Title: AI- Enabled Database System

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Project Description:

The AI-enabled Healthcare database system is a comprehensive database solution which is used to store, manage, and analyze healthcare related data including patient information, doctors' schedules, medical records, and research data. The system shall provide ease of use by professionals through implementing AI tools which shall help in retrieving/storing data, personalized content recommendations, medical image analysis, and much more.

Table of contents:

Use-case: Image-based Diagnosis

Actor: Radiologist (John)

Description: John is a radiologist working in a research lab of a well-known hospital. He is tired of analyzing patient's medical scans and can't work in a faster pace because he can't risk misdiagnosing a case. To improve his and his team's work rate, they suggested the use of AI tools to help them detect anomalies in a faster, more precise way.

Use-case: Treatment plans

Actor: Physician (Mohammed)

Description: Mohammed has been a physician for many years. He oversees many cases such as common illnesses and patients with cancer. Creating a good treatment plan requires him to invest a lot of time and hard work to get the best treatment plan for his patients. The harder cases such as his cancer patients need more care with their treatment plans since their illnesses are life threatening so it drains his energy studying the patient's treatment responses and genetic profiles. Having a personalized treatment plan using AI to study the patient's genetic profiles will improve his performance and efficiency in creating treatment plans.

Use-case: Overbooking Appointments

Actor: Medical Office Scheduler (Sherry)

Description: Sherry takes a lot of phone calls for scheduling appointments in the hospital. She doesn't mind taking the same amount of phone calls, but her issue is looking into each doctor's schedule every time she gets a phone call for an appointment. She gets frustrated when she can't find appropriate schedule times or the doctor's is fully booked. Sherry recommends the use of a software that can prevent overbooking of appointments, ensuring that practitioners have sufficient time for each patient encounter. The system will consider appointment durations and the nature of medical visits to make it more efficient.

Use-case: Medication Calculation

Actor: Nurse (Sereen)

Description: Sereen is a recovery room nurse, and she looks over many patients. Patients are prescribed medications from the doctors, and she gives her patients their medication in specific times of the day. Since she works with a lot of patients, efficiently managing the patients time of medication and calculating the doses can be exhausting and repetitive. She recommends the use of a software where she can have automated medication reminders and input the patient information and condition to get the best medication time and dosage according to the patient case, so it doesn't have to be necessary to consult the physician, which would make both their work more efficient.

Use-case: Research Data Analysis

Actor: Medical researcher (Jose)

Description: Jose is a medical researcher working in a drug testing lab. His research is focused on analyzing big data sets to identify new drug discoveries. He gets burnt out frequently because he's always analyzing big sets of data and it gets tiring for him. He suggests the use of a software that can support him with his analysis to increase his productivity and help him identify trends and patterns for drug discovery.

Functional Requirements:

1-User

1.1 A user shall go through identity verification.

1.2 A user shall have a username.

1.3 A user shall have a password.

1.4 A user shall have a unique ID.

2-Registered User

2.1 A registered user is a user.

2.2 A registered user shall have a role.

2.3 A registered user shall have full access to his/her department's database.

2.4 A registered user shall be able to manage their schedule.

2.5 A registered user shall have a

3-Patient

3.1 A patient is a user.

3.2 A patient shall have access to their own medical records.

3.3 A patient shall have access to their own personal information.

3.4 A patient shall have the ability to schedule appointments.

3.5 A patient shall have the ability to view their upcoming and past appointments.

3.6 A patient shall be able to receive automated notifications.

4-Doctor

4.1 A doctor is a registered user.

4.2 A doctor shall have a specific role.

4.3 A doctor shall have access to patient records.

4.4 A doctor shall have access to patient medical history.

4.5 A doctor shall have access to patient diagnostic reports.

4.6 A doctor shall have access to patient treatment plans.

4.7 A doctor shall be able to update patient records.

4.8 A doctor shall be able to add new diagnosis to patients.

4.9 A doctor shall be able to update patient treatment plans.

4.10 A doctor shall be able to add prescriptions.

4.11 A doctor shall have access to AI tools for clinical decision support.

4.12 A doctor shall have access to AI tools for aiding in diagnosis.

4.13 A doctor shall have access to AI tools for treatment recommendations.

5-Researcher

5.1 A researcher is a registered user.

5.2 A researcher shall have access to research databases and tools for data analysis.

5.3 A researcher shall be able to upload research data.

5.4 A researcher shall be able to manage research data.

5.5 A researcher shall be able to analyze research data.

5.6 A researcher shall be able to collaborate with other researchers. (Recursive)

5.7 A researcher shall belong to one department.

6-Nurse

6.1 A nurse is a registered user.

6.1 A nurse shall have access to patient records.

6.2 A nurse shall have access to medication administration.

6.3 A nurse shall have access to patients care plans.

6.4 A nurse shall be able to receive automated medication administration reminders.

6.5 A nurse shall have access to AI dosage calculation tools.

6.6 A nurse shall be able to record patient observations in the database.

6.7 A nurse shall be able to record patient vital signs in the database.

7-Front Desk Staff

7.1 A front desk staff is a registered user.

7.2 A front desk staff shall have access to appointment scheduling tools.

7.3 A front desk staff shall help patients in scheduling appointments.

7.4 A front desk staff shall help patients in verifying insurance information.

7.5 A front desk staff shall help patients in handling check-ins.

8-System Administrators

8.1 A system administrator is a registered user.

8.2 A system administrator shall have highest system access and control.

8.3 A system administrator shall be able to manage user accounts.

8.4 A system administrator shall be able to manage user roles.

8.5 A system administrator shall be able to manage permissions.

8.6 A system administrator shall have access to system configuration settings.

9-Hospital

9.1 A hospital shall contain many departments.

9.2 A hospital shall have an address.

9.3 A hospital shall have a name.

10-Departments

10.1 Each department shall belong to one hospital. (aggregation)

10.1 A department shall have many doctors.

10.2 A department shall have many nurses.

10.3 A department shall have many researchers.

Non-functional requirements:

1-Performance

1.1 The database system shall be able to handle high volume of concurrent users.

1.2 The database system shall handle many queries in a short time.

1.3 The database system shall have fast response time in data upload.

1.4 The database system shall have fast response time in data retrieval.

2-Security

2.1 The database system shall have role-based authorization requirements.

2.2 The database system shall only allow access to registered users.

2.3 The database system shall authenticate user login by username and password.

2.4 The database shall encrypt user data during transmission.

3-Usability

3.1 The database system shall be easy to navigate.

3.2 The database system shall be accessible to those with audio or visual imparities.

4-Maintainability

4.1 The database system shall be easy to maintain.

4.2 The database system shall be easy to update.

4.3 The database system shall be written in readable and understandable code.

5-Scalability

5.1 The database system shall scale to handle increased load.

5.2 The database system shall scale horizontally if necessary.

5.3 The database system shall scale vertically if necessary.

5.4 The database system shall have a mechanism for data archiving to manage historical data.

6-Storage

6.1 The database system shall handle large amounts of data.

6.2 The database system shall frequently back-up the data.

6.3 The database system shall have a recovery storage.

6.4 The database system shall compress data for optimizing storage space.

6.5 The database shall encrypt sensitive user information.