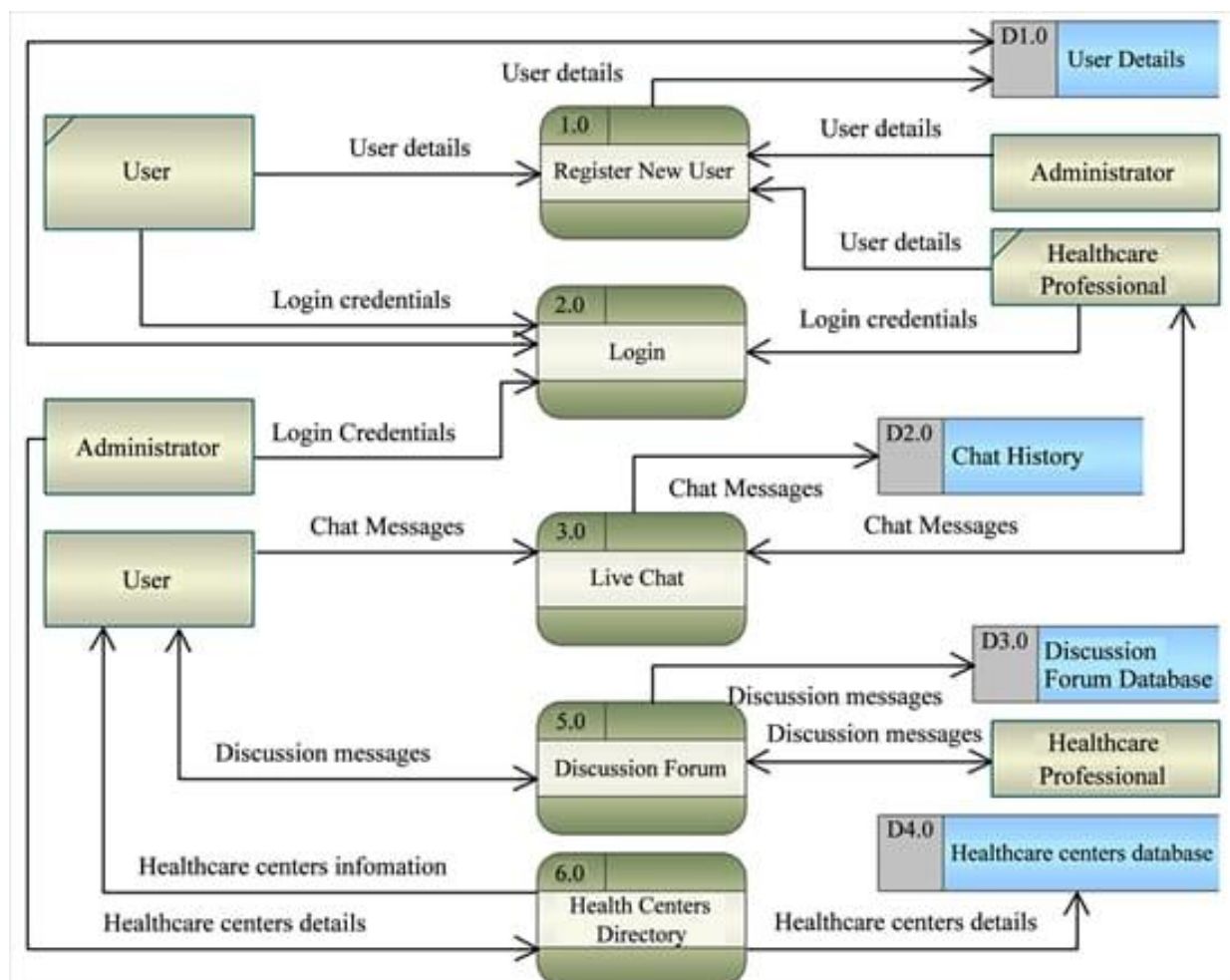
### 3.2NON-FUNCTIONAL REQUIREMENTS

FR No.	Non-Functional Requirement	Description
NFR-1	<b>Usability</b>	Provides user friendly environment
NFR-2	<b>Security</b>	Provides verification, authorization and authentication
NFR-3	<b>Reliability</b>	Reliable to user and operator
NFR-4	<b>Performance</b>	Consumes less time and space/memory
NFR-5	<b>Availability</b>	Detection availability using online counseling of patients
NFR-6	<b>Scalability</b>	System and software upgrades and backup and restore operations to ensure serviceability

# PROJECT DESIGN

## 4.1 DATAFLOW DIAGRAM

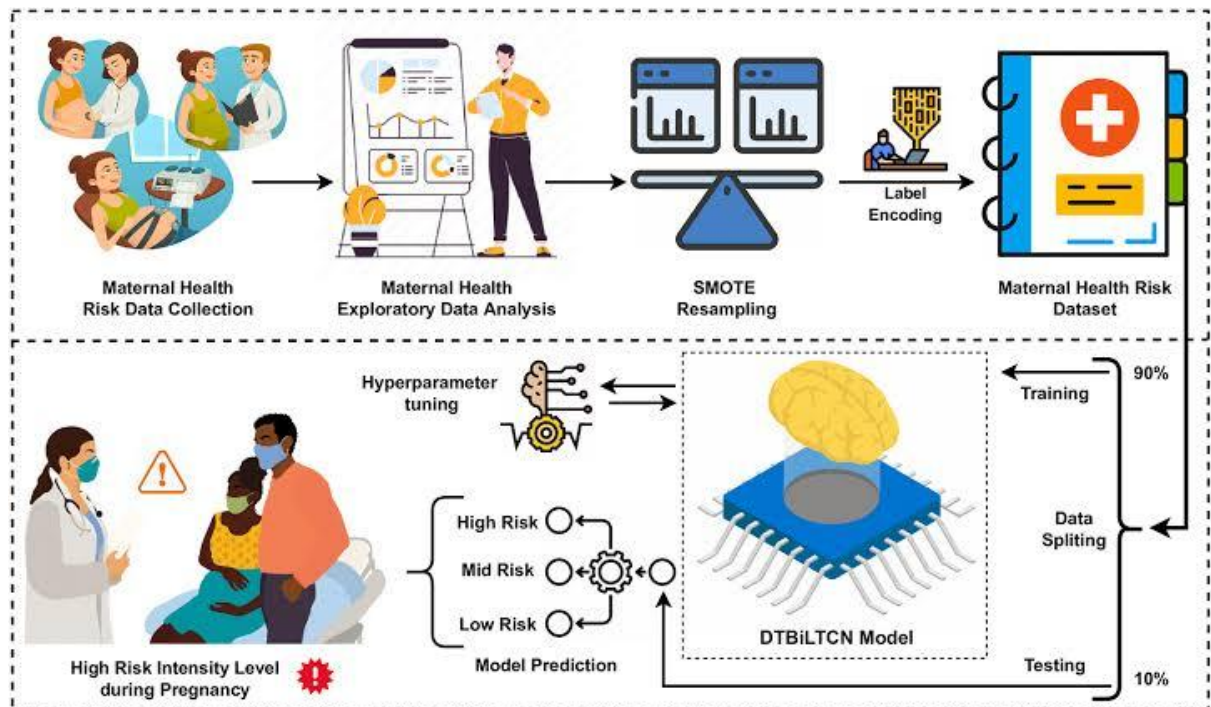
A Data Flow Diagram (DFD) is a traditional visual representation of the information flows within a system. A neat and clear DFD can depict the right amount of the system requirement graphically. It shows how data enters and leaves the system, what changes the information, and where data is stored



## 4.2 SOLUTION AND TECHNICAL ARCHITECTURE

Solution architecture is a complex process – with many sub-processes – that bridges the gap between business problems and technology solutions. Its goals are to:

- Find the best tech solution to solve existing business problems.
- Describe the structure, characteristics, behavior, and other aspects of the software to project stakeholders.
- Define features, development phases, and solution requirements.
- Provide specifications according to which the solution is defined, managed, and delivered.



4.

## SER STO RIES

User type	Functional Requirement (Epic)	User Story Number	User Story / Task	Acceptance criteria	Priority	Team Member
Customer (Mobile user/ PC user)	Registration	USN-1	As a user, I can register for the application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Bharathi
		USN-2	As a user, I will receive confirmation email once I have registered for the application	I can receive confirmation email & click confirm	High	Charu
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Angeline
	Login	USN-4	As a user, I can register for the application through Gmail		Medium	Abi
Customer (Web user)						
Customer Care Executive						
Administrator						

## 5. CODING AND SOLUTIONING:

## 5.1 FEATURE 1:

Authentication using Email

## 5.2 FEATURE 2:

Incase of forgetting the password, you can login to the website using OTP.

# 6. RESULTS:

## 6.1 PERFORMANCE METRICS:

```
#printing the train accuracy and test accuracy respectively
svm(x_train,x_test,y_train,y_test)
```

```
0.7628654264315052
0.7555555555555555
***Support Vector Machine***
Confusion_Matrix
[[719 314]
 [192 845]]
Classification Report
```

	precision	recall	f1-score	support
0	0.79	0.70	0.74	1033
1	0.73	0.81	0.77	1037
accuracy			0.76	2070
macro avg	0.76	0.76	0.75	2070
weighted avg	0.76	0.76	0.75	2070

# TUNE THE MODEL

```
0.8859627929451558
0.7454106280193237
***Random Forest after Hyperparameter tuning***
Confusion Matrix
[[553 480]
 [ 47 990]]
Classification Report
      precision    recall  f1-score   support

     0       0.92     0.54     0.68     1033
     1       0.67     0.95     0.79     1037

 accuracy          0.75     2070
 macro avg         0.80     2070
 weighted avg      0.80     2070

Predicting on random input
output is: [0]
[Parallel(n_jobs=1)]: Using backend SequentialBackend with 1 concurrent workers.
[Parallel(n_jobs=1)]: Done 1 out of 1 | elapsed: 0.0s remaining: 0.0s
[Parallel(n_jobs=1)]: Done 2 out of 2 | elapsed: 0.0s remaining: 0.0s
[Parallel(n_jobs=1)]: Done 3 out of 3 | elapsed: 0.0s remaining: 0.0s
[Parallel(n_jobs=1)]: Done 4 out of 4 | elapsed: 0.0s remaining: 0.0s
[Parallel(n_jobs=1)]: Done 5 out of 5 | elapsed: 0.0s remaining: 0.0s
[Parallel(n_jobs=1)]: Done 6 out of 6 | elapsed: 0.0s remaining: 0.0s
[Parallel(n_jobs=1)]: Done 7 out of 7 | elapsed: 0.0s remaining: 0.0s
```

## **7. ADVANTAGES AND DISADVANTAGES:**

### **Advantages:**

- Result consumes less time
- Provide accurate result
- Secured website

### **Disadvantages :**

- Needs specific software to run
- Can't perform on any platform.

## **8. CONCLUSION:**

resource intensive care, perinatal health risk of patients followed in a multi disciplinary clinic was found to be the modest. Whether enhanced educational strategies can improve patients outcomes warrants further study. This model examines the ability to detect perinatal health risk using machine learning algorithms while considering the least number of tests and the results of whether the person has perinatal health risk or not is given.



## **9. FUTURE SCOPE:**

increasing number of prenatal diagnostic tests in prenatal screening strategies, raises the question what tests to offer and why. This qualitative study investigated the views and preferences of professionals and potential users regarding four diagnostic test options for women at increased risk for common aneuploidies.

## **10. APPENDIX:**

**YOU TUBE LINK**

**<https://youtu.be/3qrDj0z-L6k>**

**GITHUB LINK**

**<https://github.com/naanmudhalvan-SI/IBM--15540-1682404419>**