## Title: Using Artificial Intelligence to Diagnose Endemic Infectious Diseases in Liberia

## Background of the Project

Infectious diseases such as malaria, tuberculosis (TB), HIV/AIDS, and typhoid fever are among the top causes of morbidity and mortality in Liberia, particularly in rural and resource-limited settings. The shortage of trained healthcare personnel and limited diagnostic tools delay early detection and treatment. This project aims to develop an AI-based diagnostic tool capable of analyzing clinical symptoms, patient history, and available test results to provide fast and accurate preliminary diagnoses. The goal is to empower frontline health workers to improve timely decision-making and patient outcomes.

## Relevance to Sustainable Development Goals (SDGs)

The project supports:  
• SDG 3: Good Health and Well-being – by improving early disease detection and reducing preventable deaths.  
• SDG 1: No Poverty – by minimizing the economic burden of prolonged illness.  
• SDG 9: Industry, Innovation, and Infrastructure – by leveraging AI to strengthen healthcare systems in low-resource settings.

## Reviewed Literature

1. 'Deep Learning for Tuberculosis Diagnosis from Chest X-rays' – Demonstrated that AI can match radiologist-level accuracy in detecting TB from medical images.  
2. 'Artificial Intelligence for Malaria Diagnosis Using Blood Smear Images' – Achieved over 95% accuracy in detecting malaria parasites, showing potential for reducing diagnostic delays in low-resource labs.

## Project Description

The project will use:  
• Clinical data (symptoms, demographics, medical history) from Liberia’s Ministry of Health.  
• Diagnostic data including malaria blood smear images, TB chest X-rays, and rapid diagnostic test results.  
• Geospatial prevalence data from WHO and national health surveys and other open source platform.  
Formats: CSV, DICOM images, and JPEG microscopy images.  
Preprocessing: Data cleaning, anonymization, feature extraction, and multimodal integration.

## Approach (Machine Learning or Deep Learning)

A hybrid AI approach will be used:  
• Deep Learning (CNNs) for image analysis (microscopy and radiology).  
• Machine Learning (Random Forest, Gradient Boosting) for structured clinical and test result data.  
• Ensemble models to combine multiple outputs for improved accuracy.  
This approach balances interpretability, accuracy, and computational efficiency for deployment in mobile applications.