Project Approach & Platform

Chosen Technologies:

- **Backend Framework:** FastAPI (Python)
- **Database:** PostgreSQL
- **ORM & Migrations:** SQLAlchemy + Alembic
- **Hosting/Infrastructure:**
    - Code deployed on AWS EC2 instance currently provided by Morphace.
    - Database to be hosted on AWS RDS for production (if Morphace sets it up) or on the same EC2 instance using Docker for testing.
- **Reasoning:**
    - FastAPI for rapid development, built-in validation, and automatic API docs.
    - PostgreSQL for robust relational data storage and support for arrays and JSON if needed.
    - SQLAlchemy for flexible, Pythonic ORM and Alembic for versioned database schema changes.

Example Records and Entity-Relationship Diagram (ERD)

Entities & Their Example Data:

1. **Users Table**
    - **Example:**
        - id (UUID): `550e8400-e29b-41d4-a716-446655440000`
        - email: `null`
        - first_name: `J`
        - last_name: `null`
        - age: `null`
        - gender: `Female`
2. **Sensor Data & Related Tables**
    - **sensor_data**
        - id: `1`
        - user_id: `550e8400-e29b-41d4-a716-446655440000` (FK to `users.id`)
        - timestamp: `2024-12-08T18:48:00Z`
        - sensor_id: `1`
    - **humidity_readings** (linked by `sensor_data_id = 1`)
        - For index 0: value = 44.34
            ... (up to index 9)
    - **temperature_readings** (linked by `sensor_data_id = 1`)

- For index 0: value = 22.72
  - ... (up to index 9)
- **impedance_readings** (linked by `sensor_data_id = 1`)
  - index: 0, freq: 1000.00, reZ: 200.02, imZ: 100.02, magZ: 223.61, phase: 26.57
    - ... (for subsequent indices)

3. **User Habits**
   - **user_habits**
     - id: `5`
     - user_id: `550e8400-e29b-41d4-a716-446655440000`
     - timestamp: `2024-12-08T19:02:00Z`
     - sleep_hours: `9`
     - used_spf: `False`
   - **habit_skincare_products** (join table)
     - user_habit_id: `5`
     - product_id: `10` (refers to a product in `skincare_products`)

4. **Skincare Products**
   - **skincare_products**
     - id: `10`
     - identifier: `serum0001`
     - brand: `Estee Lauder`
     - name: `Advanced Night Repair Serum Synchronized Multi-Recovery Complex`
     - type: `serum`
   - **skincare_ingredients**
     - product_id: `10`
     - ingredient: `water`
     - ingredient: `bifida ferment lysate`
     - ingredient: `peg-8`

ERD (Entity Relationship Diagram)

Users
- id: UUID [PK]
- email: String
- first_name: String
- last_name: String
- age: Integer
- gender: String

SensorData
- id: UUID [PK]
- user_id: UUID [FK]
- sensor_id: String
- timestamp: DateTime

UserHabits
- id: UUID [PK]
- user_id: UUID [FK]
- timestamp: DateTime
- sleep_hours: Float
- used_spf: Boolean

HumidityReadings
- id: UUID [PK]
- sensor_data_id: UUID [FK]
- value_index: Integer
- value: Float

TemperatureReadings
- id: UUID [PK]
- sensor_data_id: UUID [FK]
- value_index: Integer
- value: Float

ImpedanceReadings
- id: UUID [PK]
- sensor_data_id: UUID [FK]
- index: Integer
- freq: Float
- reZ: Float
- imZ: Float
- magZ: Float

HabitSkincareProducts
- id: UUID [PK]
- user_habit_id: UUID [FK]
- product_id: UUID [FK]

SkincareProducts
- id: UUID [PK]
- identifier: String [Unique]
- brand: String
- name: String
- type: String

SkincareIngredients
- id: UUID [PK]
- product_id: UUID [FK]
- ingredient: String

Relationships:
- Users 1 has 0..* SensorData
- Users 1 has 0..* UserHabits
- SensorData 1 has 0..* HumidityReadings
- SensorData 1 has 0..* TemperatureReadings
- SensorData 1 has 0..* ImpedanceReadings
- UserHabits 1 has 0..* HabitSkincareProducts
- HabitSkincareProducts 0..* references 1 SkincareProducts
- SkincareProducts 1 has 0..* SkincareIngredients