**Diabetes Risk Prediction Web Application**

**1. Introduction**

Diabetes is a widespread chronic illness that, if left undiagnosed or untreated, can lead to serious health complications such as heart disease, kidney failure, nerve damage, and vision loss. With the growing number of diabetic cases globally, there is a rising need for early detection and awareness. Traditional diagnostic procedures often require clinical visits and laboratory testing, which can be costly, time-consuming, and inaccessible to many. To address this gap, this project aims to develop an AI-powered web application that can predict an individual's risk of having diabetes based on basic medical parameters such as glucose levels, BMI, age, insulin levels, and more. The application leverages machine learning and a clean, user-friendly interface to deliver fast and reliable predictions directly to the user in real time.

The project uses a Random Forest classifier trained on the Pima Indians Diabetes dataset. It is built using Python for backend logic and machine learning, Flask as the web framework, and Tailwind CSS for styling the frontend. The final application is responsive, visually engaging, and maintains user privacy by avoiding data storage. This solution bridges the gap between complex medical data and easily understandable health assessments, empowering users to make informed health decisions from the comfort of their own devices.

**2. Objective**

The main objective of this project is to build a smart, accessible, and user-friendly diabetes risk prediction system that utilizes machine learning techniques to provide real-time health insights. The specific goals include:

* Designing a responsive web interface for user input and prediction results.
* Implementing a trained machine learning model to assess diabetes risk based on user-provided health data.
* Ensuring the application is fast, accurate, and easy to use for individuals without any medical background.
* Protecting user data by not storing or transmitting sensitive health information.
* Presenting predictions with clarity using animations and color-coded result displays.

**3. Methodology**

The diabetes prediction system was developed using a structured and modular approach that involves data collection, model training, backend development, and user interface design. Each stage contributes to delivering a complete, accurate, and user-friendly web application.

1. Dataset

* The project uses the Pima Indians Diabetes Dataset from Kaggle, a widely accepted benchmark dataset in the healthcare ML domain.
* It includes 768 entries with 8 features and 1 binary outcome label (0 = Non-Diabetic, 1 = Diabetic).

2. Technologies Used

* **Python**: Core language for model building and backend.
* **Scikit-learn**: For building and training the machine learning model.
* **Flask**: Lightweight Python web framework used to serve the model.
* **Joblib**: Used to serialize the trained model (model.pkl).
* **HTML + Tailwind CSS**: For creating the frontend UI (using v0.dev).
* **JavaScript (Fetch API)**: For sending data to the backend and displaying results.
* **AOS.js**: For scroll-based animations and user experience.

3. Steps Followed

1. Load and preprocess the dataset (handle any missing/zero values).
2. Split the data into training and testing sets.
3. Train a RandomForestClassifier model on the training data.
4. Export the trained model using joblib.
5. Create a Flask backend to expose a /predict API endpoint.
6. Design a responsive frontend form using Tailwind CSS.
7. On form submission, send the input data to the backend using fetch().
8. Receive prediction response and display result card with animations and styling.

**4. Code and Implementation**

Index.html

<!DOCTYPE html>

<html lang="en">

<head>

    <meta charset="UTF-8">

    <meta name="viewport" content="width=device-width, initial-scale=1.0">

    <title>Diabetes Risk Predictor - Know Your Risk. Live Smarter.</title>

    <script src="https://cdn.tailwindcss.com"></script>

    <link rel="preconnect" href="https://fonts.googleapis.com">

    <link rel="preconnect" href="https://fonts.gstatic.com" crossorigin>

    <link href="https://fonts.googleapis.com/css2?family=Poppins:wght@300;400;500;600;700;800&display=swap" rel="stylesheet">

    <link href="https://unpkg.com/aos@2.3.1/dist/aos.css" rel="stylesheet">

    <script src="https://unpkg.com/aos@2.3.1/dist/aos.js"></script>

    <script>

        tailwind.config = {

            theme: {

                extend: {

                    colors: {

                        primary: '#7F5AF0',

                        accent: '#2CB67D',

                        background: '#F9F9F9'

                    },

                    fontFamily: {

                        'poppins': ['Poppins', 'sans-serif']

                    },

                    animation: {

                        'float': 'float 6s ease-in-out infinite',

                        'float-delayed': 'float 6s ease-in-out 2s infinite',

                        'pulse-slow': 'pulse 4s cubic-bezier(0.4, 0, 0.6, 1) infinite',

                        'ripple': 'ripple 0.6s linear',

                    },

                    keyframes: {

                        float: {

                            '0%, 100%': { transform: 'translateY(0px)' },

                            '50%': { transform: 'translateY(-20px)' }

                        },

                        ripple: {

                            '0%': { transform: 'scale(0)', opacity: '1' },

                            '100%': { transform: 'scale(4)', opacity: '0' }

                        }

                    }

                }

            }

        }

    </script>

    <style>

        .gradient-bg {

            background: linear-gradient(135deg, #667eea 0%, #764ba2 100%);

        }

        .hero-gradient {

            background: linear-gradient(135deg, rgba(127, 90, 240, 0.1) 0%, rgba(44, 182, 125, 0.1) 100%);

        }

        .floating-shape {

            position: absolute;

            border-radius: 50%;

            background: linear-gradient(45deg, rgba(127, 90, 240, 0.3), rgba(44, 182, 125, 0.3));

            filter: blur(1px);

        }

        .ripple-effect {

            position: relative;

            overflow: hidden;

        }

        .ripple-effect::before {

            content: '';

            position: absolute;

            top: 50%;

            left: 50%;

            width: 0;

            height: 0;

            border-radius: 50%;

            background: rgba(255, 255, 255, 0.5);

            transform: translate(-50%, -50%);

            transition: width 0.6s, height 0.6s;

        }

        .ripple-effect:active::before {

            width: 300px;

            height: 300px;

        }

    </style>

</head>

<body class="bg-background font-poppins">

    <!-- Navigation -->

    <nav class="fixed top-0 w-full bg-white/90 backdrop-blur-md shadow-sm z-50 transition-all duration-300">

        <div class="max-w-7xl mx-auto px-4 sm:px-6 lg:px-8">

            <div class="flex justify-between items-center h-16">

                <div class="flex items-center">

                    <div class="text-2xl font-bold text-primary">DiabetesAI</div>

                </div>

                <div class="hidden md:block">

                    <div class="ml-10 flex items-baseline space-x-8">

                        <a href="#home" class="text-gray-700 hover:text-primary px-3 py-2 text-sm font-medium transition-colors duration-200">Home</a>

                        <a href="#prediction" class="text-gray-700 hover:text-primary px-3 py-2 text-sm font-medium transition-colors duration-200">Prediction</a>

                        <a href="#about" class="text-gray-700 hover:text-primary px-3 py-2 text-sm font-medium transition-colors duration-200">About</a>

                        <a href="#contact" class="text-gray-700 hover:text-primary px-3 py-2 text-sm font-medium transition-colors duration-200">Contact</a>

                    </div>

                </div>

                <div class="md:hidden">

                    <button id="mobile-menu-button" class="text-gray-700 hover:text-primary">

                        <svg class="h-6 w-6" fill="none" viewBox="0 0 24 24" stroke="currentColor">

                            <path stroke-linecap="round" stroke-linejoin="round" stroke-width="2" d="M4 6h16M4 12h16M4 18h16" />

                        </svg>

                    </button>

                </div>

            </div>

        </div>

        <!-- Mobile menu -->

        <div id="mobile-menu" class="hidden md:hidden bg-white border-t">

            <div class="px-2 pt-2 pb-3 space-y-1">

                <a href="#home" class="block px-3 py-2 text-base font-medium text-gray-700 hover:text-primary">Home</a>

                <a href="#prediction" class="block px-3 py-2 text-base font-medium text-gray-700 hover:text-primary">Prediction</a>

                <a href="#about" class="block px-3 py-2 text-base font-medium text-gray-700 hover:text-primary">About</a>

                <a href="#contact" class="block px-3 py-2 text-base font-medium text-gray-700 hover:text-primary">Contact</a>

            </div>

        </div>

    </nav>

    <!-- Hero Section -->

    <section id="home" class="min-h-screen flex items-center justify-center relative overflow-hidden hero-gradient">

        <!-- Floating Shapes -->

        <div class="floating-shape w-64 h-64 top-20 left-10 animate-float opacity-30"></div>

        <div class="floating-shape w-32 h-32 top-40 right-20 animate-float-delayed opacity-40"></div>

        <div class="floating-shape w-48 h-48 bottom-20 left-1/4 animate-float opacity-25"></div>

        <div class="floating-shape w-20 h-20 top-1/3 right-1/3 animate-pulse-slow opacity-50"></div>

        <div class="text-center z-10 px-4 sm:px-6 lg:px-8 max-w-4xl mx-auto">

            <h1 class="text-5xl md:text-7xl font-bold text-gray-800 mb-6 leading-tight" data-aos="fade-up">

                Know Your Risk.

                <span class="text-primary block">Live Smarter.</span>

            </h1>

            <p class="text-xl md:text-2xl text-gray-600 mb-8 max-w-2xl mx-auto" data-aos="fade-up" data-aos-delay="200">

                Advanced AI-powered diabetes risk assessment to help you make informed health decisions.

            </p>

            <button

                id="start-prediction-btn"

                class="bg-primary hover:bg-purple-600 text-white font-semibold py-4 px-8 rounded-full text-lg transition-all duration-300 transform hover:scale-105 shadow-lg ripple-effect"

                data-aos="fade-up"

                data-aos-delay="400"

            >

                Start Prediction

            </button>

        </div>

    </section>

    <!-- Prediction Section -->

    <section id="prediction" class="min-h-screen py-20 px-4 sm:px-6 lg:px-8">

        <div class="max-w-2xl mx-auto">

            <div class="text-center mb-12" data-aos="fade-up">

                <h2 class="text-4xl md:text-5xl font-bold text-gray-800 mb-4">Health Assessment</h2>

                <p class="text-xl text-gray-600">Please fill in your health information accurately</p>

            </div>

            <!-- Form Container -->

            <div class="bg-white rounded-3xl shadow-2xl p-8 md:p-12 mb-8" data-aos="fade-up" data-aos-delay="200">

                <form id="diabetesForm" class="space-y-6">

                    <div class="grid grid-cols-1 md:grid-cols-2 gap-6">

                        <!-- Pregnancies -->

                        <div class="space-y-2" data-aos="fade-right" data-aos-delay="300">

                            <label for="pregnancies" class="block text-sm font-semibold text-gray-700">

                                Pregnancies

                            </label>

                            <input

                                type="number"

                                id="pregnancies"

                                name="pregnancies"

                                min="0"

                                max="20"

                                required

                                class="w-full px-4 py-3 border-2 border-gray-200 rounded-xl focus:ring-2 focus:ring-primary focus:border-primary transition-all duration-200 hover:border-gray-300"

                                placeholder="Number of pregnancies"

                            >

                        </div>

                        <!-- Glucose -->

                        <div class="space-y-2" data-aos="fade-left" data-aos-delay="300">

                            <label for="glucose" class="block text-sm font-semibold text-gray-700">

                                Glucose Level (mg/dL)

                            </label>

                            <input

                                type="number"

                                id="glucose"

                                name="glucose"

                                min="0"

                                max="300"

                                required

                                class="w-full px-4 py-3 border-2 border-gray-200 rounded-xl focus:ring-2 focus:ring-primary focus:border-primary transition-all duration-200 hover:border-gray-300"

                                placeholder="Glucose concentration"

                            >

                        </div>

                        <!-- Blood Pressure -->

                        <div class="space-y-2" data-aos="fade-right" data-aos-delay="400">

                            <label for="bloodPressure" class="block text-sm font-semibold text-gray-700">

                                Blood Pressure (mmHg)

                            </label>

                            <input

                                type="number"

                                id="bloodPressure"

                                name="bloodPressure"

                                min="0"

                                max="200"

                                required

                                class="w-full px-4 py-3 border-2 border-gray-200 rounded-xl focus:ring-2 focus:ring-primary focus:border-primary transition-all duration-200 hover:border-gray-300"

                                placeholder="Diastolic blood pressure"

                            >

                        </div>

                        <!-- Skin Thickness -->

                        <div class="space-y-2" data-aos="fade-left" data-aos-delay="400">

                            <label for="skinThickness" class="block text-sm font-semibold text-gray-700">

                                Skin Thickness (mm)

                            </label>

                            <input

                                type="number"

                                id="skinThickness"

                                name="skinThickness"

                                min="0"

                                max="100"

                                required

                                class="w-full px-4 py-3 border-2 border-gray-200 rounded-xl focus:ring-2 focus:ring-primary focus:border-primary transition-all duration-200 hover:border-gray-300"

                                placeholder="Triceps skin fold thickness"

                            >

                        </div>

                        <!-- Insulin -->

                        <div class="space-y-2" data-aos="fade-right" data-aos-delay="500">

                            <label for="insulin" class="block text-sm font-semibold text-gray-700">

                                Insulin (μU/mL)

                            </label>

                            <input

                                type="number"

                                id="insulin"

                                name="insulin"

                                min="0"

                                max="1000"

                                required

                                class="w-full px-4 py-3 border-2 border-gray-200 rounded-xl focus:ring-2 focus:ring-primary focus:border-primary transition-all duration-200 hover:border-gray-300"

                                placeholder="2-Hour serum insulin"

                            >

                        </div>

                        <!-- BMI -->

                        <div class="space-y-2" data-aos="fade-left" data-aos-delay="500">

                            <label for="bmi" class="block text-sm font-semibold text-gray-700">

                                BMI (kg/m²)

                            </label>

                            <input

                                type="number"

                                id="bmi"

                                name="bmi"

                                step="0.1"

                                min="10"

                                max="70"

                                required

                                class="w-full px-4 py-3 border-2 border-gray-200 rounded-xl focus:ring-2 focus:ring-primary focus:border-primary transition-all duration-200 hover:border-gray-300"

                                placeholder="Body mass index"

                            >

                        </div>

                        <!-- Diabetes Pedigree Function -->

                        <div class="space-y-2" data-aos="fade-right" data-aos-delay="600">

                            <label for="diabetesPedigree" class="block text-sm font-semibold text-gray-700">

                                Diabetes Pedigree Function

                            </label>

                            <input

                                type="number"

                                id="diabetesPedigree"

                                name="diabetesPedigree"

                                step="0.001"

                                min="0"

                                max="3"

                                required

                                class="w-full px-4 py-3 border-2 border-gray-200 rounded-xl focus:ring-2 focus:ring-primary focus:border-primary transition-all duration-200 hover:border-gray-300"

                                placeholder="Family history score"

                            >

                        </div>

                        <!-- Age -->

                        <div class="space-y-2" data-aos="fade-left" data-aos-delay="600">

                            <label for="age" class="block text-sm font-semibold text-gray-700">

                                Age (years)

                            </label>

                            <input

                                type="number"

                                id="age"

                                name="age"

                                min="18"

                                max="120"

                                required

                                class="w-full px-4 py-3 border-2 border-gray-200 rounded-xl focus:ring-2 focus:ring-primary focus:border-primary transition-all duration-200 hover:border-gray-300"

                                placeholder="Age in years"

                            >

                        </div>

                    </div>

                    <!-- Submit Button -->

                    <div class="pt-6" data-aos="fade-up" data-aos-delay="700">

                        <button

                            type="submit"

                            id="predict-btn"

                            class="w-full bg-primary hover:bg-purple-600 text-white font-bold py-4 px-8 rounded-xl text-lg transition-all duration-300 transform hover:scale-105 shadow-lg ripple-effect relative overflow-hidden"

                        >

                            <span id="btn-text">Predict Now</span>

                            <div id="loading-spinner" class="hidden absolute inset-0 flex items-center justify-center">

                                <div class="animate-spin rounded-full h-6 w-6 border-b-2 border-white"></div>

                            </div>

                        </button>

                    </div>

                </form>

            </div>

            <!-- Result Card (Hidden by default) -->

            <div id="resultCard" class="hidden bg-white rounded-3xl shadow-2xl p-8 md:p-12 border-l-8 transition-all duration-500 transform translate-y-4" data-aos="zoom-in">

                <div class="text-center">

                    <div id="resultIcon" class="text-6xl mb-4"></div>

                    <h3 class="text-2xl font-bold mb-4" id="resultTitle">Prediction Result</h3>

                    <div id="resultMessage" class="text-xl font-semibold mb-4"></div>

                    <div id="riskPercentage" class="text-lg text-gray-600 mb-6"></div>

                    <div class="w-full bg-gray-200 rounded-full h-3 mb-6">

                        <div id="riskBar" class="h-3 rounded-full transition-all duration-1000 ease-out" style="width: 0%"></div>

                    </div>

                    <p class="text-sm text-gray-600">

                        Please consult with a healthcare professional for proper medical advice and diagnosis.

                    </p>

                </div>

            </div>

        </div>

    </section>

    <!-- About Section -->

    <section id="about" class="py-20 bg-white">

        <div class="max-w-6xl mx-auto px-4 sm:px-6 lg:px-8">

            <div class="text-center mb-16" data-aos="fade-up">

                <h2 class="text-4xl md:text-5xl font-bold text-gray-800 mb-4">About DiabetesAI</h2>

                <p class="text-xl text-gray-600 max-w-3xl mx-auto">

                    Our advanced machine learning algorithm analyzes multiple health factors to provide accurate diabetes risk assessment.

                </p>

            </div>

            <div class="grid grid-cols-1 md:grid-cols-3 gap-8">

                <div class="text-center p-6" data-aos="fade-up" data-aos-delay="200">

                    <div class="w-16 h-16 bg-primary/10 rounded-full flex items-center justify-center mx-auto mb-4">

                        <span class="text-2xl">🎯</span>

                    </div>

                    <h3 class="text-xl font-semibold mb-2">Accurate Predictions</h3>

                    <p class="text-gray-600">Advanced AI algorithms trained on extensive medical datasets</p>

                </div>

                <div class="text-center p-6" data-aos="fade-up" data-aos-delay="400">

                    <div class="w-16 h-16 bg-accent/10 rounded-full flex items-center justify-center mx-auto mb-4">

                        <span class="text-2xl">🔒</span>

                    </div>

                    <h3 class="text-xl font-semibold mb-2">Privacy First</h3>

                    <p class="text-gray-600">Your health data is processed securely and never stored</p>

                </div>

                <div class="text-center p-6" data-aos="fade-up" data-aos-delay="600">

                    <div class="w-16 h-16 bg-primary/10 rounded-full flex items-center justify-center mx-auto mb-4">

                        <span class="text-2xl">⚡</span>

                    </div>

                    <h3 class="text-xl font-semibold mb-2">Instant Results</h3>

                    <p class="text-gray-600">Get your risk assessment in seconds, not days</p>

                </div>

            </div>

        </div>

    </section>

    <!-- Contact Section -->

    <section id="contact" class="py-20 bg-gray-50">

        <div class="max-w-4xl mx-auto px-4 sm:px-6 lg:px-8 text-center" data-aos="fade-up">

            <h2 class="text-4xl md:text-5xl font-bold text-gray-800 mb-4">Get In Touch</h2>

            <p class="text-xl text-gray-600 mb-8">Have questions about your health or our service?</p>

            <div class="flex flex-col sm:flex-row gap-4 justify-center">

                <a href="mailto:deokuledevang@gmail.com" class="bg-primary hover:bg-purple-600 text-white font-semibold py-3 px-6 rounded-full transition-all duration-300 transform hover:scale-105">

                    Email Us

                </a>

                <a href="tel:+1234567890" class="bg-accent hover:bg-green-600 text-white font-semibold py-3 px-6 rounded-full transition-all duration-300 transform hover:scale-105">

                    Call Now

                </a>

            </div>

        </div>

    </section>

    <!-- Footer -->

    <footer class="bg-gray-800 text-white py-12">

        <div class="max-w-6xl mx-auto px-4 sm:px-6 lg:px-8">

            <div class="grid grid-cols-1 md:grid-cols-4 gap-8">

                <div class="col-span-2">

                    <div class="text-2xl font-bold text-primary mb-4">DiabetesAI</div>

                    <p class="text-gray-300 mb-4">

                        Empowering individuals with AI-driven health insights for better diabetes prevention and management.

                    </p>

                    <div class="flex space-x-4">

                        <a href="#" class="text-gray-300 hover:text-primary transition-colors duration-200">

                            <svg class="w-6 h-6" fill="currentColor" viewBox="0 0 24 24">

                                <path d="M24 4.557c-.883.392-1.832.656-2.828.775 1.017-.609 1.798-1.574 2.165-2.724-.951.564-2.005.974-3.127 1.195-.897-.957-2.178-1.555-3.594-1.555-3.179 0-5.515 2.966-4.797 6.045-4.091-.205-7.719-2.165-10.148-5.144-1.29 2.213-.669 5.108 1.523 6.574-.806-.026-1.566-.247-2.229-.616-.054 2.281 1.581 4.415 3.949 4.89-.693.188-1.452.232-2.224.084.626 1.956 2.444 3.379 4.6 3.419-2.07 1.623-4.678 2.348-7.29 2.04 2.179 1.397 4.768 2.212 7.548 2.212 9.142 0 14.307-7.721 13.995-14.646.962-.695 1.797-1.562 2.457-2.549z"/>

                            </svg>

                        </a>

                        <a href="#" class="text-gray-300 hover:text-primary transition-colors duration-200">

                            <svg class="w-6 h-6" fill="currentColor" viewBox="0 0 24 24">

                                <path d="M22.46 6c-.77.35-1.6.58-2.46.69.88-.53 1.56-1.37 1.88-2.38-.83.5-1.75.85-2.72 1.05C18.37 4.5 17.26 4 16 4c-2.35 0-4.27 1.92-4.27 4.29 0 .34.04.67.11.98C8.28 9.09 5.11 7.38 3 4.79c-.37.63-.58 1.37-.58 2.15 0 1.49.75 2.81 1.91 3.56-.71 0-1.37-.2-1.95-.5v.03c0 2.08 1.48 3.82 3.44 4.21a4.22 4.22 0 0 1-1.93.07 4.28 4.28 0 0 0 4 2.98 8.521 8.521 0 0 1-5.33 1.84c-.34 0-.68-.02-1.02-.06C3.44 20.29 5.7 21 8.12 21 16 21 20.33 14.46 20.33 8.79c0-.19 0-.37-.01-.56.84-.6 1.56-1.36 2.14-2.23z"/>

                            </svg>

                        </a>

                        <a href="#" class="text-gray-300 hover:text-primary transition-colors duration-200">

                            <svg class="w-6 h-6" fill="currentColor" viewBox="0 0 24 24">

                                <path d="M20.447 20.452h-3.554v-5.569c0-1.328-.027-3.037-1.852-3.037-1.853 0-2.136 1.445-2.136 2.939v5.667H9.351V9h3.414v1.561h.046c.477-.9 1.637-1.85 3.37-1.85 3.601 0 4.267 2.37 4.267 5.455v6.286zM5.337 7.433c-1.144 0-2.063-.926-2.063-2.065 0-1.138.92-2.063 2.063-2.063 1.14 0 2.064.925 2.064 2.063 0 1.139-.925 2.065-2.064 2.065zm1.782 13.019H3.555V9h3.564v11.452zM22.225 0H1.771C.792 0 0 .774 0 1.729v20.542C0 23.227.792 24 1.771 24h20.451C23.2 24 24 23.227 24 22.271V1.729C24 .774 23.2 0 22.222 0h.003z"/>

                            </svg>

                        </a>

                    </div>

                </div>

                <div>

                    <h3 class="text-lg font-semibold mb-4">Quick Links</h3>

                    <ul class="space-y-2">

                        <li><a href="#home" class="text-gray-300 hover:text-primary transition-colors duration-200">Home</a></li>

                        <li><a href="#prediction" class="text-gray-300 hover:text-primary transition-colors duration-200">Prediction</a></li>

                        <li><a href="#about" class="text-gray-300 hover:text-primary transition-colors duration-200">About</a></li>

                        <li><a href="#contact" class="text-gray-300 hover:text-primary transition-colors duration-200">Contact</a></li>

                    </ul>

                </div>

                <div>

                    <h3 class="text-lg font-semibold mb-4">Legal</h3>

                    <ul class="space-y-2">

                        <li><a href="#" class="text-gray-300 hover:text-primary transition-colors duration-200">Privacy Policy</a></li>

                        <li><a href="#" class="text-gray-300 hover:text-primary transition-colors duration-200">Terms of Service</a></li>

                        <li><a href="#" class="text-gray-300 hover:text-primary transition-colors duration-200">Medical Disclaimer</a></li>

                    </ul>

                </div>

            </div>

            <div class="border-t border-gray-700 mt-8 pt-8 text-center">

                <p class="text-gray-300 text-sm">

                    &copy; <strong>Devang Deokule</strong>.<br>

                    Contact: <a href="mailto:deokuledevang@gmail.com" class="text-primary hover:underline">deokuledevang@gmail.com</a> |

                    <a href="https://github.com/Devang-Deokule" target="\_blank" class="text-primary hover:underline">GitHub</a> |

                    <a href="https://www.linkedin.com/in/devang-deokule-188584268/" target="\_blank" class="text-primary hover:underline">LinkedIn</a> |

                    <a href="https://devang-deokule.github.io/Portfolio/" target="\_blank" class="text-primary hover:underline">Portfolio</a>

                </p>

            </div>

        </div>

    </footer>

    <script>

        // Initialize AOS

        AOS.init({

            duration: 800,

            easing: 'ease-in-out',

            once: true,

            offset: 100

        });

        // Mobile menu toggle

        const mobileMenuButton = document.getElementById('mobile-menu-button');

        const mobileMenu = document.getElementById('mobile-menu');

        mobileMenuButton.addEventListener('click', () => {

            mobileMenu.classList.toggle('hidden');

        });

        // Smooth scrolling for navigation links

        document.querySelectorAll('a[href^="#"]').forEach(anchor => {

            anchor.addEventListener('click', function (e) {

                e.preventDefault();

                const target = document.querySelector(this.getAttribute('href'));

                if (target) {

                    target.scrollIntoView({

                        behavior: 'smooth',

                        block: 'start'

                    });

                }

                // Close mobile menu if open

                mobileMenu.classList.add('hidden');

            });

        });

        // Start prediction button

        document.getElementById('start-prediction-btn').addEventListener('click', () => {

            document.getElementById('prediction').scrollIntoView({

                behavior: 'smooth',

                block: 'start'

            });

        });

        // Form submission

        document.getElementById('diabetesForm').addEventListener('submit', function(e) {

            e.preventDefault();

            const predictBtn = document.getElementById('predict-btn');

            const btnText = document.getElementById('btn-text');

            const loadingSpinner = document.getElementById('loading-spinner');

            // Show loading state

            btnText.classList.add('hidden');

            loadingSpinner.classList.remove('hidden');

            predictBtn.disabled = true;

            // Get form data

            const formData = new FormData(this);

            const data = Object.fromEntries(formData);

            // Real API call

            fetch("/predict", {

                method: "POST",

                headers: { "Content-Type": "application/json" },

                body: JSON.stringify({

                    features: [

                        parseFloat(data.pregnancies),

                        parseFloat(data.glucose),

                        parseFloat(data.bloodPressure),

                        parseFloat(data.skinThickness),

                        parseFloat(data.insulin),

                        parseFloat(data.bmi),

                        parseFloat(data.diabetesPedigree),

                        parseFloat(data.age)

                    ]

                })

            })

            .then(response => response.json())

            .then(result => {

                const isHighRisk = result.prediction === 1;

                const riskScore = isHighRisk ? 75 + Math.floor(Math.random() \* 10) : Math.floor(Math.random() \* 45);

                // Show results

                showResult(isHighRisk, riskScore);

                // Reset button

                btnText.classList.remove('hidden');

                loadingSpinner.classList.add('hidden');

                predictBtn.disabled = false;

            })

            .catch(error => {

                alert("Something went wrong. Please try again.");

                console.error(error);

                // Reset button on error

                btnText.classList.remove('hidden');

                loadingSpinner.classList.add('hidden');

                predictBtn.disabled = false;

            });

        });

        function showResult(isHighRisk, riskScore) {

            const resultCard = document.getElementById('resultCard');

            const resultIcon = document.getElementById('resultIcon');

            const resultMessage = document.getElementById('resultMessage');

            const riskPercentage = document.getElementById('riskPercentage');

            const riskBar = document.getElementById('riskBar');

            // Show result card

            resultCard.classList.remove('hidden', 'translate-y-4');

            resultCard.classList.add('translate-y-0');

            if (isHighRisk) {

                // High risk styling

                resultCard.classList.remove('border-accent');

                resultCard.classList.add('border-red-500');

                resultIcon.textContent = '⚠️';

                resultMessage.textContent = 'High Diabetes Risk Detected';

                resultMessage.classList.remove('text-accent');

                resultMessage.classList.add('text-red-600');

                riskBar.classList.remove('bg-accent');

                riskBar.classList.add('bg-red-500');

            } else {

                // Low risk styling

                resultCard.classList.remove('border-red-500');

                resultCard.classList.add('border-accent');

                resultIcon.textContent = '✅';

                resultMessage.textContent = 'Low Diabetes Risk';

                resultMessage.classList.remove('text-red-600');

                resultMessage.classList.add('text-accent');

                riskBar.classList.remove('bg-red-500');

                riskBar.classList.add('bg-accent');

            }

            riskPercentage.textContent = `Risk Score: ${riskScore}%`;

            // Animate progress bar

            setTimeout(() => {

                riskBar.style.width = `${riskScore}%`;

            }, 100);

            // Scroll to result

            setTimeout(() => {

                resultCard.scrollIntoView({

                    behavior: 'smooth',

                    block: 'center'

                });

            }, 300);

        }

        // Add scroll effect to navbar

        window.addEventListener('scroll', () => {

            const nav = document.querySelector('nav');

            if (window.scrollY > 100) {

                nav.classList.add('bg-white/95');

                nav.classList.remove('bg-white/90');

            } else {

                nav.classList.add('bg-white/90');

                nav.classList.remove('bg-white/95');

            }

        });

    </script>

</body>

</html>

**app.py**

from flask import Flask, request, jsonify, render\_template

import joblib

import numpy as np

from flask\_cors import CORS

app = Flask(\_\_name\_\_)

CORS(app)

model = joblib.load("model.pkl")

@app.route('/')

def home():

    return render\_template('index.html')

@app.route('/predict', methods=['POST'])

def predict():

    data = request.get\_json()

    features = data.get("features")

    if not features or len(features) != 8:

        return jsonify({"error": "Invalid input"}), 400

    input\_array = np.array(features).reshape(1, -1)

    prediction = model.predict(input\_array)[0]

    return jsonify({"prediction": int(prediction)})

if \_\_name\_\_ == "\_\_main\_\_":

    app.run(debug=True)

**train\_and\_save\_model.py**

import pandas as pd

import joblib

from sklearn.ensemble import RandomForestClassifier

from sklearn.model\_selection import train\_test\_split

# Load dataset

df = pd.read\_csv("diabetes.csv")

X = df.drop("Outcome", axis=1)

y = df["Outcome"]

X\_train, X\_test, y\_train, y\_test = train\_test\_split(X, y, test\_size=0.2, random\_state=42)

model = RandomForestClassifier()

model.fit(X\_train, y\_train)

joblib.dump(model, "model.pkl")

print("✅ Model trained and saved as model.pkl")

diabetes.csv

<https://www.kaggle.com/datasets/uciml/pima-indians-diabetes-database?resource=download>

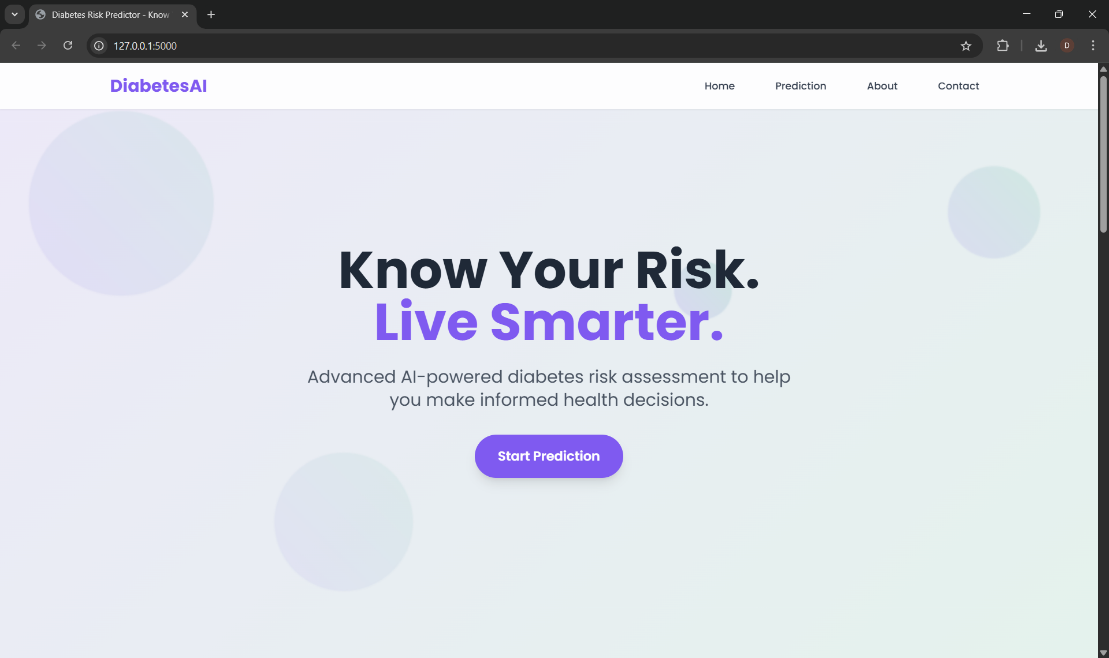
**5. Result and Observation**

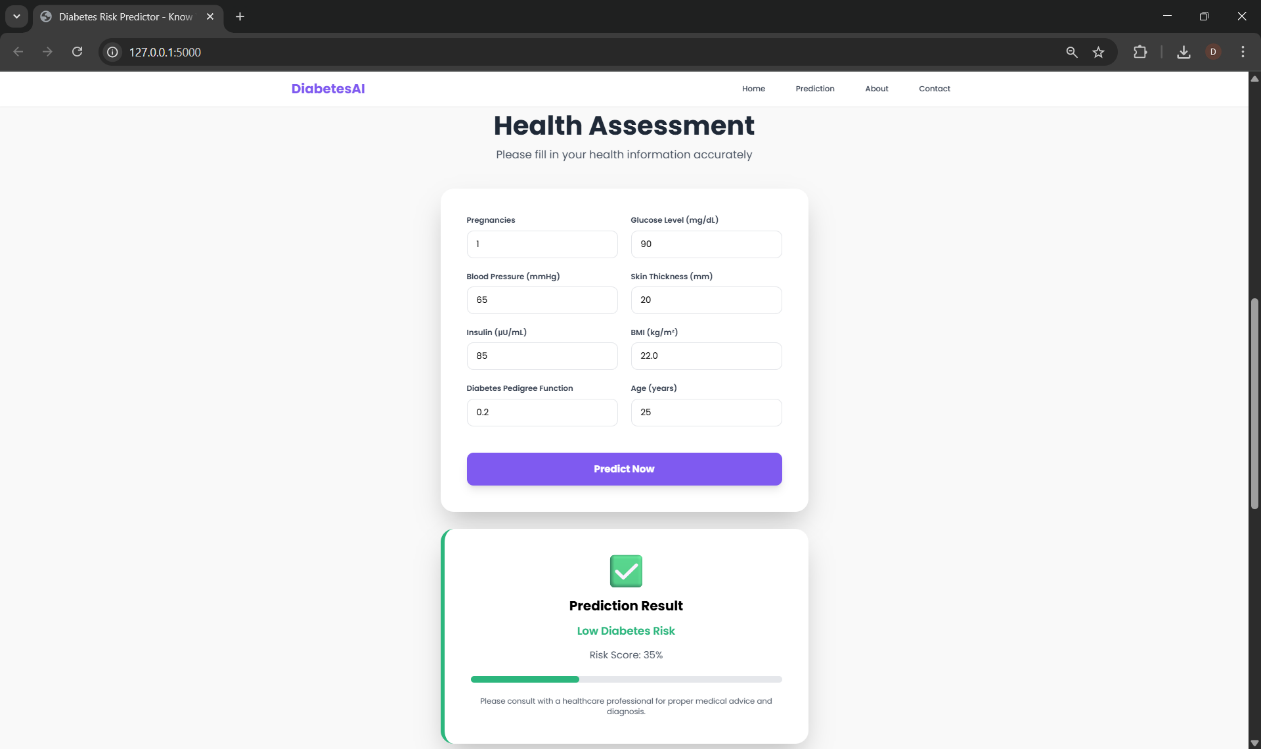
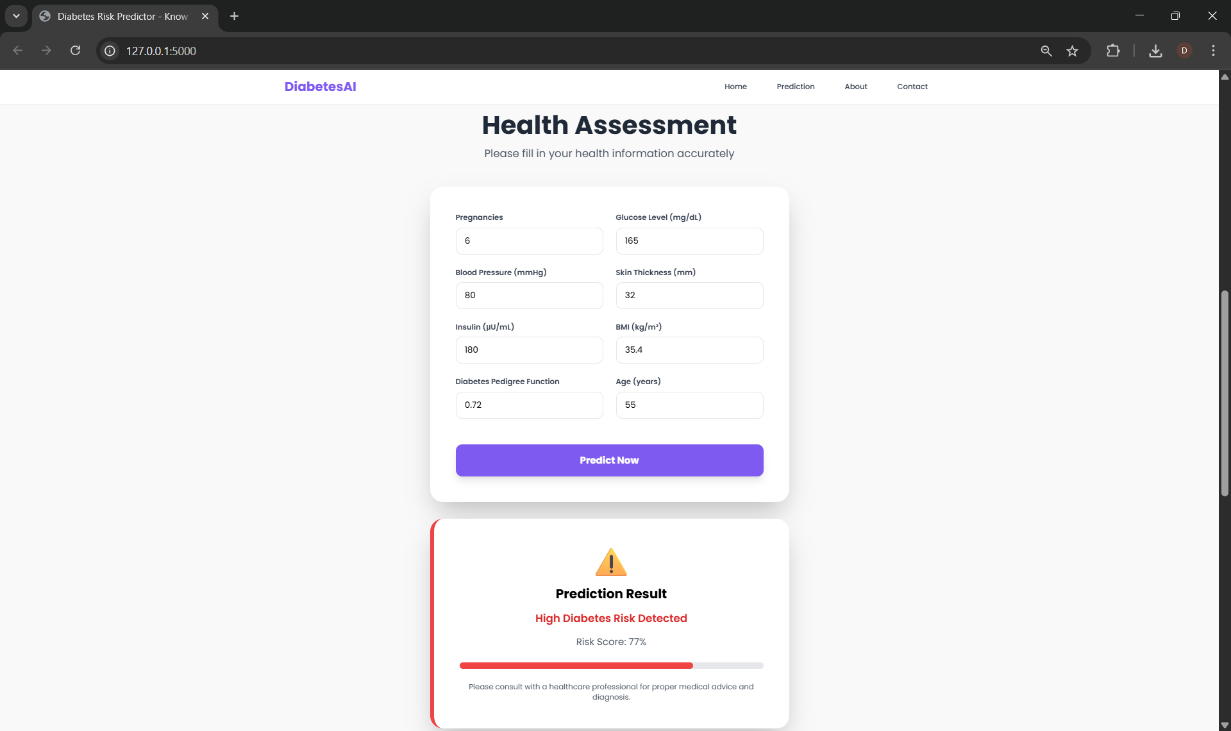
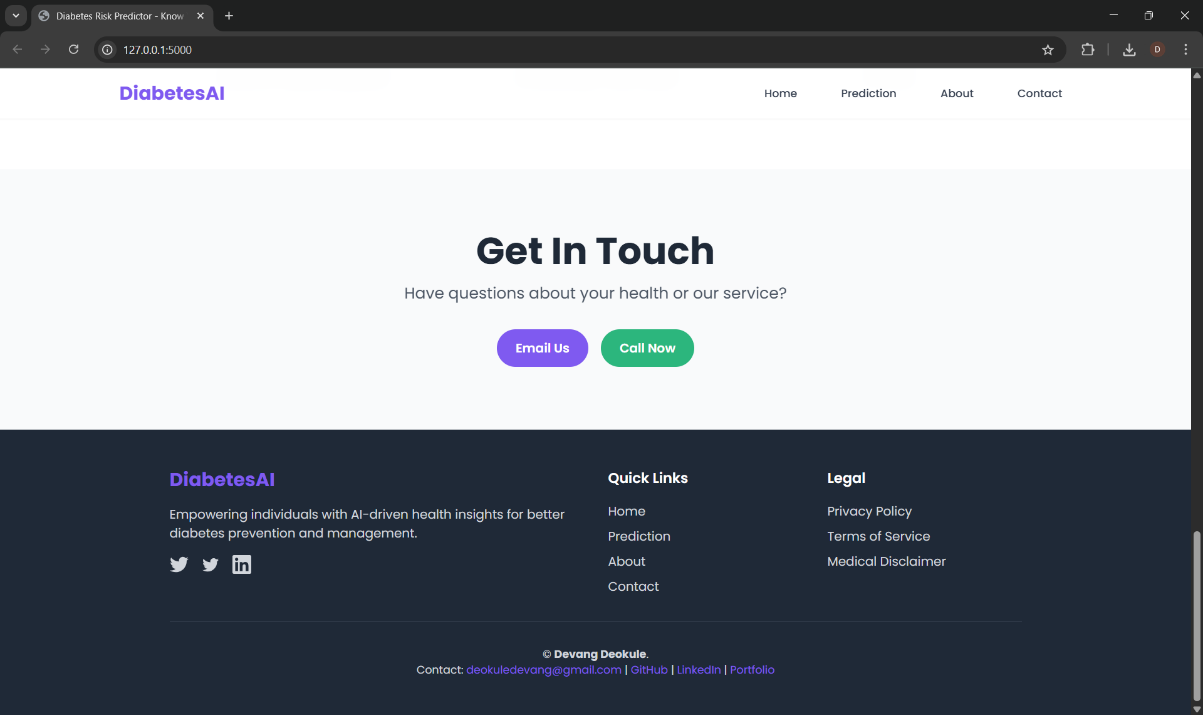
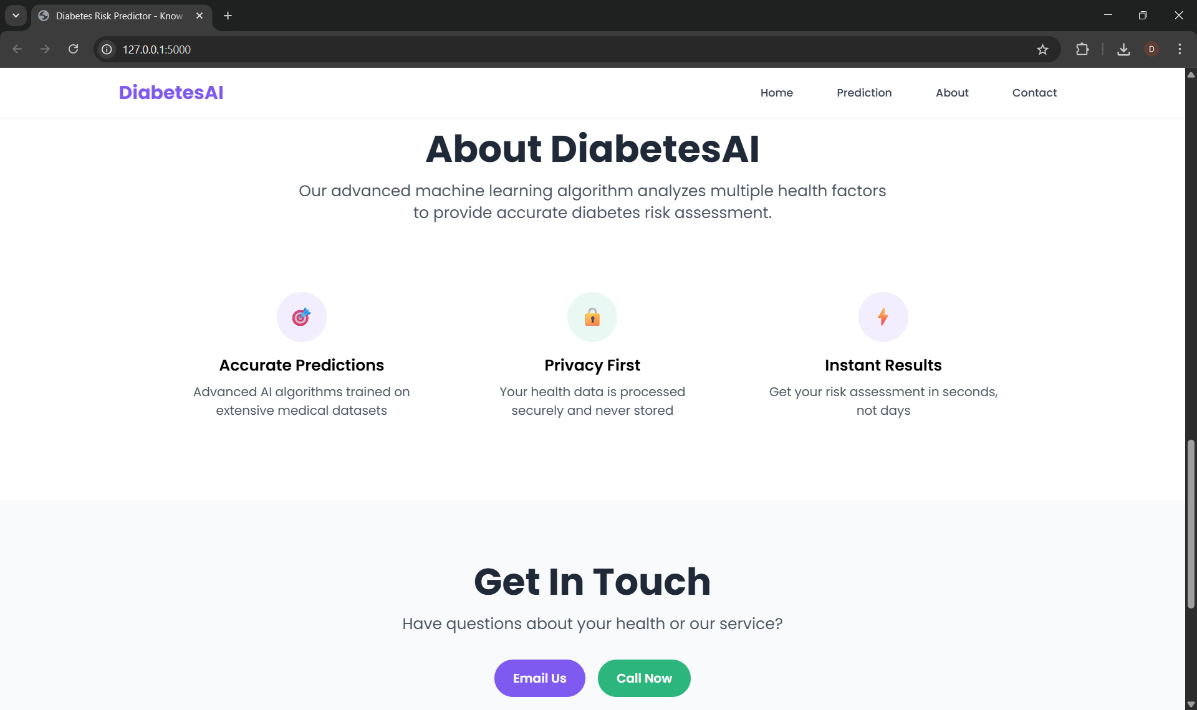
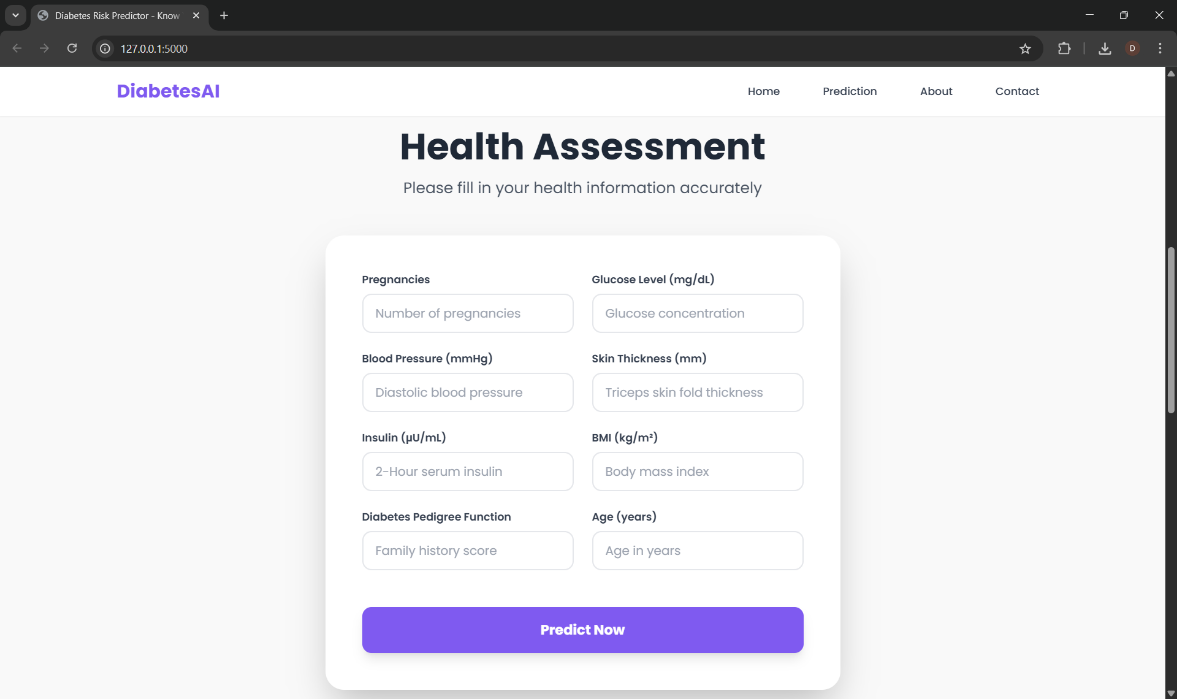
The system was tested with various input combinations, both manually and using known samples from the dataset. It provided accurate predictions based on the model's training, displayed with animated UI feedback.

The result card clearly displays:

* A warning emoji (⚠️) for high risk
* A check mark (✅) for low risk
* Risk percentage bar
* Custom messages like “Low Diabetes Risk” or “High Diabetes Risk Detected”

AOS-powered transitions smoothly animate form, result, and contact sections.





**6. Conclusion**

This project successfully demonstrates the application of machine learning and modern web technologies to solve a real-world healthcare problem — early detection of diabetes. By combining a trained Random Forest classifier with a responsive, animated frontend, the system provides users with a fast, accurate, and intuitive way to assess their health.

The frontend offers a clean and professional user experience, while the backend ensures privacy by not storing user data. Users can access the application from any device and receive predictions in real time.

This system lays the foundation for further development in digital health tools. With minimal resources and open-source technologies, impactful solutions like this can be built to serve society and raise awareness in critical areas like diabetes management.