**ARTIFICIAL INTELLIGENCE**

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MediCare AI: Intelligent Healthcare and Diagnosis Portal

# Overview

Our projects focus on **Sustainable Development Goal (SDG) 3: Better health and wellness**. It is one of the main SDGs of Pakistan. The goals emphasize that access to quality health care is essential for a healthy and productive society. Health is a fundamental pillar of a country's progress. If you do not have good health Individuals will not be able to perform their duties to their full potential. and affect the overall development and growth of the community. Our project addresses this by leveraging artificial intelligence (AI) to help diagnose and detect **underlying diseases and cardiovascular diseases** that are so prevalent in today's society. In the past few years more and more people are dealing with heart problems such as heart disease, stents, and bypass surgery, which makes it imperative to focus on early diagnosis and treatment.

This healthcare platform is designed to provide basic diagnosis of common conditions. It helps patients detect early symptoms of diseases such as **asthma, influenza, diabetes**, etc. The platform also focuses on **detecting heart disease**. It is based on the alarming rate of heart-related conditions around the world and in Pakistan. With our AI model, patients can upload textual messages to detect early signs of heart disease. This will help patients receive advance warning and seek medical treatment early.

# User Roles and Functionalities

## Admin

* The admin will have full control over the system, managing the platform's operations and overall functionality.
* Ability to view a list of patients and monitor their diagnostic history.
* Ensure the system runs smoothly for all users.
* Manage user accounts and maintain the integrity of the platform.
* Review AI-generated reports for patient diagnostics.
* Keep track of data being processed across the platform.
* View graphical data and visualizations, such as patient health trends, disease statistics, and platform usage metrics.

## Patient

Patients are the core users of the system. They will have access to **health diagnostics**, **AI tools**, and **personal health records** through an intuitive dashboard. The platform ensures a seamless experience with personalized health insights and actionable recommendations.

### Authentication Flow:

* **Sign-up/Login**: Patients can register or log in through email, phone, For enhanced security, **OTP-based authentication** could be an option.

### Symptom Checker (AI-Powered Disease Detection):

* **Symptom Input**: Patients can input basic symptoms (e.g., coughing, fever, fatigue), and the AI model will analyze the symptoms to provide potential diagnoses.
* **AI Analysis**: Using machine learning models trained on extensive patient data, the AI suggests possible conditions like asthma, influenza, or other common diseases.
* **Recommendations**: The system will provide real-time diagnostic results, along with advice on whether the patient should consult a specialist or take further medical steps.

### Heart Disease Detection (Textual and Image-Based):

* **Symptom Entry**: Patients can input heart-related symptoms (chest pain, shortness of breath) for textual analysis.
* **Heart Scan Upload**: Patients can also upload  **heart scan images** for a more detailed AI-driven analysis (Future Goal in Project).
* **AI Predictions**: The AI model will predict the likelihood of heart disease based on the textual input or image data, providing suggestions for follow-up with a cardiologist if needed.
* **Real-Time Results**: Results are shown immediately with a detailed breakdown of the analysis.

### Chatbot (AI Health Assistant):

* **AI Chat Support**: An **AI-powered chatbot** will be available to answer health-related queries. It will provide basic healthcare advice, disease prevention tips, and general medical guidance.
* **Natural Language Processing (NLP)**: The chatbot uses **NLP algorithms** to understand patient inputs and respond meaningfully with relevant health information.

### Profile and Health Records Management:

* **Health Dashboard**: Patients can view a **dynamic dashboard** that provides an overview of their health statistics, including BMI, heart rate, and other vitals if integrated with wearable devices.
* **Medical Records**: Patients will have access to their past **medical records**, diagnosis reports, treatment history, and AI predictions.
* **Record Updates**: Patients can update personal details and keep track of medical history for future reference.

### Report Generation and Download:

* **Custom Reports**: After each diagnostic session, the system generates a personalized health report that includes diagnostic results, AI predictions, and recommended next steps.
* **Visual Insights**: The report can include **visual graphs**, charts, and tables summarizing health statistics, making it easy for patients and healthcare providers to analyze.
* **Downloadable Reports**: Patients can download these reports in **PDF format** for personal records or to share with doctors.

### Notifications and Reminders:

* **Health Alerts**: The system will send **automated notifications** for upcoming medical appointments, new health reports, or critical health changes.
* **Medication Reminders**: Patients can set up reminders for medications or follow-up appointments to ensure they remain consistent with their healthcare regimen.

# Domain

The domain of this project is **online healthcare services** powered by **artificial intelligence (AI)**. The platform allows patients to access health diagnostics, monitor symptoms, and check for diseases like heart conditions from anywhere. With AI tools for quick diagnosis and report generation, the system helps patients manage their health easily. The project focuses on making healthcare more accessible and efficient by offering users an online platform where they can get basic health advice and recommendations without needing in-person visits.

# SDG Focus: Good Health and Well-Being (SDG 3)

This project aligns with **Sustainable Development Goal 3 (Good Health and Well-Being)** by focusing on the following aspects:

* **Access to Healthcare**: The online platform ensures healthcare services are available to anyone with an internet connection, making health diagnostics more accessible, especially in remote or underserved areas.
* **Early Disease Detection**: By using AI for symptom checking and heart disease detection, the system promotes early diagnosis, allowing patients to take timely action and potentially prevent serious complications.
* **Improved Healthcare Quality**: AI-based diagnostics enhance the accuracy of disease detection and provide personalized health reports, leading to better quality healthcare for patients.
* **Promoting Preventative Care**: With real-time health insights, the platform encourages patients to monitor their health regularly and take preventive steps to avoid more serious health issues.
* **Reduced Healthcare Inequality**: The platform helps reduce the gap in healthcare access by providing affordable and easy-to-use health diagnostics, contributing to equitable healthcare for all.

# Technology Stack

* **MySQL**:
  + Relational database for storing patient records, health data, and user profiles.
  + Ensures data integrity and supports complex queries.
* **Express.js**:
  + Web application framework for Node.js to build RESTful APIs.
  + Facilitates smooth communication between the front end and back end.
* **React.js**:
  + Frontend library for building user interfaces.
  + Provides a responsive and interactive experience for users, enabling dynamic data rendering.
* **Node.js**:
  + JavaScript runtime environment for server-side programming.
  + Handles client requests and serves APIs, ensuring efficient performance and scalability.
* **AI Integration Tools**:
  + Libraries like TensorFlow.js or Scikit-learn for implementing AI models for symptom checking and heart disease detection.
* **Data Visualization Libraries**:
  + Tools like Chart.js or D3.js for creating graphical representations of patient data and analytics on the admin dashboard.
* **Authentication**:
  + Tools like JWT (JSON Web Tokens) for secure user authentication and session management.
* **Deployment**:
  + Hosting solutions such as Heroku, AWS, Netlify or Vercel for deploying the application and managing server resources.

# UI Interface Sketch Overview

## Authentication Screen:

* **User Options:** The first screen presents options to log in or sign up as either a **Patient** or **Admin**.
* **Input Fields:** Users enter their email/phone and password. An OTP-based option can be included for added security.
* **Action Buttons:**
  + Login /Sign Up

## Dashboard (Post-Authentication):

### Admin Dashboard:

* + **Patient Management:** Admin can view a list of patients, with several options for patient records.
  + **Analytics Section:** Graphical data displays showing patient statistics and system usage.
  + **Report Review:** Access to AI-generated patient reports and summaries.

### Patient Dashboard:

* + **Profile Overview:** Displays a summary of the patient's health profile, including key stats and previous diagnoses.
  + **Symptom Checker:** A button to start inputting symptoms for AI analysis.
  + **Heart Disease Detection:** Options to enter heart-related symptoms and upload relevant images.
  + **Chatbot Access:** A dedicated button to launch the AI chatbot for health queries.
  + **Report Generation:** An option to generate and download personalized health reports.
  + **Notifications :** Real-time notifications will be sent to patient for his checkup.

# Future goals

## Advanced Model Integration:

Currently, I plan to integrate two AI models—one for symptom screening. and another for detecting cardiovascular disease. In the future, if I find a dataset related to cardiac imaging, I also aim to develop an image analysis model.

## Exploring different algorithms:

I have a basic understanding of logistic regression models. which gives binary results. However, I have noticed that random forest models are being used more and more these days. If I successfully use logistic regression I will search for other models. and compare accuracy and performance to find the best fit for my project.

## Expand Data Set Integration:

What if I have additional information relevant to treatment? I plan to include that information in my project. When I had success with the first two prototypes I will aim to further improve the system by integrating new datasets and improving the system's capabilities.

# Summary

This project develops an AI-powered healthcare platform that enhances patient diagnosis and management, supporting Sustainable Development Goal 3 (Good Health and Well-Being). By integrating AI models for symptom checking and heart disease detection, the platform improves healthcare accessibility and quality. The user-friendly interface and efficient administrative tools streamline healthcare delivery, with future plans to expand model capabilities and incorporate more datasets.