Medi Predict AI – Integrated Multi-Disease Risk Assessment System

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Abstract: I am currently working on a project that addresses the growing need for intelligent, automated healthcare diagnostic systems capable of assessing multiple disease risks in an integrated manner. Traditional diagnostic tools often operate in isolation, focusing on single diseases and relying heavily on manual interpretation, which can lead to delays, inconsistencies, and missed early warnings. As healthcare data volumes grow—including patient history, symptoms, lab results, and imaging data—the complexity of accurate Multidisease risk prediction increases significantly. This research presents MediPredict AI, a unified, AI-driven risk assessment system that Analyzes heterogeneous health data to provide early, explainable predictions for multiple diseases simultaneously. The system extracts features from structured and unstructured medical inputs, applies hybrid machine learning models, and delivers risk scores with clinical reasoning. Developed as a web application with a .NET backend, MediPredict AI integrates with electronic health records (EHRs) and supports real-time analytics. Preliminary validation using public health datasets shows promising accuracy in predicting risks for cardiovascular, diabetic, and respiratory conditions, with improved diagnostic speed and clinician workload reduction.

I. INTRODUCTION

Modern healthcare systems are inundated with vast amounts of patient data, yet effectively synthesizing this information for proactive and multi-condition risk assessment remains a challenge. Clinicians often rely on sequential, single-disease diagnostic protocols, which can be time-consuming and may overlook comorbid risks. Slow diagnostics, increased workload, and variability in interpretation impact patient outcomes and healthcare efficiency.

While existing clinical decision support systems (CDSS) and AI diagnostic tools show potential, they are often disease-specific, lack explainability, or fail to integrate multi-modal data seamlessly. Moreover, they seldom provide unified risk profiling across several conditions in a single workflow. This gap calls for an intelligent, integrated system capable of continuous learning from diverse health data sources and delivering actionable, multidisease risk insights.

This research aims to develop an automated, intelligent risk assessment platform that:

- Integrates multi-source health data (EHR, labs, symptoms, images),
- Extracts clinically relevant features for multi-disease modeling,
- Employs hybrid AI techniques for accurate and explainable predictions,
- Presents risk scores and clinical insights via an interactive dashboard.

II. BACKGROUND AND RELATED WORK

A. Traditional Clinical Risk Assessment

Conventional risk assessment relies on standardized scoring systems (e.g., Framingham Risk Score, ASCVD Risk Estimator) which use limited variables and static equations. These are effective for specific populations but lack adaptability to individual patient nuances and multi-modal data.

B. AI in Diagnostic Medicine

Recent advances in machine learning, especially deep learning, have shown strong

SYSTEM OVERVIEW

AI is a web-based clinical decision support system designed to assess multiple disease risks from integrated health data.

A. System Components

- Data Integration Module – Connects to EHR, lab systems, and manual inputs
- Feature Extraction Engine – Processes structured and unstructured medical data
- Multi-Disease Prediction Model – Hybrid ML engine for concurrent risk scoring
- Explainability Module – Generates clinical reasoning for each prediction
- Web Dashboard – Interactive UI for clinicians and patients

B. WorkFlow

- Patient data is collected from EHRs, lab reports, and symptom logs.
- performance in medical image analysis, lab value interpretation, and predictive analytics. Tools like IBM Watson Health and Google's DeepMind demonstrate AI's potential but are often proprietary, expensive, and focused on narrow use cases.

C. Multi-Disease Prediction Systems

Some research explores multi-task learning for predicting several conditions from shared features. However, most systems are experimental, require extensive labeled data, and are not deployable in real clinical workflows.

D. Research Gap

There is a noticeable lack of integrated, deployable AI systems that provide explainable, multi-disease risk assessment using hybrid AI models and real-time data integration in a clinician-friendly interface.

- Features are extracted and normalized.
- Hybrid AI models evaluate risks for multiple diseases simultaneously.
- Risk scores are generated with explainable insights.
- Results are displayed in a dashboard with actionable recommendations.

IV. FEATURE EXTRACTION AND PROCESSING

Medical data is heterogeneous and requires careful preprocessing for AI readiness.

Type	Sample	Use in MediPredict
Basic	Time: 2.3s	Speed guess
Shape	Depth: 12	Check complexity
Smart	Symptom code: 768	Link diseases

Feature Categories

TABLE I: Feature Categories in MediPredict AI

Category	Features
Demographic	Age, gender, BMI, family history
Clinical Vitals	Blood pressure, heart rate, temperature, respiratory rate
Lab Values	Glucose, cholesterol, HbA1c, creatinine, CRP
Symptoms	Textual symptom descriptions, severity scores, duration
Imaging Markers	Extracted features from X-rays, ECG waveforms (if available)
Lifestyle	Smoking, alcohol, diet

V. EXTRACTING FEATURES OF EXECUTION PLANS

MediPredict grabs logs from tools like XGBoost. It notes steps like tree branches or layer math. Then it pulls simple stats: time used, memory, and plan shape—like tree depth.

Code turns these into graphs. It adds scores for busy spots or path lengths, making a short list of 50 key traits.

Main Features

- Basic Stats: Run time (2s), math ops, param count—to guess costs quick.
- Shape Traits: Node count, links, branch spread; e.g., splits per tree.
- Smart Codes: Symptom meanings turned to numbers, mixed with plan data.

VI. CONCLUSION

MediPredict presents an AI-powered healthcare prediction system designed to support early disease detection and smarter clinical decisions. By using

machine learning techniques on patient data, the system analyzes symptoms and medical history to generate accurate risk predictions. Data preprocessing methods such as handling missing values, normalization, and feature selection improve the model's reliability and performance.

Overall, MediPredict demonstrates how artificial intelligence can enhance modern healthcare systems. With future improvements like real-time health monitoring and advanced deep learning models, the system has strong potential to become a valuable clinical decision-support tool.

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