POWER LEARN PROJECT SOFTWARE DEVELOPMENT PROGRAM

Specialization: AI for Software Engineering

Report made by:

Emmanuel Odenyire, odenyireemmanuel@gmail.com

AI for Good: Project Report

1. Project Title

"AI-Powered Prediction of Maternal Mortality in Hospitals (SDG 3)"

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2. SDG Focus

- **Goal**: SDG 3 – *Good Health and Well-Being*
- **Problem Statement**:
  Maternal mortality remains a pressing health issue, especially in low-resource hospitals. There's often a lack of early warning systems or data-driven tools to identify high-risk hospitals and reduce preventable deaths during childbirth.

3. AI Approach

Software Engineering Skills Applied

Skill	Application
Automation	Machine learning automates the prediction of mortality based on hospital metrics.
Testing	Model performance validated using metrics such as RMSE and R^2.
Modular Design	Code modularized into a notebook for modeling and `app.py` for deployment.
Deployment	Web deployment using **Streamlit Cloud**.

Technical Solution

- **Model**: Random Forest Regressor trained on 100 synthetic hospitals with realistic attributes.

- **Input Features**: Beds, NICU availability, staff-to-patient ratios, equipment quality, hospital age, etc.
- **Output**: Predicted **maternal mortality rate** (per 1,000 births).
- **Post-processing**: Risk feedback provided (low, moderate, high) in the UI.

4. Tools & Frameworks

Category	Tools Used
ML/AI	`scikit-learn`, `numpy`, `pandas`
Visualization	`matplotlib`, `seaborn`
App Framework	`streamlit`
Version Control	`Git`, GitHub
Deployment	Streamlit Community Cloud
Data Source	Synthetic data generation based on domain logic

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5. Deliverables

Item	Description
Notebook	Complete notebook for EDA, model training, and saving.
Trained Model	`model.pkl` + `scaler.pkl` for inference.
Streamlit App	`app.py` with sliders and real-time predictions.
Requirements	`requirements.txt` with minimal and exact libraries.
Deployment	Hosted on Streamlit Cloud

6. Ethical & Sustainability Checks

- ✅ **Bias Mitigation**: No personal identifiers; input features are institution-level.
- ✅ **Sustainability**: Lightweight model (Random Forest), runs locally or in the cloud.
- ✅ **Equity**: Designed to help under-resourced hospitals get attention and allocate aid.
- ✅ **Privacy**: All data is synthetic, no personal health information (PHI) used.

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7. Sample Project Outline

Phase	Tasks
Ideation	Identified maternal mortality as a critical SDG 3 challenge.
Development	Generated synthetic data, built ML pipeline, wrote prediction function.
Testing	Evaluated model using MSE, RMSE, R^2. Checked robustness of predictions.
Deployment	Packaged app using Streamlit and deployed on Streamlit Cloud.
Monitoring	Ready to expand to real data once available (e.g., WHO datasets).

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8. How AI for Software Engineering Concepts Apply to SDGs

Concept	Application
Modular Code	Separated model logic (notebook) from UI (Streamlit).
Ethical AI Design	Avoids biased individual-level predictors; focuses on institutions.
Automated Testing	Uses validation metrics (RMSE, R^2) to ensure model quality.
Version Control	Git used to track model evolution and deployment changes.

Reflection Answers

Q: How does your solution align with the SDG targets?
A: It directly addresses **SDG 3.1**: *Reduce the global maternal mortality ratio to less than 70 per 100,000 live births.* This model predicts hospital-level risk and supports proactive intervention.

Q: What ethical risks might arise, and how will you address them?
A: If deployed on real data, ensuring privacy and transparency will be crucial. Currently, synthetic data mitigates this risk.

Q: How can software engineering practices ensure long-term sustainability?
A: By keeping the code modular, testable, and open-source, it can evolve and scale across countries or integrate with other hospital management systems.

Final Thoughts

This project is an example of how **responsible AI** can be applied using solid software engineering practices to tackle real-world problems like maternal health inequality. Once real hospital data becomes available, this system can be fine-tuned for even greater impact.