MENTOR EVALUATION

GluCare

Product Perspective

- **User Convenience:** The main advantage of non-invasive glucose monitoring is the level of user convenience it provides. Non-invasive devices often use technologies like spectroscopy, sensors, or wearable devices to detect glucose levels painlessly, in contrast to conventional procedures, which call for the user to prick their finger and extract a blood sample.

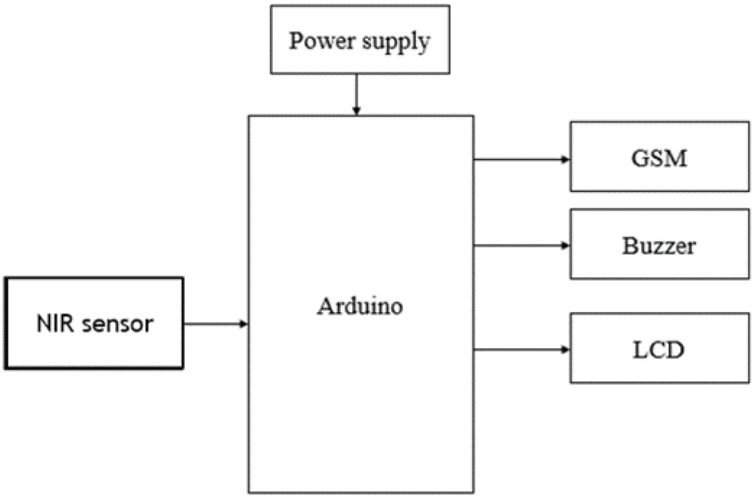
- **Pain reduction:** The elimination of the discomfort connected to conventional glucose monitoring is one of the largest benefits. People with diabetes frequently find fingerstick painful, and as a result, they may forego monitoring. Non-invasive techniques lessen or do away with this discomfort barrier, making it simpler for people to effectively manage their diabetes.

- **Reduced Infection Risk:** Traditional monitoring techniques include skin-breaking, which, if done improperly, increases the risk of infection. Non-invasive techniques eliminate this risk, improving user safety in general.

- **Improved Quality of Life:** Non-invasive monitoring can considerably enhance a person's quality of life for those who have diabetes. It lessens the burden, stress, and shame connected to conventional monitoring techniques, allowing people to concentrate on other facets of their lives.

For the hardware part

- The hardware part consists of The Arduino Uno. It has a number of facilities for communicating with a computer, another Arduino, or other microcontrollers.



BLOCK DIAGRAM

- **NIR Sensor:**

Machines can learn about objects in the physical world through NIR-based sensing. An NIR sensor measures the distance, size, location, and distinguishing characteristics of objects in the three-dimensional environment by receiving the reflected light or light pattern that is produced when NIR light is emitted and reflected off of an object.

- **GSM:**

Global system for mobile communication, or GSM, is a type of mobile communication modem. The GSM architecture is made up of the Radio Subsystem, Network and Switching Subsystem, and Operation Subsystem. The radio subsystem is composed of the Base Station Subsystem and the Mobile Station Subsystem. The mobile station is the standard mobile phone, which consists of a transceiver, display, and processor. Every handheld or portable mobile station has a SIM (Subscriber Identity Chip) module that stores a unique identity. A tiny microchip that is inserted into the phone houses the mobile station's database.

- **Buzzer:**

An audio signalling device, such as a buzzer or beeper, can be piezoelectric, electromechanical, or mechanical. Buzzer alarm circuits are used in situations where

the user needs to be alerted, such as in communication equipment, automobile electronics, and portable devices because of their small size.

- **LCD:**

Liquid Crystal Display, or LCD For LCD screens, there are two types of RAM: DDRAM and CGRAM. The location of a character's display in an ASCII chart is recorded by DDRAM. Every byte in the DDRAM corresponds to a single position on the LCD display. The LCD controller reads the data from the DDRAM and shows it on the LCD screen.

For the software part

- **Arduino IDE:**

An intuitive software platform called the Arduino Integrated Development Environment (IDE) is used to program and create applications for Arduino microcontroller boards. It is well-liked by both novice and seasoned developers in the maker and electronics communities because it offers an easy-to-use environment for writing, compiling, and uploading code to Arduino devices.

Since the Arduino IDE is open-source software, a committed user and development community works together to continuously improve it. It enables developers to work on a variety of hardware projects with ease by supporting a large selection of Arduino-compatible boards and shields. All things considered, the Arduino IDE is essential for helping professionals and hobbyists realize their ideas for electronic and embedded systems in an effective and user-friendly way.

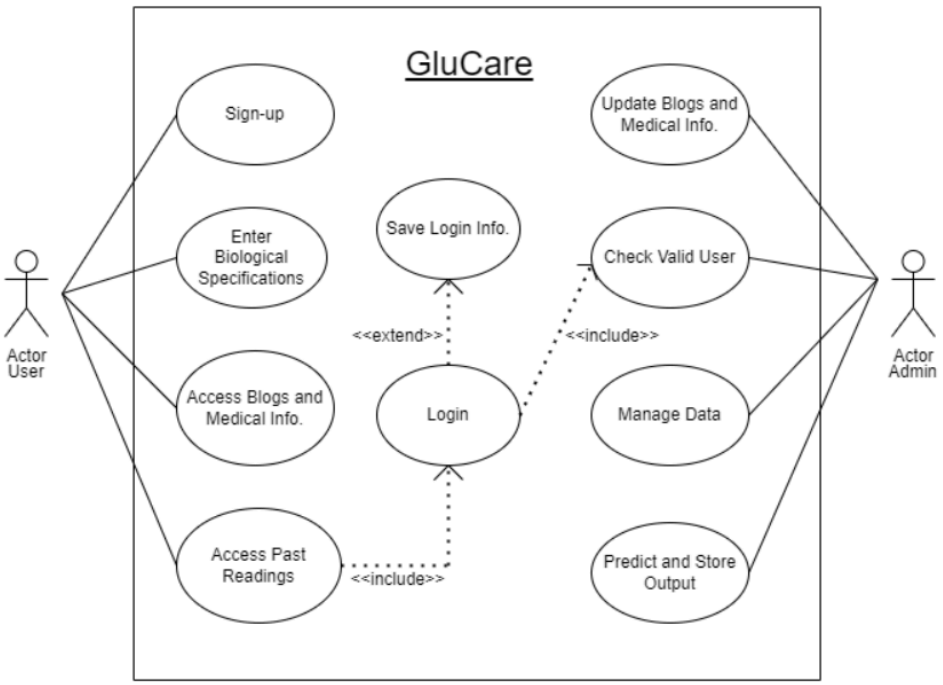
- **Website:**

The front-end part of our website is handled by HTML, CSS, JavaScript, python, bootstrap and backend part by Django and database is maintained in sql.

S. No	Tool/Technology	Usage
1	HTML/CSS/bootstrap/python/Django/sql	These two are the core technologies for web development as they are the building blocks for any website layout.
2	Arduino IDE	An intuitive software platform called the Arduino Integrated Development Environment (IDE) is used to program and create applications for Arduino microcontroller boards.
3	NIR Sensor	Machines can learn about objects in the physical world through NIR-based sensing. An NIR sensor measures the distance, size, location, and distinguishing characteristics of objects in the three-dimensional environment by receiving the reflected light or light pattern that is produced when NIR light is emitted and reflected off of an object.
4	LCD	Liquid Crystal Display, or LCD For LCD screens, there are two types of RAM: DDRAM and CGRAM. It is used to display our readings
5	Arduino UNO	It has number of facilities for communicating other microcontrollers and another Arduino
6	GSM	Global system for mobile communication, or GSM, is a type of mobile communication modem.

7	Buzzer	An audio signaling device, such as a buzzer or beeper, can be piezoelectric, electromechanical, or mechanical. Buzzer alarm circuits are used in situations where the user needs to be alerted, such as in communication equipment, automobile electronics, and portable devices because of their small size.

Use Case Diagram



Template 1

1. Use Case Title	Sign-up
2. Abbreviated Title	Sign-up
3. Use Case ID	1
4. Actors	User
5. Description	User must enter personal information like name, email id, etc.
5.1. Pre-Conditions	Set attributes which user must enter.
5.2. Task Sequence	a) User Info form will be displayed on the page. b) User must enter corresponding details.
5.3. Post Conditions	If successful, user is signed up for the next step.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

Template 2

1. Use Case Title	Enter Biological Specifications
2. Abbreviated Title	Enter Biological Specifications
3. Use Case ID	2
4. Actors	User
5. Description	User must enter biological specifications like BMI, Age, etc to predict the blood glucose level.
5.1. Pre-Conditions	Blood Glucose relationship with biological details.
5.2. Task Sequence	a) Fields corresponding to factors will be displayed. b) User must enter details.
5.3. Post Conditions	Blood Glucose levels will be displayed.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

Template 3

1. Use Case Title	Access Blogs and Medical Information
2. Abbreviated Title	Access Blogs and Medical Info.
3. Use Case ID	3
4. Actors	User
5. Description	User can read diabetes related blogs and access information regarding doctors and clinics.
5.1. Pre-Conditions	Blogs and medical contacts should be available.
5.2. Task Sequence	a) Click on the Blogs and Info. section. b) Access desired information.
5.3. Post Conditions	User is equipped with latest information.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

Template 4

1. Use Case Title	Access Past Readings
2. Abbreviated Title	Access Past Readings
3. Use Case ID	4
4. Actors	User
5. Description	User can view past readings with infographics.
5.1. Pre-Conditions	There must be a set of the user's readings in the database.
5.2. Task Sequence	a) User can login with valid login ID. b) Access readings which have been calculated by the model in the past.
5.3. Post Conditions	User has a visual idea of his glucose fluctuations in the past.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

Template 5

1. Use Case Title	Login
2. Abbreviated Title	Login
3. Use Case ID	5
4. Actors	User
5. Description	User must enter personal information like name, email id, etc. Enables Admin to find out which user is valid to access the model.
5.1. Pre-Conditions	Set attributes which user must enter.
5.2. Task Sequence	a) User Info form will be displayed on the page. b) User must enter corresponding details.
5.3. Post Conditions	If successful, user is logged in for the next step.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

Template 6

1. Use Case Title	Save Login Information
2. Abbreviated Title	Save Login Info.
3. Use Case ID	6
4. Actors	User
5. Description	User can choose whether or not to store his login info for future login.
5.1. Pre-Conditions	User must have entered some information prior to this.
5.2. Task Sequence	a) User must select the option whether or not he wants his information saved for future. b) Click login button
5.3. Post Conditions	User information is saved for future.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

Template 7

1. Use Case Title	Update Blogs and Medical Information
2. Abbreviated Title	Update Blogs and Medical Info.
3. Use Case ID	7
4. Actors	Admin
5. Description	Admin must design a system which can replace old information with the latest.
5.1. Pre-Conditions	There must be a section on the portal accessible and dedicated for the same.
5.2. Task Sequence	Continuous updating using APIs.
5.3. Post Conditions	Portal is up to date with the necessary information.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

Template 8

1. Use Case Title	Check Valid User
2. Abbreviated Title	Check Valid User
3. Use Case ID	8
4. Actors	Admin
5. Description	Admin must check if user is allowed access or not depending upon his login ID.
5.1. Pre-Conditions	A set sequence of login IDs for users who are to be allowed access.
5.2. Task Sequence	Followed by entering of Login details. Admin must display message if user invalid.
5.3. Post Conditions	If valid, user accepted for next step.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

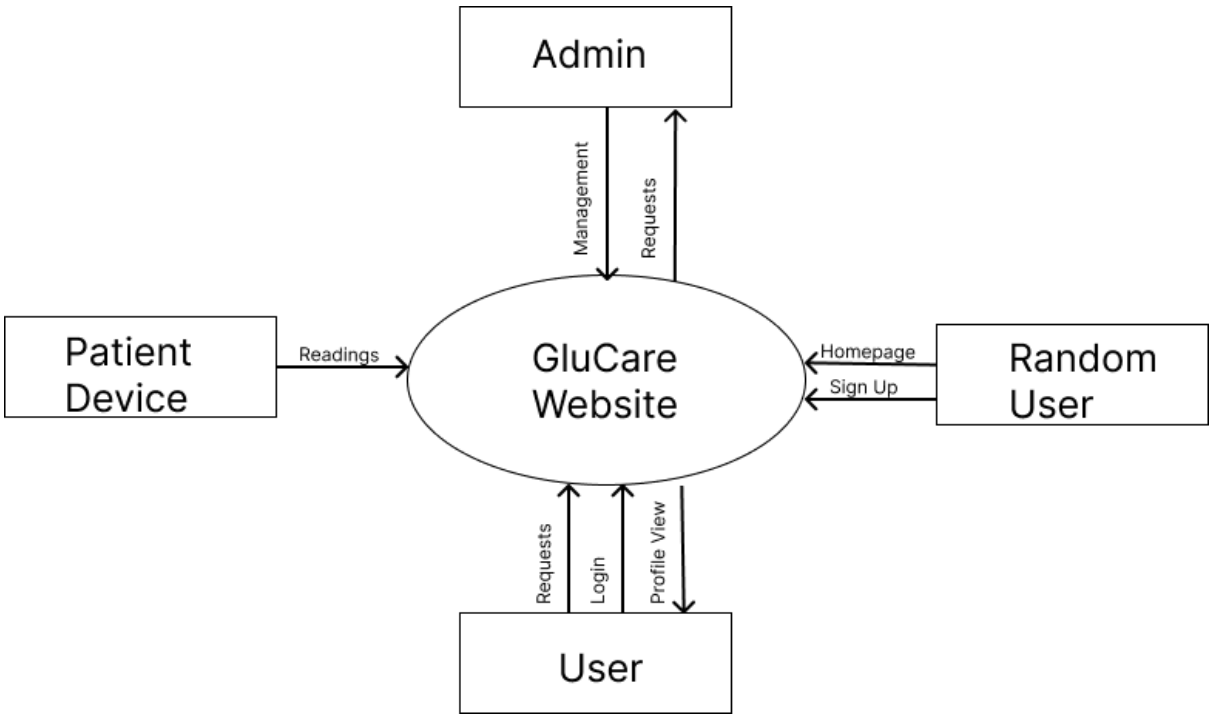
Template 9

1. Use Case Title	Manage Data
2. Abbreviated Title	Manage Data
3. Use Case ID	9
4. Actors	Admin
5. Description	Admin must manage and store database on which the model is built and results are stored. Graphs and plots can be used to show variations.
5.1. Pre-Conditions	Glucose values are predicted.
5.2. Task Sequence	User outputs are maintained as a database.
5.3. Post Conditions	Model is learned to be implemented and user results are stored.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

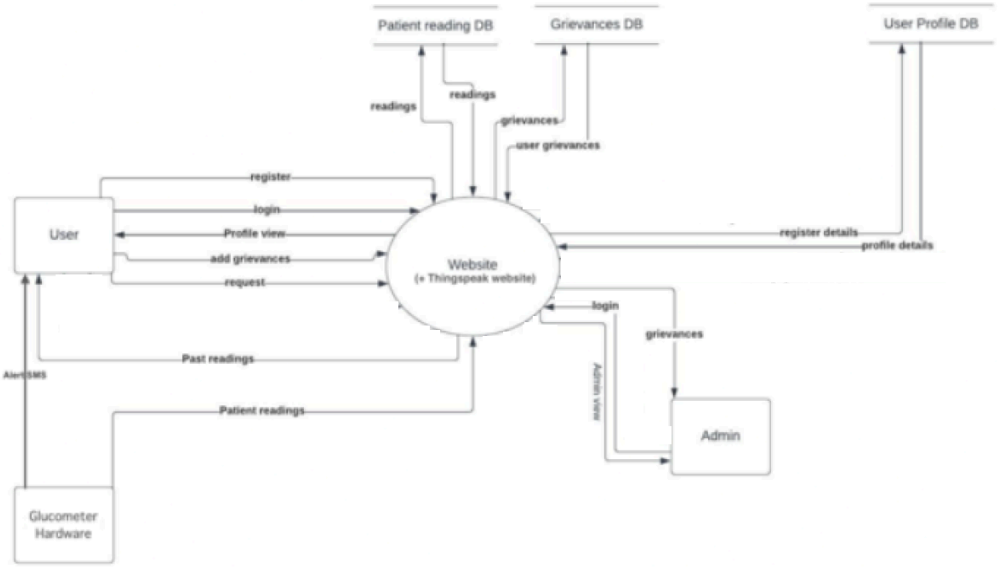
Template 10

1. Use Case Title	Predict and Store Output
2. Abbreviated Title	Predict and Store Output
3. Use Case ID	10
4. Actors	Admin
5. Description	Output for which the model is built is calculated and stored.
5.1. Pre-Conditions	All processes must be executed successfully.
5.2. Task Sequence	a) Model must calculate the result. b) The result must be displayed on the screen, visible to the user.
5.3. Post Conditions	User can apply this model for blood glucose level prediction.
6. Modification History	May 2, 2024
7. Author	Nitleen, Pia, Anupriya, Stuti, Riddhi

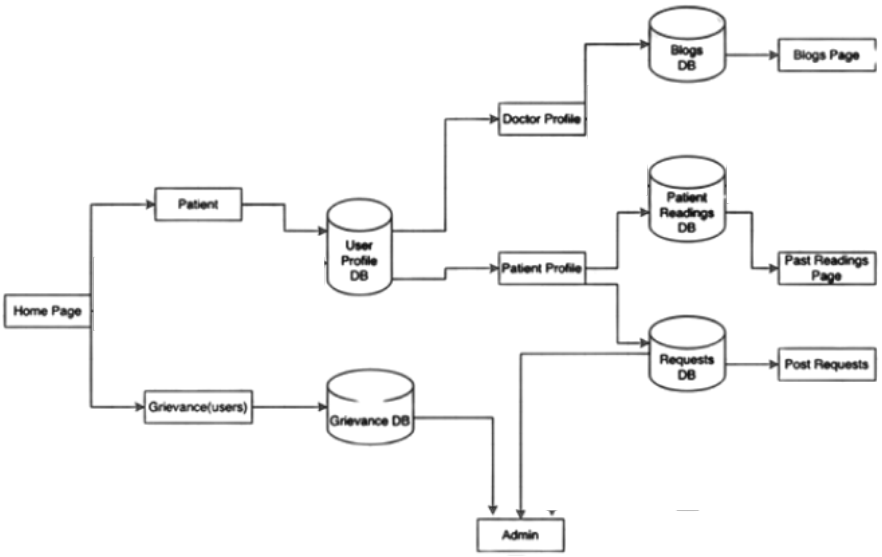
DFD 0



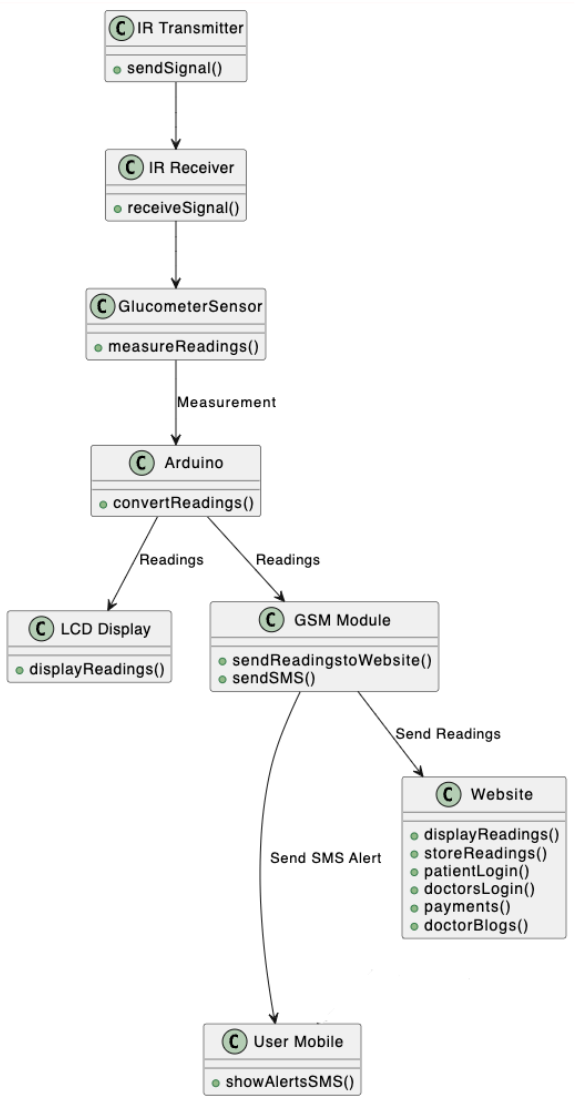
DFD 1



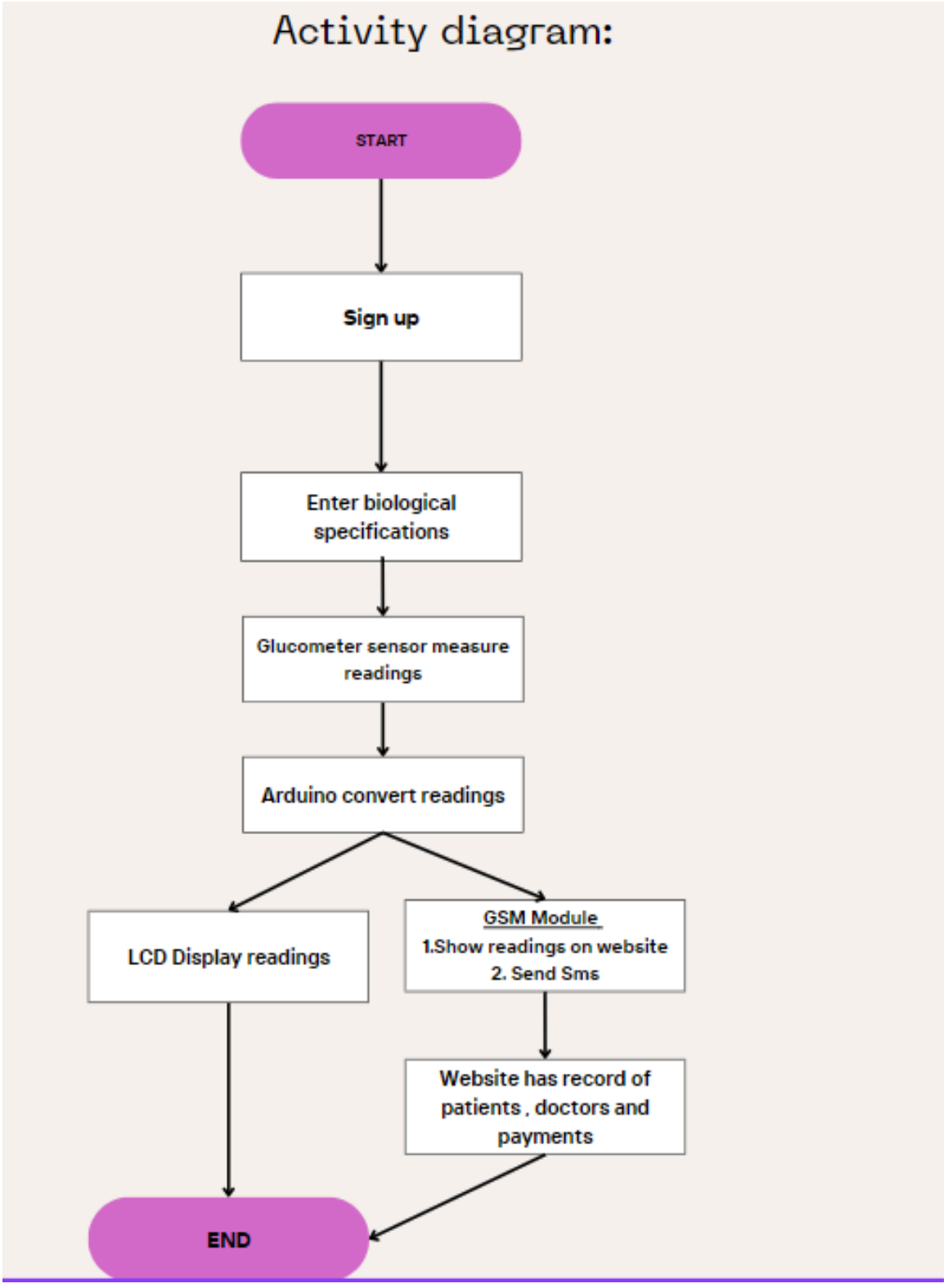
ARCHITECTURE DESIGN – Component Diagram



CLASS DIAGRAM



Activity Diagram



Functional Requirements:

1. **Glucose Monitoring Capability:** The device must accurately measure blood glucose levels using Near-Infrared Spectroscopy (NIRS) technology.
2. **Real-Time Monitoring:** The device should provide real-time glucose readings to the user.
3. **User Interface:** The device must have a user-friendly interface that displays glucose levels clearly and intuitively.
4. Alert System: The device should have an alert system to notify users of critical glucose levels.
5. **Data Storage:** The device should store glucose data securely for future reference and analysis.
6. **Compatibility:** The device should be compatible with a web application for data visualisation and management.
7. **Accuracy:** The device must meet or exceed clinical standards for accuracy in glucose monitoring.
8. **Calibration:** The device should have a calibration process to ensure accurate readings over time.

Non-Functional Requirements:

1. **Reliability:** The device should provide consistent and reliable glucose readings under varying physiological conditions.
2. **Security:** The device and associated web application should have robust security measures to protect user data.
3. **Ease of Use**: The device and web application should be easy to use for individuals of varying technical abilities.
4. **Comfort:** The device should be designed to minimise discomfort during use, promoting regular monitoring.
5. **Portability:** The device should be portable and lightweight for ease of carrying and use in various settings.
6. **Regulatory Compliance:** The device should comply with relevant medical device regulations and standards.
7. **Durability:** The device should be durable and able to withstand everyday use without significant degradation in performance.
8. **Scalability:** The web application should be scalable to accommodate a growing user base and increasing data volume.
9. **Training and Support:** The project should include user training and ongoing support to ensure proper use and maintenance of the device and web application.

Cost Analysis

S. No	Component	Cost
1	NIR Sensor	1000
2	GSM	1500
3	Arduino UNO	1000
4	LCD	550
5	5 V power supply	200
6	12V 1A Adapters	300
7	Buzzer	200
8	Power cable	250
9	Connectors	100
Total Cost		**5100**