Chapter 9
Intelligent Dietary Guidance System for Diabetes Patients:
A Web-Based Solution

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ABSTRACT

Diabetes management requires continuous monitoring of blood glucose levels and careful regulation of dietary intake. This chapter presents a web-based intelligent dietary guidance system designed to support patients in making informed food choices. The system collects patient-specific information, including body mass index (BMI), pre- and post-meal glucose values, and detailed meal composition. A machine learning model processes these inputs to predict postprandial glucose change (ΔBG) and classify whether a meal poses a risk of hyperglycemia. Personalized recommendations are then generated to guide patients toward safer meal planning. The system is implemented as a three-tier architecture consisting of a frontend interface, a backend prediction engine, and a secure database. Evaluation results indicate that the predictive model achieves clinically relevant accuracy, with mean absolute error (MAE) of approximately 12 mg/dL and a classification ROC AUC of 0.86. Visualization panels, including glucose trend charts and nutrient composition diagrams, enhance interpretability for both patients and clinicians. Integration with web technologies ensures accessibility, scalability, and potential interoperability with continuous glucose monitoring devices and electronic health record systems. This work demonstrates how intelligent web-based systems can improve diabetes

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self-management by delivering personalized, data-driven dietary recommendations. It also highlights future directions for expanding datasets, incorporating contextual lifestyle factors, and validating the system through clinical trials.

INTRODUCTION

Diabetes mellitus is a chronic metabolic disorder characterized by persistent hyperglycemia. It occurs due to impaired insulin secretion, insulin resistance, and both. The disease leads to long-term complications in cardiovascular, renal, and neurological systems. Effective management of diabetes requires continuous monitoring of blood glucose levels and adherence to a balanced dietary plan.

Dietary intake is a major determinant of blood glucose variation. Meals with high carbohydrate content and elevated glycemic index result in significant postprandial glucose excursions. Managing diet is thus a cornerstone in diabetes care. However, patients face challenges in estimating the impact of meals on glucose. Manual logging of diet and glucose is time-consuming and often inaccurate.

Digital health systems provide an alternative pathway. Web-based platforms can support patients in recording daily glucose and dietary data. Machine learning methods can then transform these records into predictive models of glucose response. Such systems can recommend dietary adjustments in real time, reducing the burden of manual tracking.

The objective of this chapter is to present a web-based intelligent dietary guidance system for diabetes patients. The system integrates hospital-collected patient data, applies machine learning algorithms, and delivers dietary recommendations through a web application.

Problem Statement

Patients with diabetes require frequent glucose monitoring and personalized dietary advice. Traditional consultations provide periodic guidance but do not support daily decision-making. Current mobile health applications lack integration of predictive models that account for both physiological factors and meal composition. This gap motivates the development of an intelligent system that provides immediate, individualized dietary guidance.

Aim of the System

The system is designed to: