

**FALL 2023 DATA MANAGEMENT AND DATABASE DESIGN (DAMG 6210)**  
**CRN-15022**

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### **1. OVERVIEW**

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Creating a health and fitness application using an Oracle database involves designing a robust database schema, defining tables, establishing relationships, and ensuring data integrity and security.

The project's goal is to create an all-inclusive exercise and health application. Individual data, body composition, sleep habits, exercise regimens, and overall health measures can all be tracked by users. Based on the data gathered, the application will offer insights on things like health condition, workout performance, and sleep quality. For female users, it might also include functions like menstrual monitoring.

The application will allow users to log in with their credentials and access the features based on their role (admin or regular user). Regular users can view and update their personal details, monitor body composition, track sleep patterns, and record exercise activities. Admins, in addition to regular user features, can manage users, add new users and persons, and perform advanced searches based on unique identifiers.

The user data will be securely stored and managed, ensuring privacy and data integrity. Overall, the goal is to provide a user-friendly and efficient platform for users to monitor and improve their health and fitness.

### **Project Overview:**

#### **1. User Authentication and Authorization:**

- Users can securely log in using their credentials (username and password).
- Different roles (admin and regular user) grant access to specific features, ensuring data security and privacy.

#### **2. Personal Information Management:**

- Users can input and update personal details such as name, contact information, age, height, and address.

### **3. Body Composition Tracking:**

- Enables users to record and monitor their body composition, including weight, skeletal muscle mass, fat mass, body fat percentage, BMI, body water, and basal metabolic rate (BMR).

### **4 Sleep Pattern Monitoring:**

- Allows users to track and analyze their sleep patterns, including sleep duration, blood oxygen levels, sleep cycles (deep sleep, REM, etc.), and overall sleep quality.

### **5. Exercise Logging and Insights:**

- Users can log various exercise activities such as running, walking, gym workouts, swimming, and sports.
- The application calculates and provides insights into exercise performance, including calories burnt, steps taken, and total standing/sitting time.

### **6. Health Metrics and Vital Signs:**

- Provides a platform to monitor vital health metrics like heart rate, blood pressure, and ECG readings.

## **Administrative Functionalities:**

### **1. User Management:**

- Administrators can manage user accounts, enabling or disabling them based on individual circumstances.
- Allows the addition of new users and the modification of existing user information.

## **2. Person Management:**

- Administrators can add and manage individual records, including personal details and health-related data.

## **3. Advanced Search Capabilities:**

- Enables advanced search functionalities based on unique identifiers (User IID), facilitating efficient data retrieval and management.

## **4. Security and Data Integrity:**

- User data is securely stored and managed to ensure privacy and maintain data integrity.

## **2. PROBLEM STATEMENT**

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The current era places a significant emphasis on personal health and well-being. However, individuals often struggle to effectively track and manage their health-related data, making it challenging to make informed decisions about their fitness routines, sleep patterns, and overall health. This presents an opportunity to develop a comprehensive health and fitness application that addresses these challenges and provides users with a user-friendly platform to monitor and improve their health.

The project aims to create a robust HealthTracker, allowing users to monitor and manage their personal information, body composition, sleep patterns, exercise routines, and overall health metrics. This project will provide valuable insights based on the collected data, such as sleep quality, exercise performance, and health status. Additionally, it will cater to the specific needs of female users by incorporating a menstrual tracking feature.

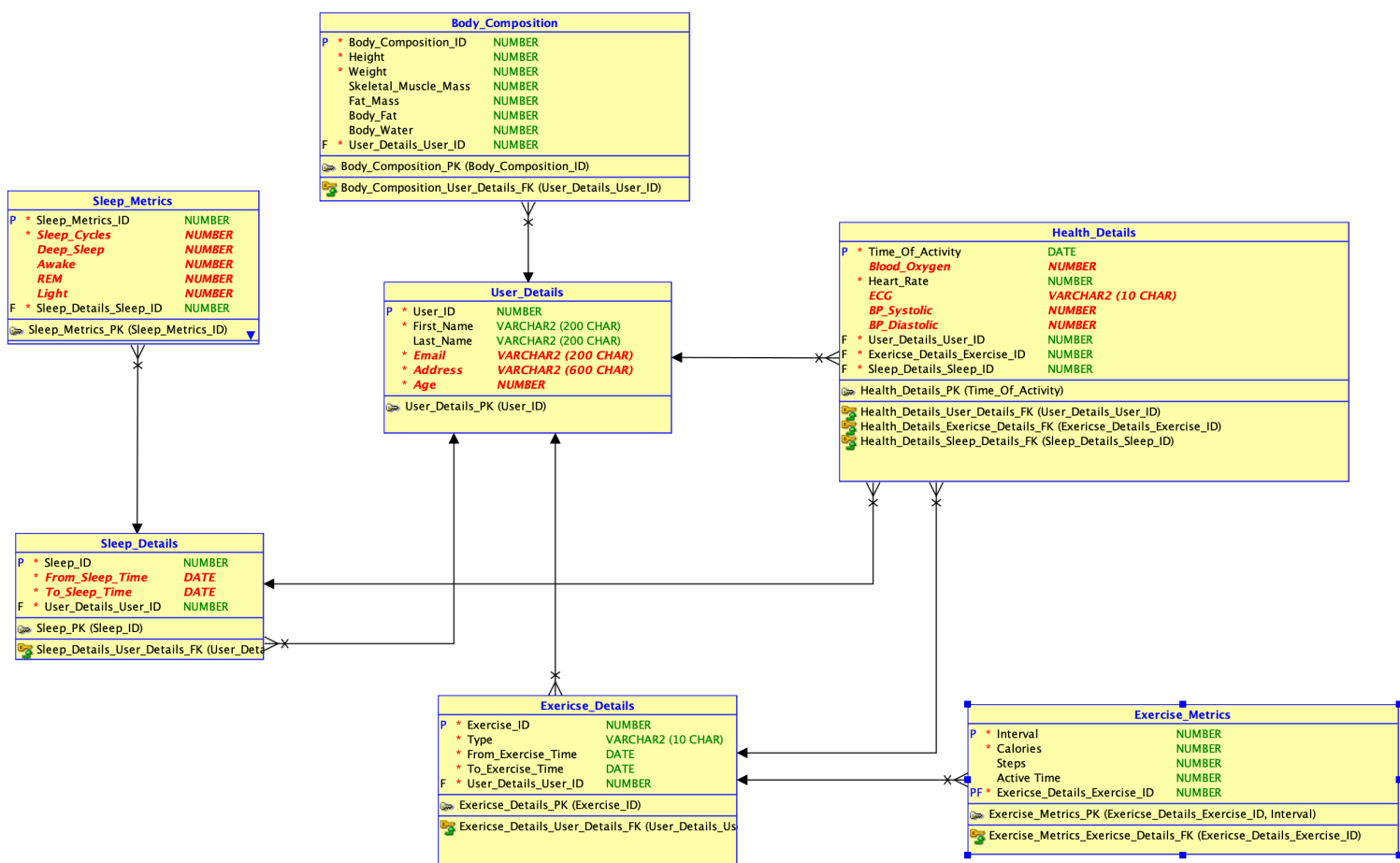
### 3. OBJECTIVES

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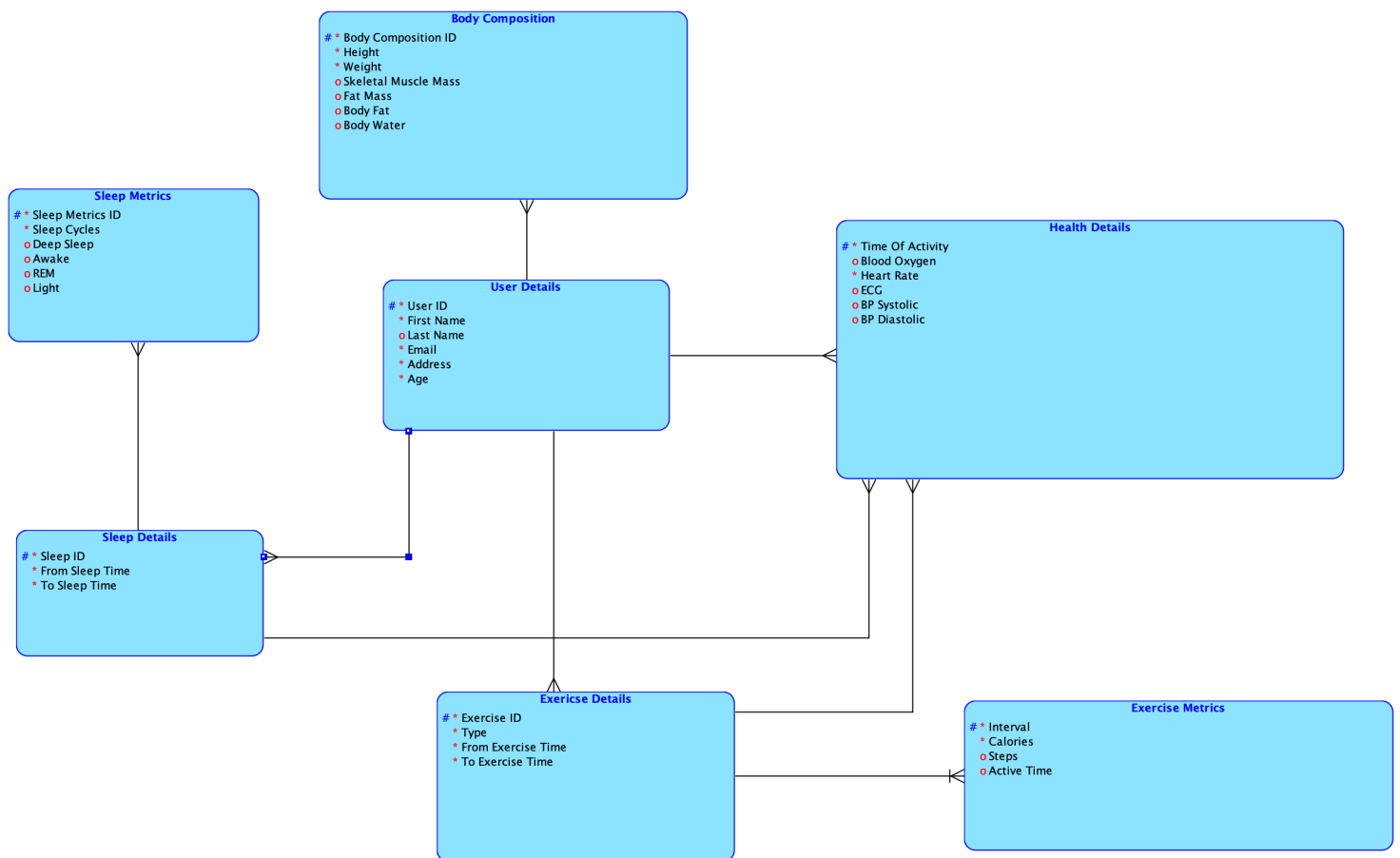
- Develop a system that can efficiently collect and store exercise-related data from smartwatches, including workout duration, type, intensity, and heart rate.
- Implement a feature that allows users to set and track daily fitness goals, such as steps taken, distance covered, and calories burned, and store this information in the database.
- Develop a performance tracking module that analyzes historical exercise data to provide insights into the user's progress, helping them evaluate their fitness goals and achievements.
- Implement a sleep tracking system capable of capturing data related to sleep patterns. Provide insights into wakefulness, physical recovery, mental recovery, total sleep duration, and an overall sleep score to help users optimize their sleep quality.
- Implement a notification system to keep users informed about their progress, achievements, and reminders to meet their fitness and wellness goals.

## 4. ENTITY RELATION DIAGRAM

### Relational Model



## Logical Model





## 5. BUSINESS PROBLEMS

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### 1. Data Privacy and Security:

**Problem:** Ensuring the privacy and security of sensitive health data is a critical concern. Unauthorized access or data breaches can lead to severe consequences.

Solution: Implement robust access control, user authentication, and hold regular security audits to protect user data. Compliance with relevant data privacy laws and regulations is essential.

### 2. Accuracy and Reliability of Data:

**Problem:** Inaccurate or unreliable health and fitness data can lead to incorrect insights or recommendations, impacting user trust and application effectiveness.

Solution: Implement data validation checks, encourage users to input data accurately, and integrate sensors or devices for automated data collection. Regularly validate and cleanse data to maintain accuracy.

### 3. Scalability for Growing User Base:

**Problem:** As the user base grows, the application might face performance issues and delays, affecting user experience.

Solution: Design a scalable architecture, use efficient database indexing, optimize queries, and leverage cloud-based solutions to accommodate a larger user base. Monitor performance and make necessary optimizations.

#### **4. User Engagement and Retention:**

**Problem:** Retaining users and keeping them engaged with the application can be challenging, impacting the success of the platform.

**Solution:** Implement features that encourage regular usage, provide personalized recommendations, offer challenges or goals, incorporate social sharing, and gather user feedback to continuously improve the app.

#### **5. Integration with Wearables and Health Devices:**

**Problem:** Integrating data from various wearable devices and health monitors can be complex, hindering a seamless user experience.

**Solution:** Develop APIs and integration points to connect with popular health devices and wearables. Ensure compatibility and provide clear instructions to users for device integration.

## 6. TABLES

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USER DETAILS			
KEY/CONSTRAINT	DATATYPE	ATTRIBUTE	DESCRIPTION
Primary Key	Number	User_ID	User ID of the the user
	Varchar	First_name	First name of user
	Varchar	Last_name	Last name of the user
	Varchar	Email	Email address of the user
	Varchar	Address	Address of the user
	Number	Age	Age of the user

BODY COMPOSITION			
KEY/CONSTRAINT	DATATYPE	ATTRIBUTE	DESCRIPTION
Primary Key	Number	Body_Composition_ID	ID for Body Composition
	Number	Height	Height of the User
	Number	Weight	Weight of the User
	Number	Skeletal_Muscle_Mass	Muscle Mass of the User
	Number	Fat_Mass	Fat Mass of the User
	Number	Body_Fat	Body Fat of the User
	Number	Body_Water	Body Water Composition of the User
Foreign Key	Number	User_Detail_User_ID	User ID FK from User Details

SLEEP DETAILS			
KEY/CONSTRAINT	DATATYPE	ATTRIBUTE	DESCRIPTION
Primary Key	Number	Sleep_ID	Sleep ID of the User
	Date	From_Sleep_Time	Starting Sleep Time
	Date	To_Sleep_Time	Ending Sleep Time
Foreign Key	Number	User_Details_User_ID	User ID FK from User Details

SLEEP METRICS			
KEY/CONSTRAINT	DATATYPE	ATTRIBUTE	DESCRIPTION
Primary Key	Number	Sleep_Metrics_ID	Sleep ID of the User's Sleep Metrics
	Number	Sleep_Cycles	Number of times the user has cycled through all four stages of sleep
	Number	Deep_Sleep	Amount of time spent in Deep Sleep
	Number	Awake	Amount of time spent Awake
	Number	REM	Amount of time spent in REM Sleep
	Number	Light	Amount of time spent in Light Sleep
Foreign Key	Number	Sleep_Pattern_Sleep_ID	Sleep ID FK from Sleep Pattern

EXERCISE DETAILS			
KEY/CONSTRAINT	DATATYPE	ATTRIBUTE	DESCRIPTION
Primary Key	Number	Exercise_ID	Exercise ID of the User

EXERCISE_DETAILS			
	Varchar	Type	Type of Exercise performed by the User
	Date	From_Exercise_Time	Starting time of the Exercise
	Date	To_Exercise_Time	Ending time of the exercise
Foreign Key	Number	User_Details_User_ID	User ID FK from User Details

EXERCISE_METRICS			
KEY/CONSTRAINT	DATATYPE	ATTRIBUTE	DESCRIPTION
Primary Key	Number	Interval	Every hourly interval for exercise metrics recorded
	Number	Calories	Calories burnt by the User while exercising
	Number	Steps	Number of Steps taken
	Number	Active_Time	Active time per Activity
Primary/Foreign Key	Number	Exercise_Details_Exercise_ID	Exercise ID FK from Exercise Details. Also acts as PK

HEALTH_DETAILS			
KEY/CONSTRAINT	DATATYPE	ATTRIBUTE	DESCRIPTION
Primary Key	Date	Time_Of_Activity	Time spent during an activity by the user
	Number	Blood_Oxygen	O2 level of the user
	Number	Hearth_Rate	Heart rate of the user
	Marcher	ECG	ECG measured during an activity of the user
	Number	BP_Systolic	
	Number	BP_Diastolic	
Foreign Key	Number	Sleep_Pattern_Sleep_ID	Sleep ID FK from Sleep Pattern

HEALTH_DETAILS			
Foreign Key	Number	Exercise_Details_Exercise_ID	Exercise ID FK from Exercise Details