**MedixBridge**

**By Anusuya Kugavarathan**

**Link to code: https://github.com/Anukuga/medix-bridge**

1. **Introduction**

Electronic Health Records (EHRs) are digital versions of patients' traditional paper records. They are real-time, patient-centered records that make information available instantly and securely to authorized users. EHRs contain a patient's comprehensive medical history, and they are designed to support the storage, retrieval, and modification of records.

* 1. **Importance**

Electronic health records, or EHRs, are essential to contemporary healthcare because they provide a host of advantages that improve patient care and provider productivity. EHRs enable healthcare providers to make well-informed decisions that result in more precise diagnosis and treatments, ultimately improving patient outcomes. This is accomplished by giving them access to current, comprehensive patient data. By providing access to medical records, patient portals in EHR systems encourage greater patient engagement by empowering people to take an active role in their healthcare journey by doing things like making appointments and reviewing results. EHRs also improve efficiency and reduce errors in administrative tasks like scheduling and documentation, freeing up healthcare providers to concentrate more on patient care. The implementation of Electronic Health Records (EHRs) results in significant cost savings as well due to decreased paperwork, avoided test duplication, and improved overall health outcomes. EHRs are also essential for maintaining healthcare compliance with legal and regulatory standards, highlighting the significance of timely and accurate documentation to meet industry requirements.

* 1. **Usage**

EHRs are used extensively in the healthcare sector to manage patient information. They allow healthcare professionals to track data over time, easily identify patients due for preventive screenings or checkups, monitor patients' measurements, and improve overall quality of care within the practice. Beyond direct patient care, EHRs facilitate prescription orders, share test results, and support the administrative aspects of care coordination.

* 1. **Development**

The inception of Electronic Health Records (EHR) dates to the mid-1960s. While they lacked the functionality of contemporary techniques, early systems concentrated on managing clinical data. Because of financial limitations, government hospitals were the first to use the first electronic medical record system, which was created in 1972 by the Regenstreif Institute. Web-based EMRs, however, were made possible by the 1990s, when personal computers became more affordable, and the Internet took off. Early in the new millennium, web-based software made it possible for doctors to access medical records remotely, increasing the allure and affordability of EHRs. The adoption of EHRs was encouraged by US government initiatives, such as the HITECH Act of 2009, which resulted in a notable expansion of the healthcare industry. Electronic prescribing and clinical decision support are two advanced features of EHR systems that have revolutionized the documentation and delivery of healthcare. Complex features like clinical decision support, cloud-based storage, patient portals, and telemedicine integration are available in today's EHR systems, improving the efficiency and accessibility of healthcare. EHRs' reach is further increased by their compatibility with mobile devices, which gives medical professionals access to patient data wherever they are.

1. **Website design and Technical Architecture**

MedixBridge's design prioritizes easy navigation and rapid access to information, reflecting a user-centric approach. Its user-friendly interface ensures that important information is always at your command. It provides a dashboard with direct linkages to other medical resources and patient management tools. Using HTML, CSS, and JavaScript for client-side operations and Flask and MySQL for server-side operations and database administration, the technical architecture is based on a strong front-end and back-end framework.

Versions of techniques:

* HTML 5
* CSS 3
* **Flask:** Version 2.1.1
* JavaScript ECMAScript 2023 (ES14)
* MySQL 9.0.1
* Bootstrap 5.0
* Font Awesome 6.5.1
* jQuery 2.2.4

**A close-up of a form

Description automatically generated**

**A screenshot of a login form

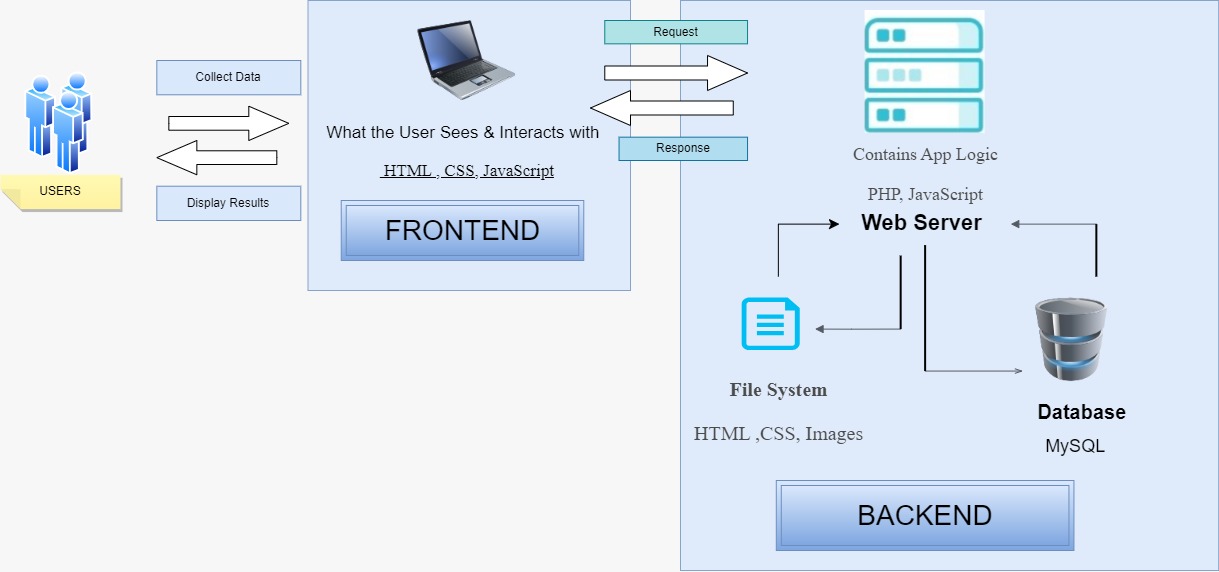
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**Figure 1 Sign in and Sign Up**

**A screenshot of a computer

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**Figure 2 Dashboard of MedixBridge**

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Python & JavaScript

**Figure 3 Technical Architecture**

1. **EHR information system**

**A person in a white coat

Description automatically generated**

**Figure 4 Snapshot of MedixBridge’s Homepage**

**Description**: This is the MedixBridge homepage, showcasing the platform's goal to provide convenient and secure access to health information. The banner features a welcoming healthcare professional and a section titled **"Better Days"** encouraging users to access their health records, manage appointments, and communicate securely with their medical team. Users can navigate to the **MedixBridge Portal** by clicking on the **"Portal" link in the navigation menu** at the top of the page, enabling them to access Sign in and Signup their health records and other features seamlessly.

A screenshot of a login form

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**Figure 5 Snapshot of Sign In Portal**

A screenshot of a computer

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**Figure 6 Snapshot of Sign Up Portal**

**Description:** The portal shown in the snapshot in figure 6 is used for the user to sign up for the doctor to be registered in the database, the doctor shall provide simple information to get his account setup. In order to register, they need to provide a strong password that passes all the checks, if not the sign-up button will not be clickable. After signing up the user can access his personal page by clicking Sign in using his username and password in figure 5.

A screenshot of a calendar

Description automatically generated

**Figure 7 snapshot of the doctor’s Dashboard**

**Description**: It is just a starting point of the doctor's home page. In this page, there are some links that are essential and helpful for the doctor.

Our website uses cookies to enhance your experience, personalize content, and analyze our traffic. By continuing to use our site, you consent to our use of cookies. For more details, please review our Cookie Policy.

**Navigation Bar:** On the left side, there's a vertical navigation bar with the following items:

The logo of the system (MedixBridge).

The user’s name (Anusuya Kugavarathan, AK) at the top, suggesting the page is personalized to the healthcare provider logged in.

A logo likely leading to the main page of the system.

My Patients, where the provider can view a list of their registered patients, also allows for easy access to patient lists, resulting in more efficient management and personalized care.

An option to "Register Patient", which is used to add new patients to the system, speeding data entry and initial documentation.

A "Log out" button in the navigation bar ensures a secure withdrawal from the system, safeguarding patient data and maintaining confidentiality.

-Medscape provides doctors with the most recent medical news ongoing education, drugs databases and disease information.

-Drug Databases are used to verify dosages, interactions, adverse effects, and contraindications, resulting in safe and effective patient pharmaceutical administration.

-Latest Health News keep doctors informed about new research treatments, and emerging health trends, crucial for patient care and safety.

-Medical Journals are used to access peer-reviewed research, keep up with medical advances, and guide evidence-based clinical practice.

-Diseases Database are used to provide diagnostic support, therapy alternatives, and an understanding of the progression and prognosis of numerous medical disorders.

-Decision Support Tools help doctors make evidence-based decisions, which improves patient care quality and safety.

Calendar in doctor’s page is used for managing time effectively and ensuring consistent patient care delivery.

A screenshot of a computer

AI-generated content may be incorrect.

**Figure 8 Snapshot of “My Patients “Page.**

**Description:** This page shows a table with a list of patients registered A unique number assigned to each patient for identification within the system.

A "Register New" button, used to add a new patient to the provider's care is displayed at the top of the table, the doctor will be directed to the Register Patient page.

**ID**: ID number assigned to each patient for identification within the system.

**First Name and Last Name**: The given and family names of the patients.

**Birthdate**: The date of birth of each patient, formatted as DD-MM-YYYY.

**Gender**: The recorded gender of each patient.

**Contact Number:** A phone number where the patient can be reached.

**Email**: The patient's email address.

**Action**: A button labelled "View", presumably to access more detailed information about the patient's health records or to perform actions related to their care.

A “Delete “button, used to delete the patient’s records.

**Patient Count**:

A widget indicating the "Total No. of Patients Registered with You", showing the number 8, which is the total count of patients currently linked to the logged in doctor.

**A screenshot of a computer

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**Figure 9 Snapshot of Patient Profile Information**

**A screenshot of a computer

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**Figure 10 Snapshot of Patient Profile Information (Edit view)**

**Description:**

When ‘View’ is pressed in the main patient’s page, it opens to display the full medical information of the patient stored in the database. Any info the doctor registered will be displayed. It has all the same fields as the ‘Register New Patient’ page displayed in Figure 12. Using Python, the information is displayed and when the doctor clicks on ‘Update patient’, all the fields become editable for the doctor to make any changes. Once the changes are done, he will press on the button ‘Save Changes’ which will send the UPDATE query to the database and update and information that has been changed, successfully updating the patients information.

A screenshot of a computer

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**Figure 11 Snapshot of “Register New Patient” Page.**

**Description:** The form is designed to collect both contact information and vital health details that can be critical in both routine health management and emergency situations. The consent statement at the bottom suggests attention to legal and privacy concerns, ensuring that the patients agrees to the terms of registration.

**1. Form Title:** "Register New Patient" - This indicates that the form is used to enter a new patient into the system.

**2. Personal Information Fields**:

- **First Name:** A field to enter the patient's first name.

**- Last Name**: A field to enter the patient's last name.

**3. Date of Birth:** A field with a date picker to enter the patient's birthdate, formatted as day-month-year (dd-mm-yyyy).

**4. Gender:** Radio buttons to select the patient's gender, with options for "Male" and "Female".

**5. Nationality:** A dropdown menu to select the patient's nationality, with a placeholder text "Select Country".

**6. Health Insurance No.:** A field to enter the patient's health insurance number.

**7. Email:** A field to enter the patient's email address.

**8. Phone No.:** A field to enter the patient's phone number.

**9. Emergency Contact Information:**

**- Emergency Contact Name:** A field to enter the name of an emergency contact.

**- Emergency Contact No.:** A field to enter the phone number of the emergency contact.

**10. Health Information Fields:**

**- Height:** A field to enter the patient's height.

**- Weight:** A field to enter the patient's weight.

- **Blood Group:** A field to enter the patient’s blood group.

**- Genotype:** A field to enter the patient’s blood group genotype.

**- Allergies:** A field to list any known allergies.

**- Chronic Diseases:** A field to list known chronic diseases.

**- Disabilities:** A field to list any disabilities.

**- Vaccines:** A field to list vaccines the patient has received.

**- Medications:** A field to list current medications.

**11. Upload file :** Any one medical files to be uploaded.

**12. Register Button:** A button labelled "Register" which, when clicked, presumably submits the form and registers the patient.

1. **Evaluation of the EHR information system**

A screenshot of a computer

Description automatically generatedA screenshot of a survey

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**Figure 12 Evaluation form Q1 to Q3 Figure 13 Evaluation from Q4 to Q7**

A screenshot of a survey

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**Figure 14 Evaluation from Q8 to Q10**

1st Evaluation:

-1odd items: (3-1, 5-1, 4-1, 5-1, 3-1) > (2, 4, 3, 4, 2)

5-even items: (5-1, 5-2, 5-1, 5-1, 5-2) >(4, 3, 4, 4, 3)

Sum = 2 + 4 + 3 + 4 + 2 + 4 + 3 + 4 + 4 +3 = 33

SUS Score = 33 2.5 = 82.5

2nd Evaluation: SUS Score = 77.5

3rd Evaluation: SUS Score = 77.5

4th Evaluation: SUS Score = 57.5

Average SUS Score = 73.75 ≈ 74

To compare our SUS Score with the benchmark of SUS which is 68

Our Score is **74** (> 68) which is **high usability**.

1. **Conclusion**

The development of the EHR system was a solo effort, meticulously handled by me, Anusuya Kugavarathan. I managed all aspects of the project, showcasing a comprehensive skill set in both front-end and back-end development.

On the front-end, I crafted a visually appealing and responsive user interface using HTML, CSS, Bootstrap, and JavaScript. Bootstrap ensured the system's responsiveness and professional design, while CSS added styling enhancements. Interactive features, implemented using jQuery, ensured smooth user interactions. The website structure was planned with wireframes created in Balsamiq, facilitating seamless design and functionality integration.

One significant challenge was dynamically generating HTML content using Python scripts. This integration bridged static front-end pages with dynamic back-end functionality, ensuring real-time updates and accurate data visualization.

On the back-end, I designed and developed the database tables, ensuring robust functionality for critical features, including:

* Connecting doctor profiles to relevant patient information.
* Implementing functionality for deleting patient data.
* Enabling comprehensive patient information retrieval for doctors.
* Establishing reliable connections between Python and the database to handle processes such as user registration, login, patient data display, and updates.

The patient table dynamically displayed accurate data, enhancing the system's utility. Additionally, the project was documented comprehensively, detailing technical and design aspects, challenges, and implemented solutions.

**Important Notes for Running the Application**

To assist in setting up the application for evaluation, I have provided a **SQL dump file** (medixbridge\_dump.sql) instead of a schema file. This SQL dump contains pre-populated data and table structures, making it easier to initialize the database.

**Instructions:**

1. Ensure MySQL is configured to run on port 8080.
2. Import the SQL dump file:
3. mysql -u <username> -p -P 8080 medixbridge < medixbridge\_dump.sql
4. Update main.py to match your database credentials and configuration.
5. Run the application on port 5001:
6. flask run --host=127.0.0.1 --port=5001

While the system has been successfully implemented, there is a minor issue with the spinner not functioning as expected due to Flask's potential lag during the loading process. Performing a hard refresh **(Ctrl + Shift + R on Windows or Cmd + Shift + R on Mac)** resolves this issue temporarily. Further optimization of the loading process is planned.

This project serves as a testament to my technical expertise and ability to manage and execute a complex project independently, delivering a fully functional EHR system with the potential to enhance electronic health record management.