AI-Driven Early-Warning System for Building Community Health Resilience
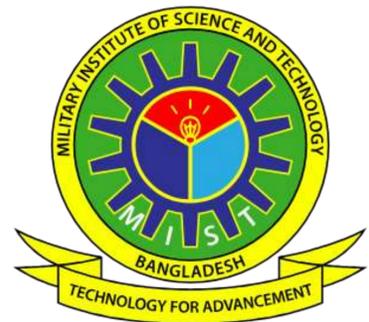
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Poster ID: 26 | Team Name: Health Signal

Problem Statement

➤ In many areas of Bangladesh, disease outbreaks are identified after a large number of people become ill.
➤ Hospitals generate patient reports daily, but this data is mostly used for internal purposes and not for early outbreak detection.
➤ Existing health monitoring systems are reactive and depend on delayed manual analysis.
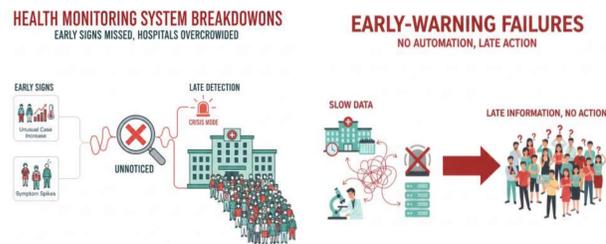
➤ Early signs such as unusual increases in disease cases often go unnoticed until hospitals become overcrowded.
➤ Due to the lack of automated early-warning mechanisms, communities receive information too late to take preventive action.

Proposed Solution

➤ We propose an AI-driven early-warning system that analyzes aggregated hospital case reports to detect early signs of disease outbreaks at the local level and use AI to identify unusual increases or abnormal patterns.
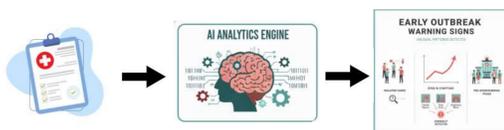
➤ AI identifies unusual increases and patterns in symptoms and assigns a risk level (Low, Medium, High).
➤ All alerts are verified by public health authorities before public release.
➤ Area-based notifications are sent via a mobile app in simple, local language, using icons for accessibility.
➤ Alerts provide general prevention guidance only and do not offer medical diagnosis or treatment.
➤ Community feedback and past data are used by ML models to improve prediction of future outbreaks.
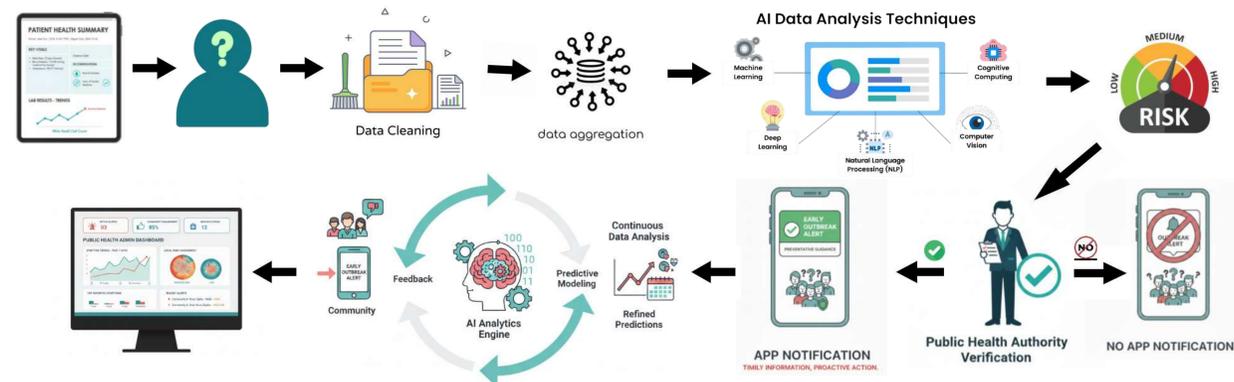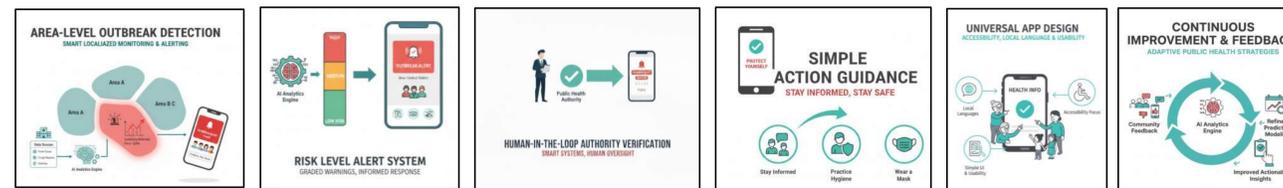
System Workflow

Fig 1: System Workflow for Community Health Outbreak Monitoring

Innovation

AI Model Development

➤ **Objective:** Detect abnormal increases in community-level disease cases and predict outbreak risk levels.
➤ **Dataset:** IEDCR Public Disease Bulletins
➤ **Model:** Isolation Forest (unsupervised anomaly detection).
➤ **Features:** Trend, growth rate, and deviation from learned baseline.
➤ **Status:** Model implemented and tested on sample data (prototype stage).
➤ **Output:** Outbreak risk level — Low / Medium / High.

Fig 2: Baseline vs. Spike Analysis for Outbreak Risk Prediction

Accessibility and Usability Evaluation of Mobile App

➤ **Inclusive Design:** Interfaces designed for accessibility, usability, and local language comprehension.
➤ **Accessibility Review:** Evaluation guided by WCAG principles to ensure perceivable and understandable interaction.
➤ **Usability Evaluation:** Expert heuristic evaluation and semiotic analysis to assess clarity of system messages and symbols.
➤ **User Testing:** Task-based usability testing with representative users to identify interaction and comprehension issues.

Energy-Efficient Deployment Design
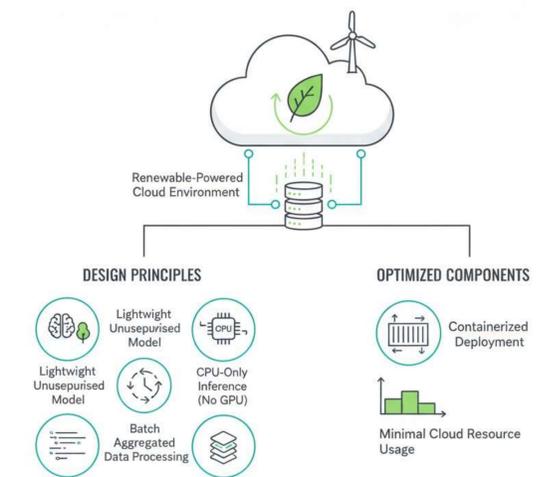
Limitation and Future Work

➤ **Prototype Stage:** Current results are based on small data; large-scale real-world validation is pending.
➤ **Data Coverage:** Future work includes integration of multi-hospital and real-time surveillance data.
➤ **Evaluation:** Conduct extended usability and accessibility testing with diverse user groups.

Conclusion

This work presents a sustainability-aware, AI-driven framework for early detection of abnormal disease trends using aggregated health data. The approach demonstrates how lightweight anomaly detection can support community-level outbreak risk awareness while prioritizing accessibility and usability.

References

[1] B. Karo, C. Haskew, A. S. Khan, J. A. Polonsky, M. K. A. Mazhar, and N. Buddha, "World Health Organization Early Warning, Alert and Response System in the Rohingya crisis, Bangladesh, 2017–2018," Emerging Infectious Diseases, vol. 24, no. 11, pp. 2074–2076, Nov. 2018, doi: 10.3201/eid2411.181237.