

GLUCOTWIN

AI-Driven Insulin Dosage Prediction System

A child-focused mobile application with machine learning and doctor review

PROJECT AT A GLANCE

Target users: Guardians, doctors and system administrators

Age group: Children aged 3 to 12 years

Main tools: Flutter, Firebase and Python-based machine learning

Project type: Healthcare decision-support application

01 Executive Summary

GLUCOTWIN is a mobile application designed to help guardians organize diabetes care for children aged 3 to 12. Guardians enter a child's health measurements and meal details. The application estimates carbohydrates and sends the information to a machine learning model, which produces an insulin-dose prediction for a doctor to review.

The application connects three users in one place. Guardians manage child profiles and view results. Doctors check prediction details and give medical recommendations. Administrators approve doctor accounts, assign patients and monitor system records.

This proposal explains the problem, the suggested system, the development method, the main features and the safety steps. The project is intended to support medical decisions, not to replace a doctor or independently guide insulin administration.

Project information

Prepared by	[Student name / group]
Supervisor	[Supervisor name]
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Based on the supplied GLUCOTWIN project thesis.

THE NEED | PURPOSE OF THE PROJECT

02 Problem Statement

Managing diabetes in young children involves regular checks, meal information and medical decisions. Insulin needs may change with glucose readings, food intake and other health details. Guardians may find it hard to bring all this information together and explain it clearly to a doctor.

When records, predictions and medical advice are kept in separate places, it becomes difficult to follow a child's care history. A single application is needed to collect information, organize results and support review by a medical professional.

03 Aim

MAIN AIM

To design and develop an easy-to-use mobile system that uses child health data to generate insulin-dose predictions for professional review and helps guardians manage diabetes records.

04 Project Objectives

- Build separate, simple screens for guardians, doctors and administrators.
- Allow guardians to register, add children and enter health and meal details.
- Estimate carbohydrate intake from the food information entered by the guardian.
- Train and connect a machine learning model for insulin-dose prediction.
- Allow doctors to review predictions and add recommendations.
- Store child profiles, predictions, recommendations and test history in Firebase.
- Support doctor approval, patient assignment and system monitoring by the administrator.

05 Target Users

Guardian: Adds child profiles, records meals and tests, views predictions, checks medical advice and looks at previous records.

Doctor: Reviews assigned patients, checks test data and predicted values, and writes recommendations.

Administrator: Approves doctor accounts, assigns patients and manages system activities.

SOLUTION | FEATURES AND SYSTEM DESIGN

06 Proposed Solution

GLUCOTWIN will bring data entry, insulin prediction, doctor review and record keeping into one mobile application. Guardians will use simple forms to provide the required information. The system will return a prediction and keep it clearly separate from a doctor's final advice.

Main features

MODULE	WHAT IT DOES
Guardian portal	Account access, child profiles, meal details, sugar-test entry, prediction results and past records.
Carbohydrate estimate	A food-entry feature that estimates carbohydrate amounts from selected foods and quantities.
Prediction module	A trained regression model that processes the recorded input values and returns a predicted insulin value.
Doctor portal	Assigned patient records, prediction review, clinical recommendations and review status.
Admin portal	Doctor approval, patient assignment, user oversight and test monitoring.
Record storage	Firebase stores accounts, child details, test results and recommendations.

07 How the System Works

1. The guardian signs in and selects a child profile.
2. The guardian adds meal details and health readings.
3. The application estimates carbohydrates and sends the inputs to the model.
4. The model produces a prediction, which is saved with the test record.
5. A doctor reviews the record and adds a recommendation.
6. The guardian reads the doctor's advice; the administrator manages access and activity.

IMPORTANT SAFETY RULE

A model prediction must not be treated as an approved insulin dose. The application should clearly show when a result is waiting for doctor review.

TECHNICAL PLAN | DEVELOPMENT AND CHECKING

08 Technology and Architecture

Flutter will provide the mobile user interface. Firebase will handle authentication and record storage. A Python program will load the trained machine learning model and return predictions to the application. Separate user roles will control which information and actions are available.

09 Development Method

Step 1 | Prepare the data

Use the dataset described in the source thesis, which contains 3,000 records and 11 columns. Inputs include age, gender, blood pressure, body temperature, glucose, BMI, meal timing and carbohydrates. Its target is named “InsulinUnits_Simulated.” Patient ID is excluded from training.

Step 2 | Train and select a model

Clean the data, prepare numeric and category fields, split the data for training and testing, and compare regression methods. The source thesis compares Linear Regression, Ridge Regression, Random Forest, Gradient Boosting and Support Vector Regression.

The thesis reports that Gradient Boosting was selected, with MAE 0.292139, RMSE 0.373556 and R^2 0.956989 on its reported evaluation. These are results for the thesis dataset, not evidence of clinical safety or performance in real patients.

Step 3 | Build and integrate the application

Create the guardian, doctor and admin screens. Connect the Flutter forms to Firebase and the Python prediction service. Store each prediction, doctor review and relevant test information as a linked record.

Step 4 | Test the system

Check registration, access rights, doctor approval, data entry, carbohydrate estimation, prediction requests, saved history and doctor recommendations. Test missing or unusual inputs, failed connections and clear warning messages.

10 Quality Requirements

- Usability: clear screens, simple language and easy navigation.
- Privacy: protect children’s health data and restrict access by user role.
- Reliability: save records correctly and handle connection or prediction errors.
- Maintainability: keep the model, mobile interface and database easy to update.

DELIVERY | SCOPE, SCHEDULE AND OUTCOME

11 Project Scope and Deliverables

The proposed project includes a mobile application, three role-based portals, child and test records, meal-based carbohydrate estimation, a prediction module, doctor recommendations and an admin dashboard.

Main deliverables: A working app prototype, trained model file, database structure, key system diagrams, test results and a final project report.

12 Suggested 12-Week Work Plan

PERIOD	PLANNED WORK
Weeks 1–2	Confirm requirements, screens and data fields.
Weeks 3–4	Prepare dataset, train models and document the results.
Weeks 5–7	Build Flutter screens and configure Firebase.
Weeks 8–9	Connect the prediction service and doctor workflow.
Weeks 10–11	Run functional, security and error-handling tests.
Week 12	Prepare demonstration, documentation and final review.

Note: This is a suggested schedule, not a timeline stated in the thesis.

13 Safety and Limitations

The thesis uses a simulated insulin target. The reported model results do not prove that a prediction is safe for a real child. Before any real-world medical use, the system would need appropriate clinical validation, secure data handling and approval by qualified medical professionals. Guardians must follow their clinician's advice, not an unreviewed app prediction.

14 Expected Outcome

The project is expected to demonstrate a connected prototype where guardians can record information, doctors can review model outputs and administrators can manage the system. Its main contribution is the organized workflow and decision-support design, not independent insulin prescribing.

SOURCE AND PREPARATION NOTE

This proposal is adapted from the supplied GLUCOTWIN thesis. The suggested 12-week schedule and recommended safety checks are proposal planning items; no new clinical study or validation is claimed.