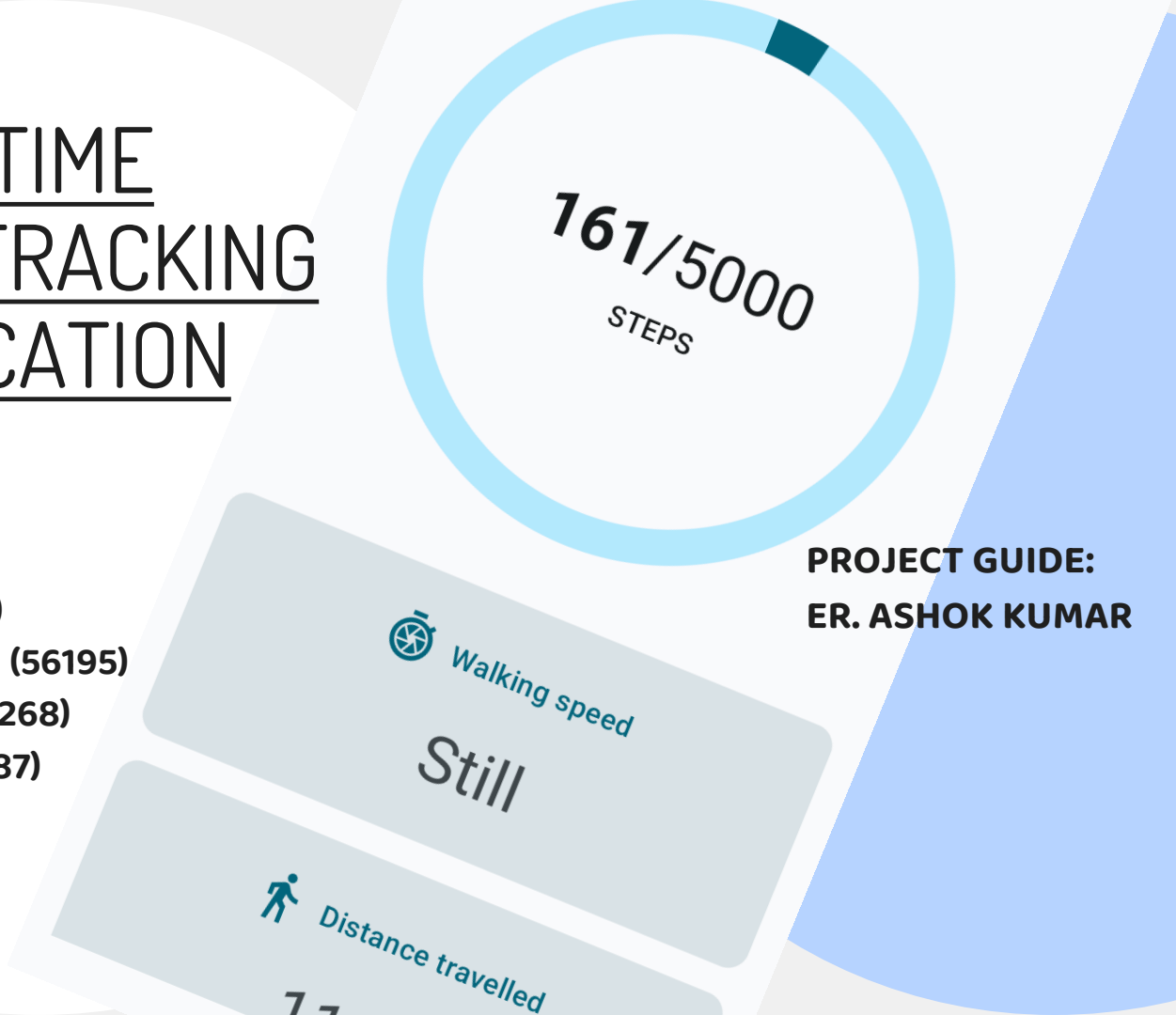
REAL-TIME STEP TRACKING APPLICATION



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PROJECT GUIDE:
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Vision

In our increasingly fast-paced and technologically driven world, the need for a step tracking application has become more crucial than ever. The rapid shift towards sedentary lifestyles, characterized by long hours spent sitting at desks, engaging with screens, and limited physical activity, has raised concerns about the impact on our overall health and well-being.

The importance of maintaining an active lifestyle cannot be overstated, as regular physical activity is closely linked to various health benefits. This is where a step tracking application comes into play. By leveraging the devices, we already carry, such as smartphones , the application can provide a simple yet effective means of monitoring our daily step count. Tracking our steps serves as a tangible and measurable indicator of our physical activity levels, encouraging individuals to incorporate more movement into their daily routines.

Primary Goals

Step tracking

Accurately tracking steps taken by the user.

Current speed estimation

Estimate current walking/running speed as still, slow, medium or fast.

Distance travelled estimation

Estimate distance travelled by the user.

Calories burnt estimation

Estimate calories burnt based different parameters e.g. step count, speed, height, weight & gender of the user.

Project Objective

- **Empower users with data and insights**: Help users understand their daily activity levels and calorie expenditure through accurate tracking and insightful analysis.
- **Promote active lifestyles**: Motivate users to increase their daily steps and engage in activities that contribute to a healthy lifestyle.
- **Support weight management goals:** Assist users in tracking their calories expenditure, aiding in weight management or fitness goals.

Project Features

Accurate Step Tracking

Using device's sensor

Current speed estimation

Still, slow, medium or fast

Calorie Burn Estimation

Based on steps taken, height, weight, gender etc.

Distance Estimation

Overall travel distance

Real-Time Updates

Immediate feedback

Set Goals

Daily step goal

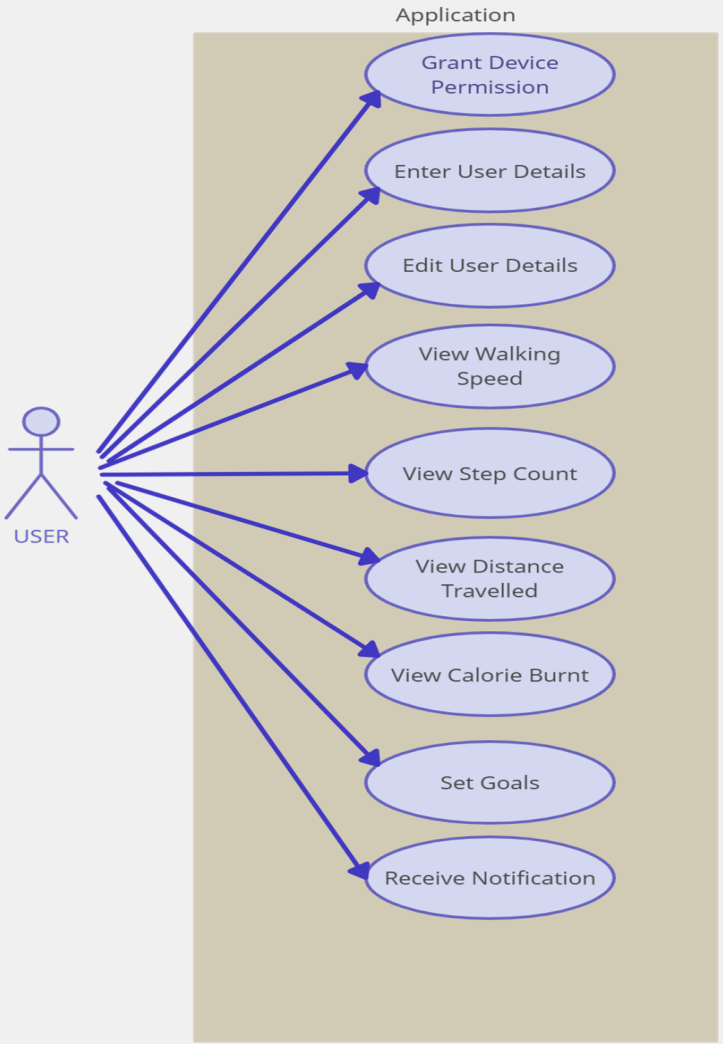
Background Processing

Using foreground service

Weekly/Monthly Analytics

Distance travelled or calories burnt over week or month

Use Case


Application
Grant Device Permission
Enter User Details
Edit User Details
View Walking Speed
View Step Count
View Distance Travelled
View Calorie Burnt
Set Goals
Receive Notification
USER

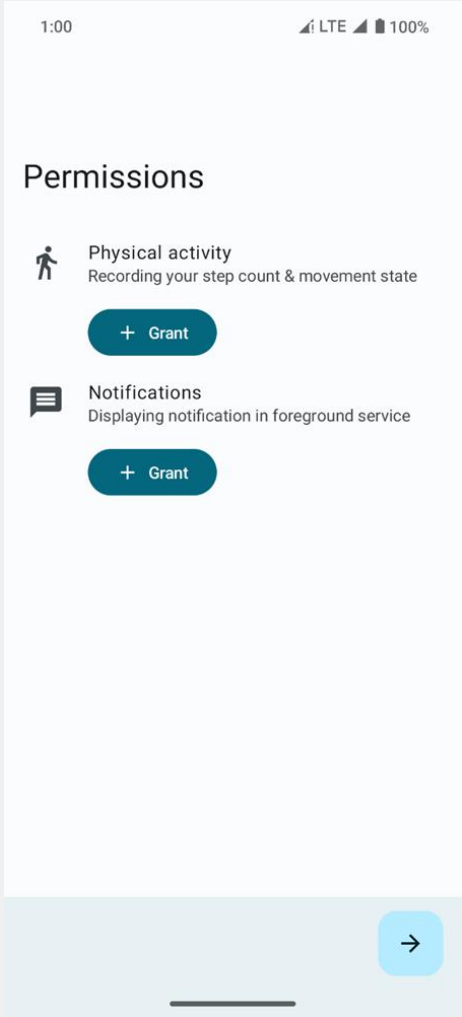
Target Audience

- **Fitness Enthusiasts**: People who are actively engaged in regular exercise and fitness routines, aiming to optimize their workouts and achieve specific health goals.
- **Athletes:** Sports professionals and enthusiasts who want to track and analyze their training sessions for performance enhancement.
- **Health-Conscious Individuals:** Those who prioritize overall health and wellness, seeking tools to monitor and improve their daily physical activity levels.
- **Seniors**: Older adults who wish to maintain mobility, track daily activity, and ensure they meet recommended exercise levels for their age group.
- **Rehabilitation Patients**: Individuals recovering from surgeries or injuries, working with healthcare professionals to gradually increase activity levels during rehabilitation.

Functionalities

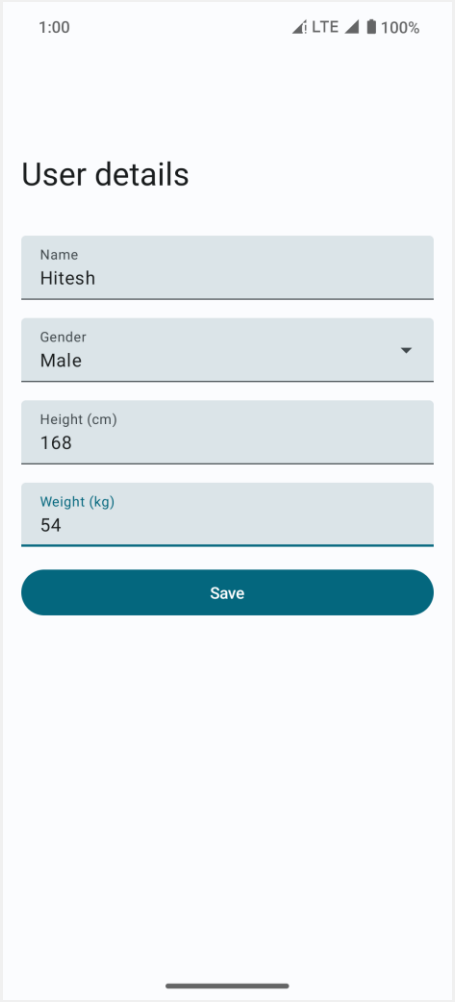
Permissions Screen

- Manifest.permission.ACTIVITY_RECOGNITION
- Manifest.permission.POST_NOTIFICATIONS

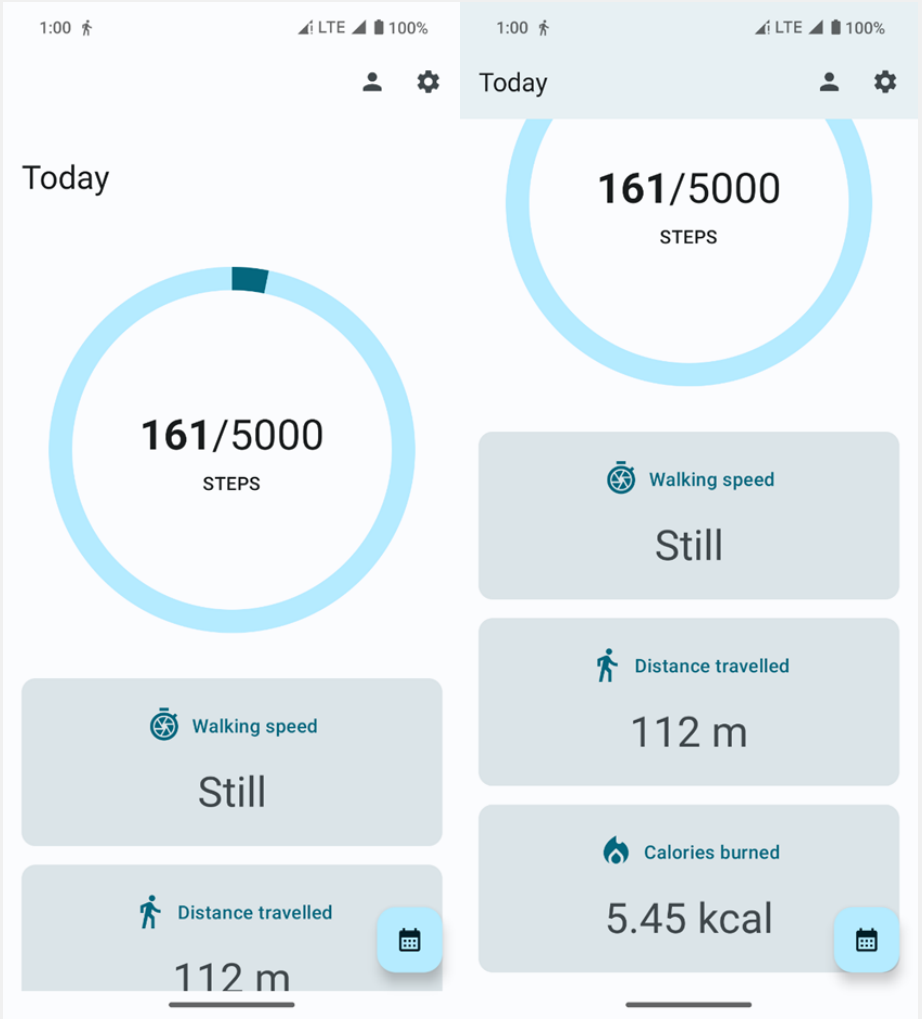


User Details Screen

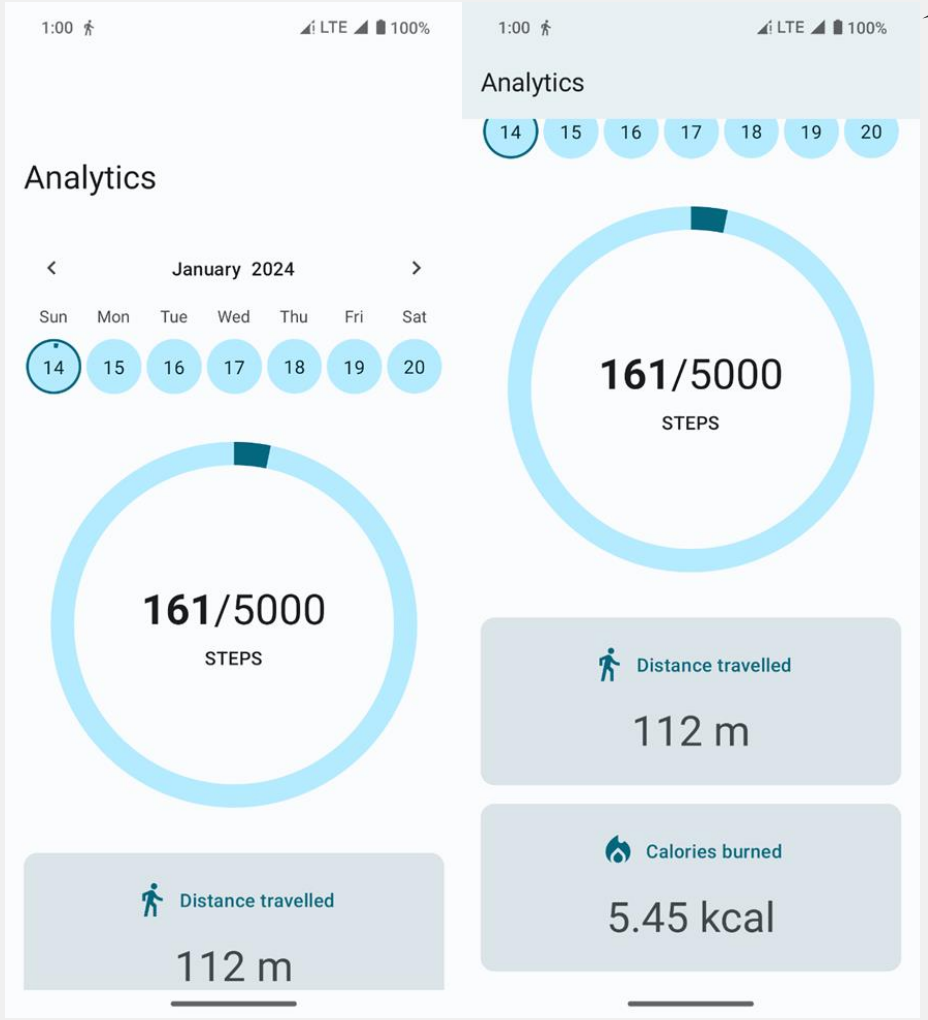
- Used to calculate different metrics



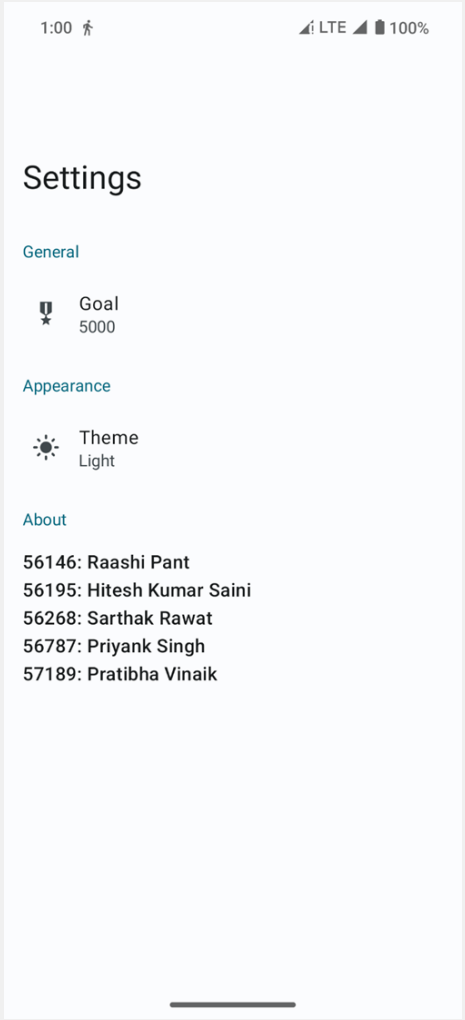
Home Screen


1:00
LTE
100%
Today
161/5000
STEPS
Walking speed
Still
Distance travelled
112 m
Calories burned
5.45 kcal

Analytics Screen

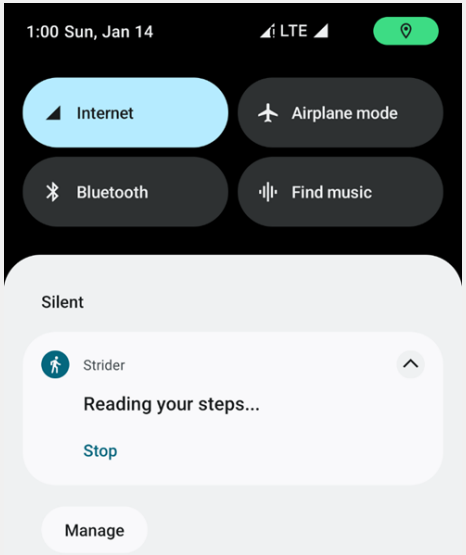


Settings Service



Background Service

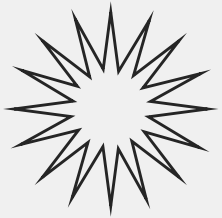
- Foreground service
- Background service
- Bound service



Technologies Used

- ❑ Kotlin
- ❑ Jetpack Compose
- ❑ Android Architecture Components
- ❑ Navigation Component
- ❑ Room
- ❑ Shared Preferences
- ❑ Services

MVVM



Room

The Room persistence library provides an abstraction layer over SQLite.

- **Entity**
- **DAO**
- **Database**

Part of Android Jetpack Suite.

- **Type Safe**
- **Programmatic Access**

Room: Entity

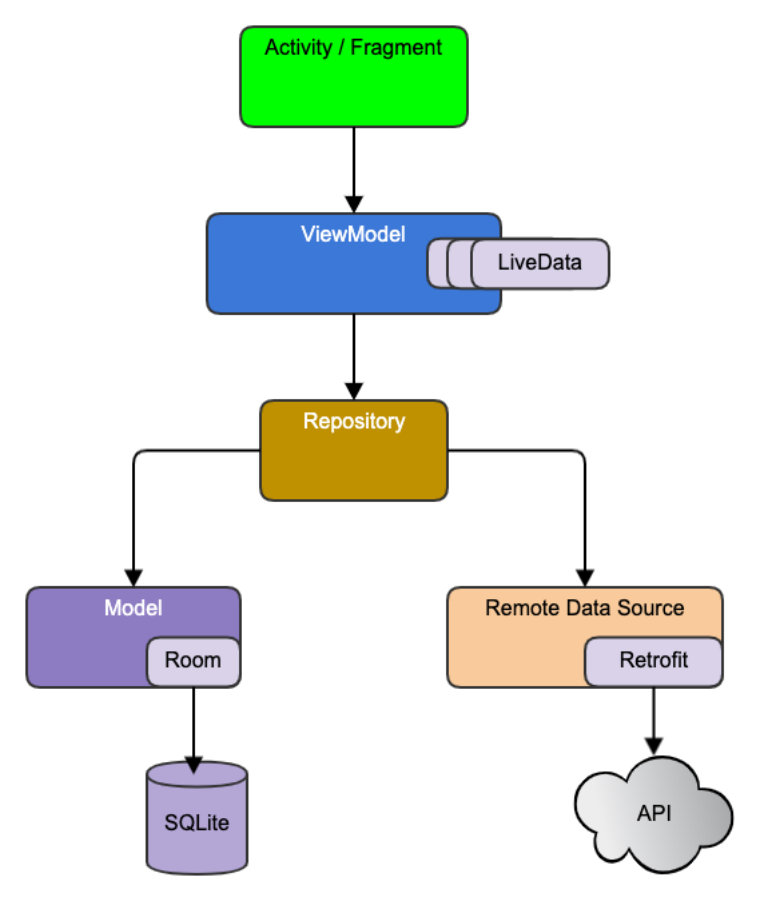
```
@Entity(
    tableName = "Step",
    primaryKeys = ["instant"],
    indices = [Index("instant", "instant", [Index.Order.ASC, Index.Order.DESC], "instant", true)]
)
data class Step(
    val instant: Instant,
    val MET: Float,
    val height: Float, /* cm */
    val weight: Float, /* kg */
    val speed: Float, /* m/s */
    val walkSpeed: WalkSpeed
) : Serializable
```

Room: DAO

```
@Dao
interface StepDao {
    @Insert()
    fun insert(value: Step)

    @Query("SELECT * FROM Step WHERE instant > :from AND instant <= :to")
    fun getStepsInRange(from: Instant, to: Instant): List<Step>

    @Query("SELECT COUNT(*) FROM Step WHERE instant > :from AND instant <= :to")
    fun getStepCountInRange(from: Instant, to: Instant): Long
}
```



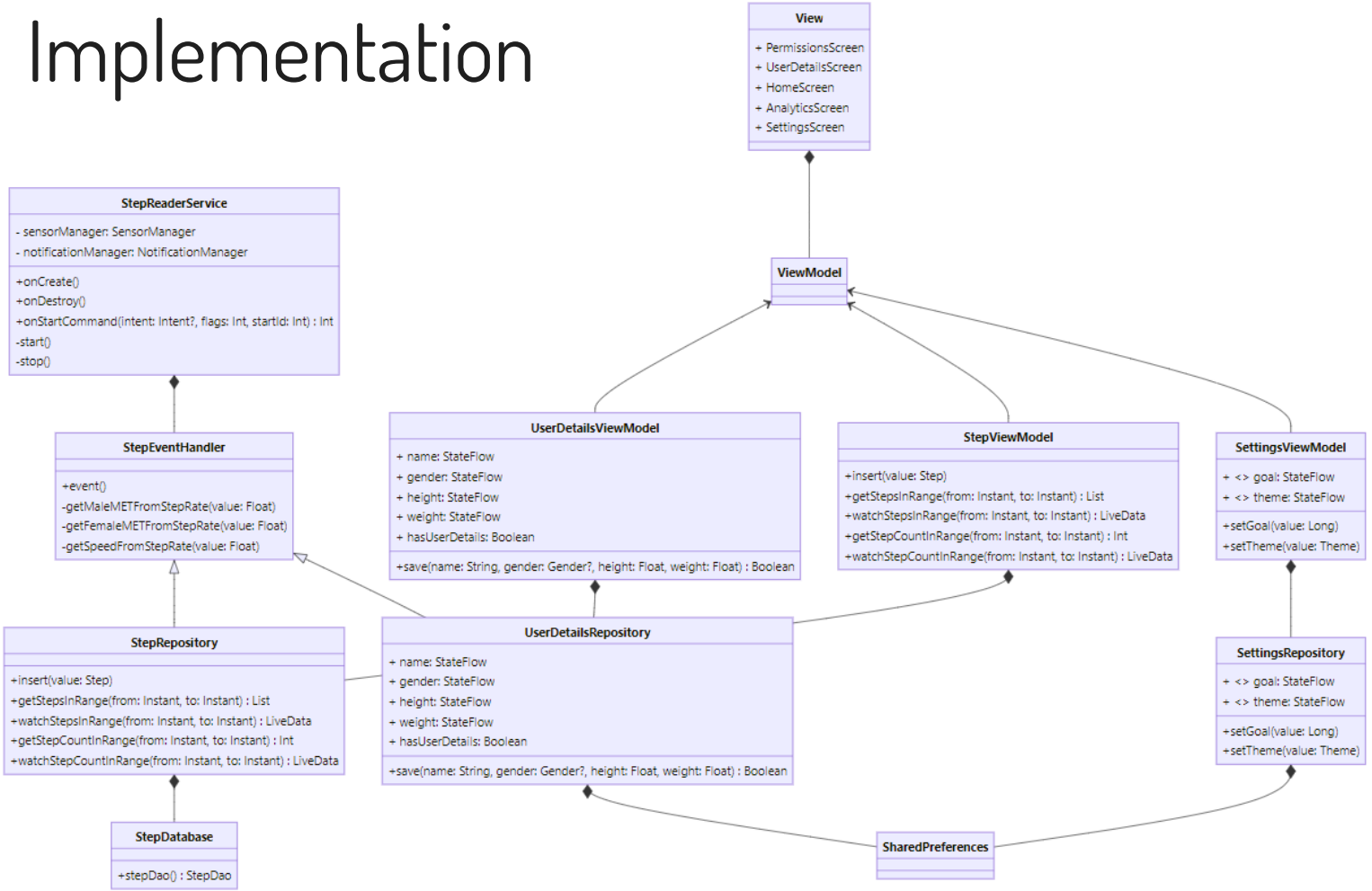
MVVM

- Model View View-Model
- Officially recommended architectural pattern for Android development.
- Allows separation of concerns.
- Allows separation of business logic from user-interface.

Implementation

- User-Interface
  - Views
    - `PermissionsScreen`
    - `UserDetailsScreen`
    - `HomeScreen`
    - `AnalyticsScreen`
    - `SettingsScreen`
  - View Models
    - `UserDetailsViewModel`
    - `StepViewModel`
    - `SettingsViewModel`
- Domain
  - Repository
    - `UserDetailsRepository`
    - `StepRepository`
    - `SettingsRepository`
- Data
  - Model
    - `Step`
  - Database
    - `StepDatabase`
    - DAO
      - `StepDao`
    - Type Converters
      - `InstantConverter`

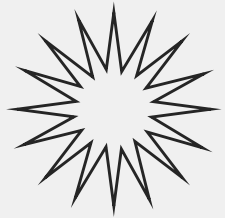
Implementation

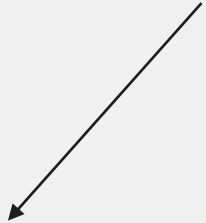


Theory

The Android operating system offers a number of sensors such as:

- TYPE_ACCELEROMETER
- TYPE_GRAVITY
- TYPE_GYROSCOPE
- TYPE_PRESSURE
- TYPE_PROXIMITY
- TYPE_STEP_COUNTER
- TYPE_STEP_DETECTOR

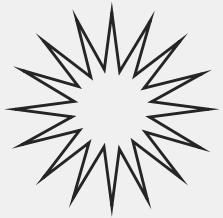




Theory: Walking Speed

- If the step-rate (per-minute) is less than 135, it is identified as “slow”.
- If the step-rate (per-minute) is less than 160, it is identified as “medium”.
- If the step-rate (per-minute) is greater, it is identified as “fast”.

Additionally, a refractory period of 2 seconds is used to check if user has entered a “still” state i.e. a state of no movement.

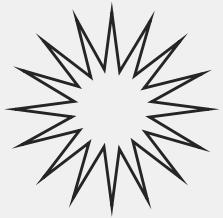


Theory: Distance Travelled

The stride of an adult human is given by expression below:

$$\text{stride} = \text{height} \times 0.414$$

It is used to calculate the distance travelled.



Theory: Calories Burnt

- Each physical activity has it's metabolic equivalent (MET).
- Based on the observations from "Determination of step rate thresholds corresponding to physical activity classifications in adults", the relationship between MET & step rate (step/minute) is given by expression below:
- For males:

$$\text{MET} = 0.00004325 \times (\text{step-rate}) \text{ ^ } 2.4528$$

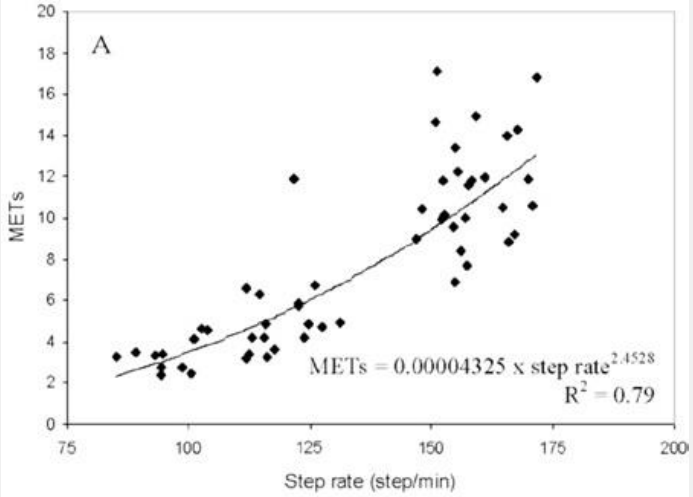
- For females:

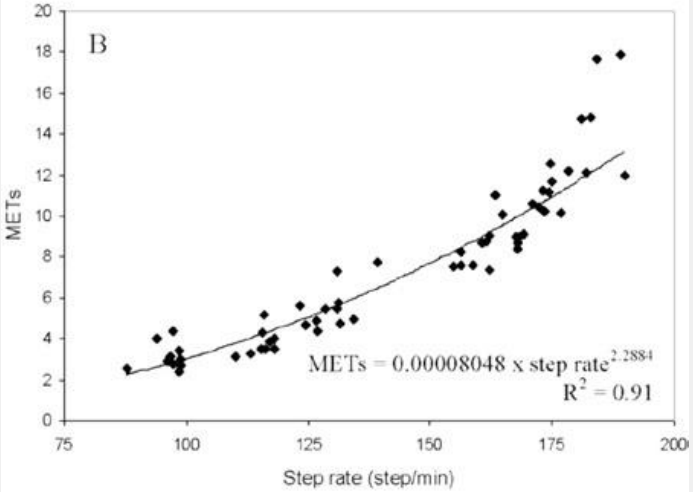
$$\text{MET} = 0.00008048 \times (\text{step-rate}) \text{ ^ } 2.2884$$

$$\text{distance} = \text{stride} \times \text{steps}$$

$$\text{time} = \text{distance} / \text{speed}$$

$$\text{calories} = \text{time} \times \text{MET} \times 3.5 \times \text{weight} / (200 \times 60)$$





Future Scope

Sync on remote database

A remote database will play a crucial role in ensuring seamless data synchronization across various platforms and devices. e. g. Firebase.

Social features

Enhancing the step-tracking application with social features involves creating a dynamic and interactive community within the platform.

Integration of Wearable Devices

This involves integrating with a broader range of wearable devices & fitness trackers to provide users with more choices and compatibility.

Machine Learning for Predictive Analytics

Implement machine learning algorithms to analyse user behaviour and patterns.

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Thank you!