**Problem statements:**

Developing a machine learning model to classify fetal health status based on Cardiotocogram (CTG) data. The dataset includes features such as fetal heart rate, movements, and uterine contractions, with the target variable having three classes: 'Normal', 'Pathological', and 'Suspect'. The goal is to create a reliable classification tool to aid healthcare professionals in identifying pregnancies at risk and reducing child and maternal mortality rates, especially in low-resource settings.

**Project proposal:**

FetalAI: Leveraging Machine Learning for Fetal Health Monitoring

Objective:

The project aims to develop an AI-driven solution for predicting and monitoring fetal health using Cardiotocogram (CTG) data. By classifying CTG recordings into 'Normal', 'Pathological', and 'Suspect' categories, the proposed solution seeks to assist healthcare professionals in early identification of potential risks to both maternal and fetal well-being, thereby contributing to the reduction of child and maternal mortality rates.

Approach:

1. Data Collection: Gather CTG datasets containing features such as fetal heart rate, movements, and uterine contractions.

2. Data Preprocessing: Clean and preprocess the data to handle missing values, outliers, and standardize features.

3. Model Development: Utilize machine learning algorithms such as Random Forest, Gradient Boosting, and Neural Networks to train a classification model.

4. Model Evaluation: Assess the performance of the trained model using metrics like accuracy, precision, recall, and F1-score through cross-validation techniques.

5. Deployment: Implement the trained model into a user-friendly interface accessible to healthcare professionals for real-time fetal health monitoring.

Expected Outcome:

The proposed solution is expected to provide an efficient and accurate means of fetal health assessment, enabling early intervention and reducing the incidence of adverse outcomes. By leveraging AI technology, the project aims to contribute significantly to the global effort of achieving the United Nations' Sustainable Development Goals, particularly in reducing child and maternal mortality rates.

Impact:

* Improved prenatal care and early detection of fetal distress.
* Reduction in unnecessary medical interventions and associated costs.
* Empowerment of healthcare professionals with an accessible tool for fetal health monitoring, particularly in low-resource settings.

Timeline:

* Data Collection and Preprocessing: 1 month
* Model Development and Evaluation: 2 months
* Deployment and Testing: 1 month

**Initial project planning report:**

Project Planning Report: FetalAI - Leveraging Machine Learning for Fetal Health Monitoring

Project Overview:

FetalAI aims to develop a machine learning-based solution for predicting and monitoring fetal health using Cardiotocogram (CTG) data. The project's primary objective is to assist healthcare professionals in early identification of potential risks to maternal and fetal well-being, ultimately contributing to the reduction of child and maternal mortality rates.

Project Objectives:

1. Gather CTG datasets containing features such as fetal heart rate, movements, and uterine contractions.

2. Preprocess the collected data to handle missing values, outliers, and standardize features.

3. Develop machine learning models to classify CTG recordings into 'Normal', 'Pathological', and 'Suspect' categories.

4. Evaluate the performance of the trained models using various metrics such as accuracy, precision, recall, and F1-score.

5. Deploy the trained model into a user-friendly interface accessible to healthcare professionals for real-time fetal health monitoring.

Key Deliverables:

1. Cleaned and preprocessed CTG dataset.

2. Trained machine learning models for fetal health classification.

3. Model evaluation report detailing performance metrics and analysis.

4. Deployed interface for real-time fetal health monitoring.

Project Phases:

1. Project Initiation (1days):

* Define project scope, objectives, and deliverables.
* Establish project team roles and responsibilities.
* Set up communication channels and project management tools.

2. Data Collection and Preprocessing (3 days):

* Identify and gather CTG datasets from relevant sources.
* Clean and preprocess the collected data to ensure quality and consistency.
* Conduct exploratory data analysis to gain insights into the dataset.

3. Model Development (2 days):

* Select appropriate machine learning algorithms for fetal health classification.
* Train multiple models using the preprocessed data.
* Fine-tune hyperparameters and optimize model performance.
* Validate models using cross-validation techniques.

4. Model Evaluation (1 days):

* Evaluate the performance of trained models using established metrics.
* Compare the performance of different models and select the best-performing one.
* Generate a comprehensive report summarizing the evaluation results.

5. Deployment and Testing (3 weeks):

* Develop a user-friendly interface for accessing the trained model.
* Integrate the model into the interface and perform thorough testing.
* Address any issues or bugs identified during testing.

6. Project Closure (3 days):

* Finalize project documentation, including the planning report, model documentation, and user guide.
* Conduct a project review meeting to assess achievements, lessons learned, and future recommendations.
* Hand over the project deliverables to stakeholders and obtain feedback.