Project Design Phase-II
Data Flow Diagram & User Stories

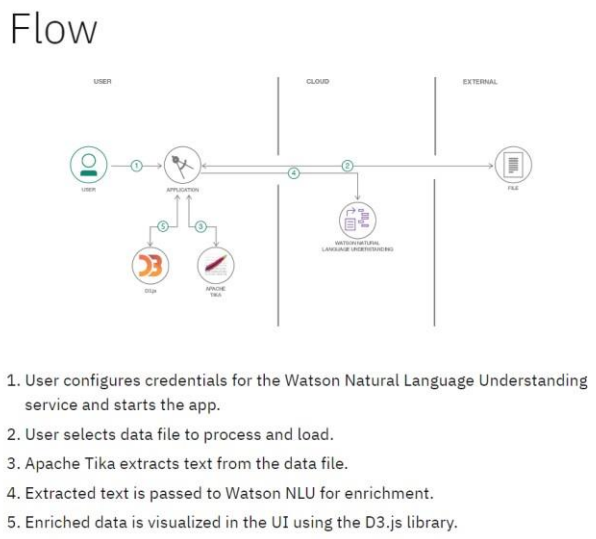
Date	03 October 2022
Team ID	PNT2022TMIDxxxxxx
Project Name	Project - xxx
Maximum Marks	4 Marks

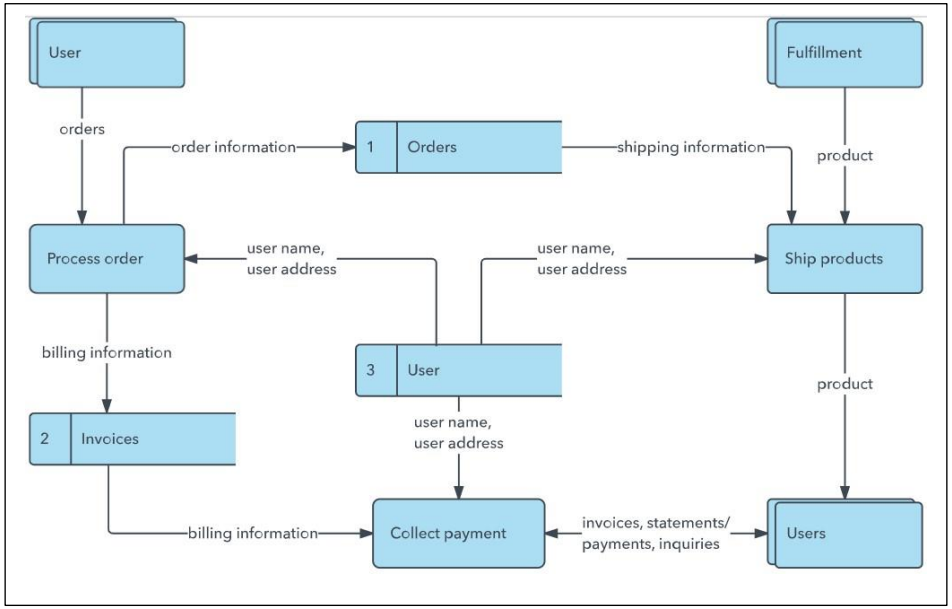
Data Flow Diagrams:

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.

Example: DFD Level 0 (Industry Standard)

Example: (Simplified)





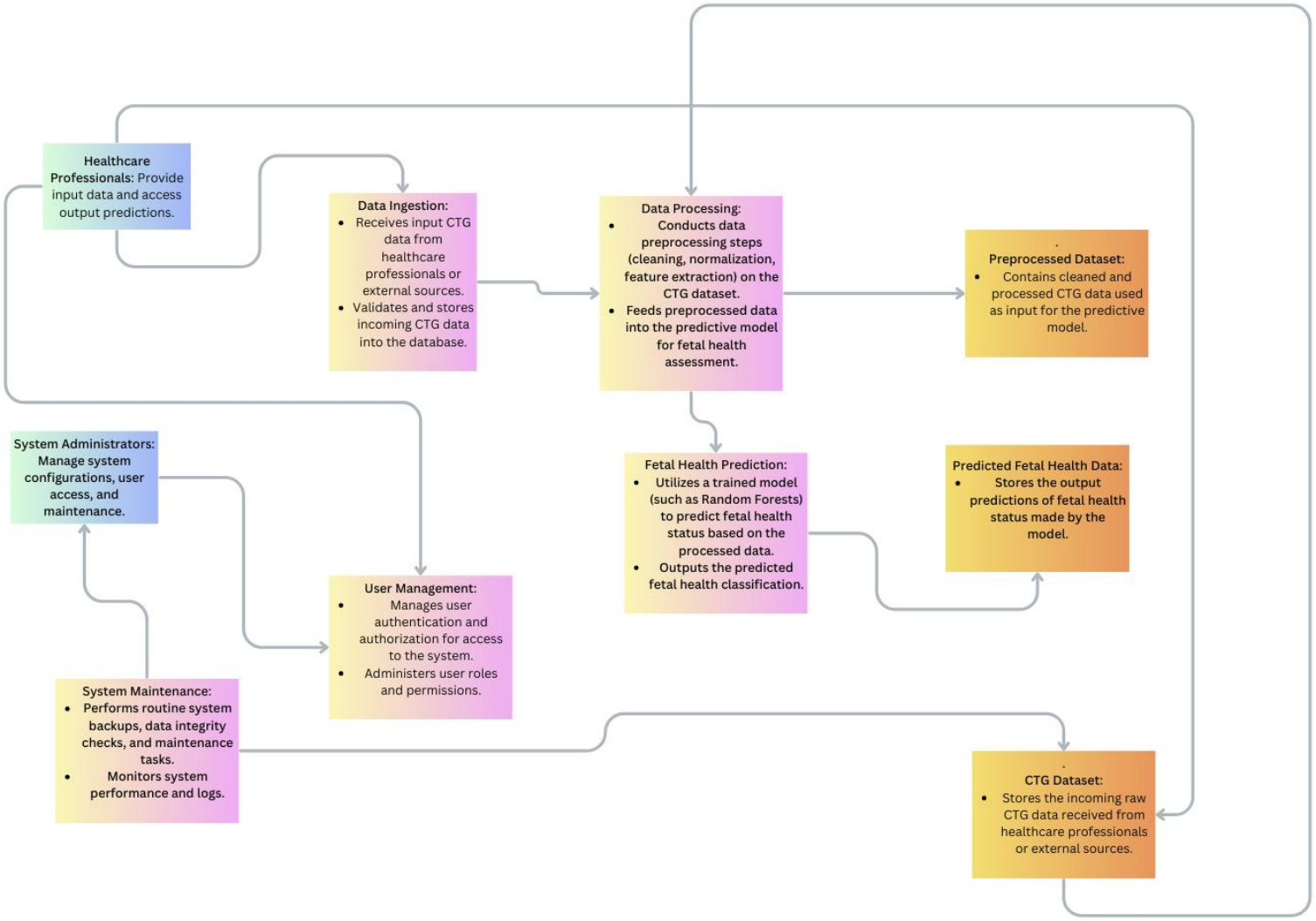
User Stories

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 application by entering my email, password, and confirming my password.	I can access my account / dashboard	High	Sprint-1
		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	Sprint-1
		USN-3	As a user, I can register for the application through Facebook	I can register & access the dashboard with Facebook Login	Low	Sprint-2
		USN-4	As a user, I can register for the application through Gmail		Medium	Sprint-1

	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
	Dashboard					
Customer (Web user)						
Customer Care Executive						
Administrator						

DATAFLOW DIAGRAM



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
Healthcare Professional (PC)	Accessing data	USN-1	As a user, I can access the CTG dataset by logging in with my credentials.	I can log in using provided credentials and access the CTG dataset dashboard.	High	Sprint-1
		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	Sprint-1
		USN-3	As a user, I can filter and search the CTG dataset based on specific features or fetal health classifications.	I can use filters to refine dataset view and search for specific records.	Medium	Sprint-2
		USN-4	As a user, I can register for the application through Work mail		High	Sprint-1
	Login	USN-5	As a user, I can log into the application by entering email & password		High	Sprint-1
Customer Care Executive	Support and Assistance	USN-6	As a customer care executive, I can view summary reports of the CTG dataset.	I can access summary reports displaying overall statistics and trends from the dataset.	High	Sprint-2
		USN-7	As a customer care executive, I can generate custom reports based on specific criteria.	I can create reports with selected parameters (e.g., time range, health classifications)	Medium	Sprint-3
		USN-8	As a customer care executive, I can export reports for sharing with healthcare professionals.	I can export reports in a format suitable for sharing (e.g., PDF, Excel).	High	Sprint-3
Administrator		USN-9	As an administrator, I can manage user access levels and permissions.	I can assign roles and access permissions to users (e.g., read-only, admin).	High	Sprint-4
		USN-10	As an administrator, I can monitor system performance and data integrity.	I can access logs and performance metrics for system monitoring.	Medium	Sprint-4

		USN-11	As an administrator, I can perform system backups and data maintenance tasks	I can schedule and execute backups and data maintenance routines.	High	Sprint-4

Project Design Phase-I
Proposed Solution Template

Date	19 September 2022
Team ID	PNT2022TMIDxxxxxx
Project Name	Project - xxx
Maximum Marks	2 Marks

Proposed Solution Template:

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

S.No.	Parameter	Description
1.	Problem Statement (Problem to be solved)	The objective is to use Cardiotocograms (CTGs) as a cost-effective and accessible tool in healthcare to help in early detection of potential risks to reduce child and maternal mortality. he goal is to create a robust multi-class classification system capable of accurately categorizing fetal health into 'Normal,' 'Pathological,' or 'Suspect' classes using features such as fetal heart rate, movements, and uterine contractions.
2.	Idea / Solution description	The proposed solution involves utilizing Random Forests to build a predictive model for fetal health classification based on a dataset comprising various features associated with fetal well-being. By leveraging Cardiotocograms (CTGs) as the primary data source, this model aims to accurately classify fetal health into 'Normal,' 'Pathological,' or 'Suspect' categories. It involves preprocessing the dataset, feature selection, and training a Random Forest algorithm to predict fetal health based on characteristics like fetal heart rate, movements, and uterine contractions.
3.	Novelty / Uniqueness	Utilizing Random Forests specifically for fetal health classification based on CTG data is a unique approach in the realm of healthcare. Integrating multiple features from CTGs into a single predictive model to categorize fetal health status distinguishes this solution from traditional approaches.
4.	Social Impact / Customer Satisfaction	Reducing Mortality: Early detection of fetal health issues can lead to timely interventions, significantly reducing child and maternal mortality rates.

		Accessible Healthcare: By leveraging CTGs, a cost-effective and widely available tool, the solution aims to make quality prenatal care more accessible, particularly in low-resource settings.
5.	Business Model (Revenue Model)	1. Partnerships with Healthcare Institutions: Collaboration with hospitals, clinics, and healthcare centers to implement the predictive model as part of their prenatal care services. 2. Consultation and Training: Providing consultation and training services to healthcare professionals on using the predictive model effectively.
6.	Scalability of the Solution	Random Forests are known for their scalability; the model can handle large datasets and diverse features, making it adaptable to various healthcare settings and different populations With continuous updates and refinements based on new data and research, the model can evolve and improve its accuracy over time.

Project Design Phase-I
Solution Architecture

Date	19 September 2022
Team ID	PNT2022TMIDxxxxxx
Project Name	Project - xxx
Maximum Marks	4 Marks

Solution 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.

Example - Solution Architecture Diagram:

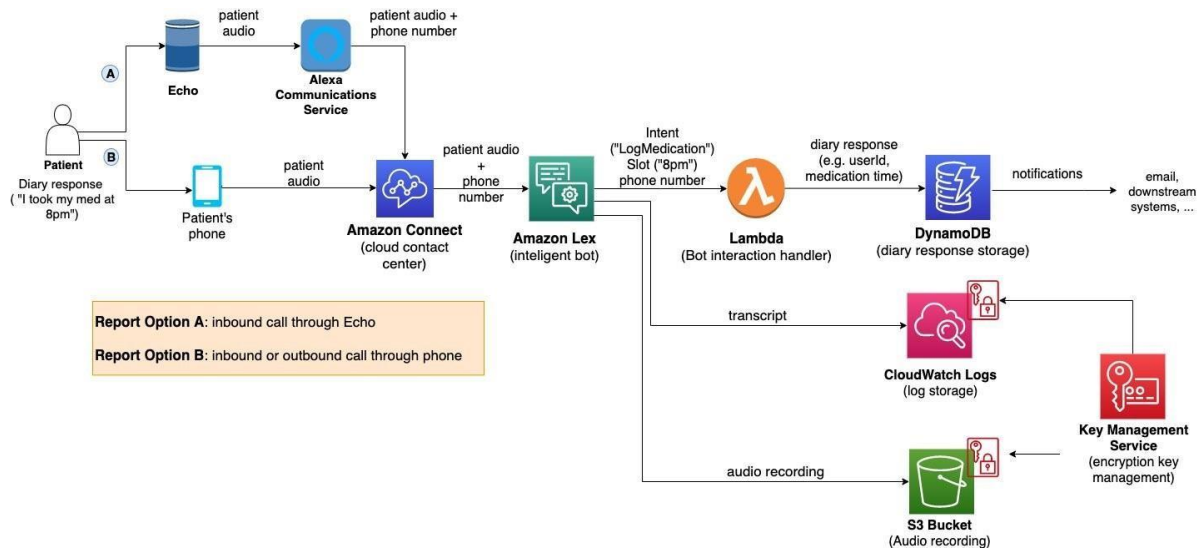


Figure 1: Architecture and data flow of the voice patient diary sample application

Reference: https://aws.amazon.com/blogs/industries/voice-applications-in-clinical-researchpowered-by-ai-on-aws-part-1-architecture-and-design-considerations/

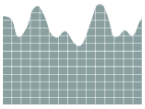
PREPROCESSING MODULE

DATA COLLECTION AND PREPROCESSING

1. Perform data cleaning, handling missing values, and normalizing/standardizing the features as required.
2. Split the dataset into training, validation, and test sets to facilitate model training and evaluation.

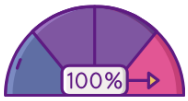
FEATURE SELECTION AND ENGINEERING

1. Analyze the relevance and importance of features in predicting fetal health status.
2. Conduct feature engineering if needed, extracting additional relevant features from the existing dataset.
3.



MODEL DEVELOPMENT# USING RANDOM FORESTS

1. Implement a Random Forest Classifier using libraries like scikit-learn in Python.
2. Input the preprocessed data into the Random Forest model.
3. Train the model on the training dataset while validating its performance on the validation set.
4. Fine-tune hyperparameters using techniques like random search to optimize model performance.



MODEL EVALUATION

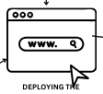
Evaluate the trained model's performance using metrics such as accuracy, precision, recall, and F1-score on the test dataset.

MAINTENANCE

- Implement monitoring systems to track model performance in real-time.
- Regularly update the model using new data to ensure its accuracy and relevance over time.

Patient Information Input:

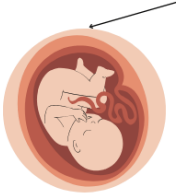
Healthcare professionals input the patient's Cardiotocogram (CTG) data, including features like FHR baseline, accelerations, fetal movements, uterine contractions, etc., into the system



DEPLOYING THE FINAL MODEL USING FLASK

PREDICTION OUTPUT

1. The model predicts the fetal health status based on the input data, assigning it to one of the three classes: 'Normal,' 'Suspect,' or 'Pathological.'
2. Results & Action:



Results & Action:

The predicted fetal health status is presented to healthcare professionals, enabling them to take appropriate actions and interventions based on the model's assessment.