SOCIAL DISTANCING REMINDER

CS4472 - Mobile Computing

Design Document

Group - NOVA

Group Members

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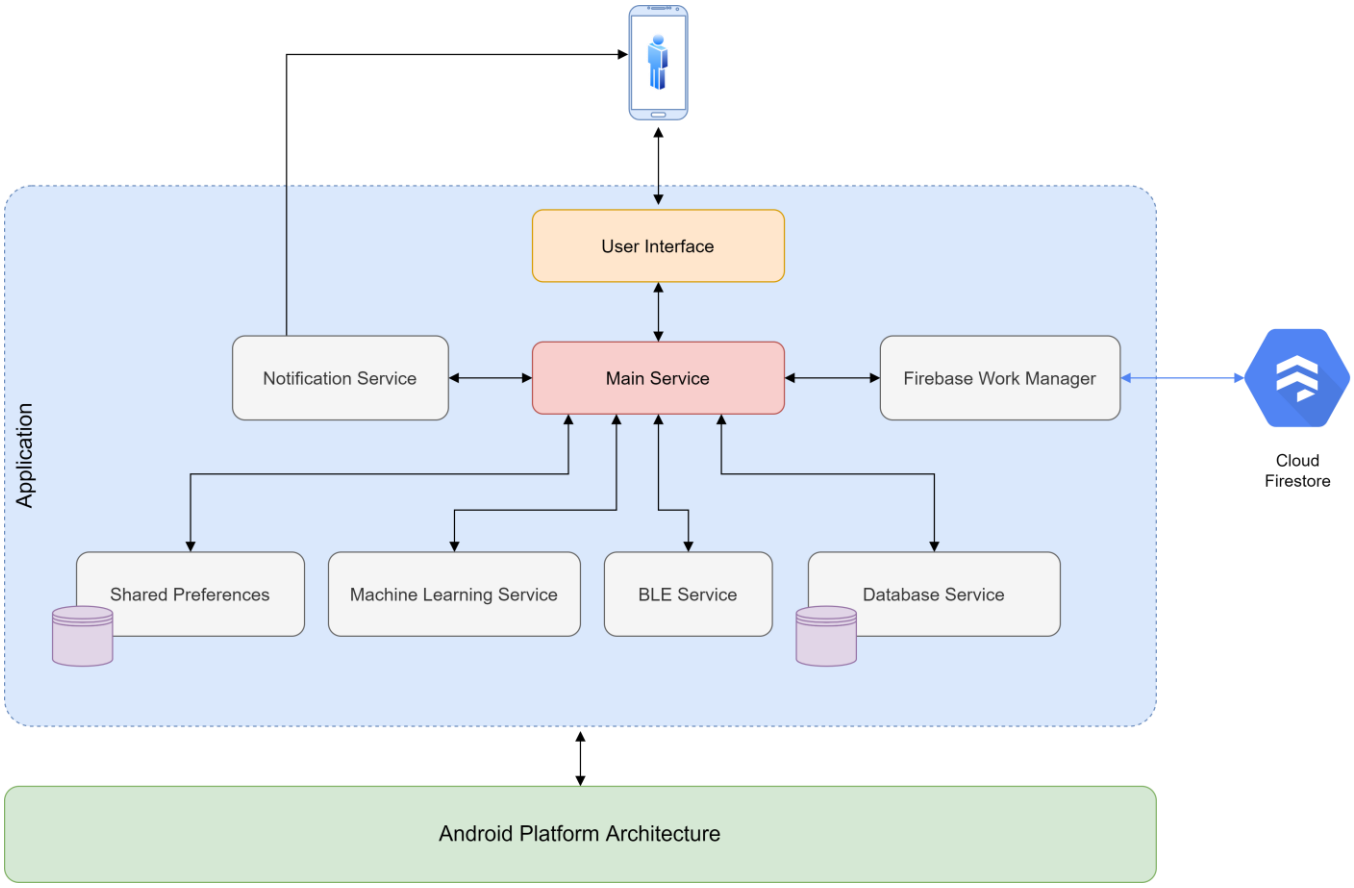
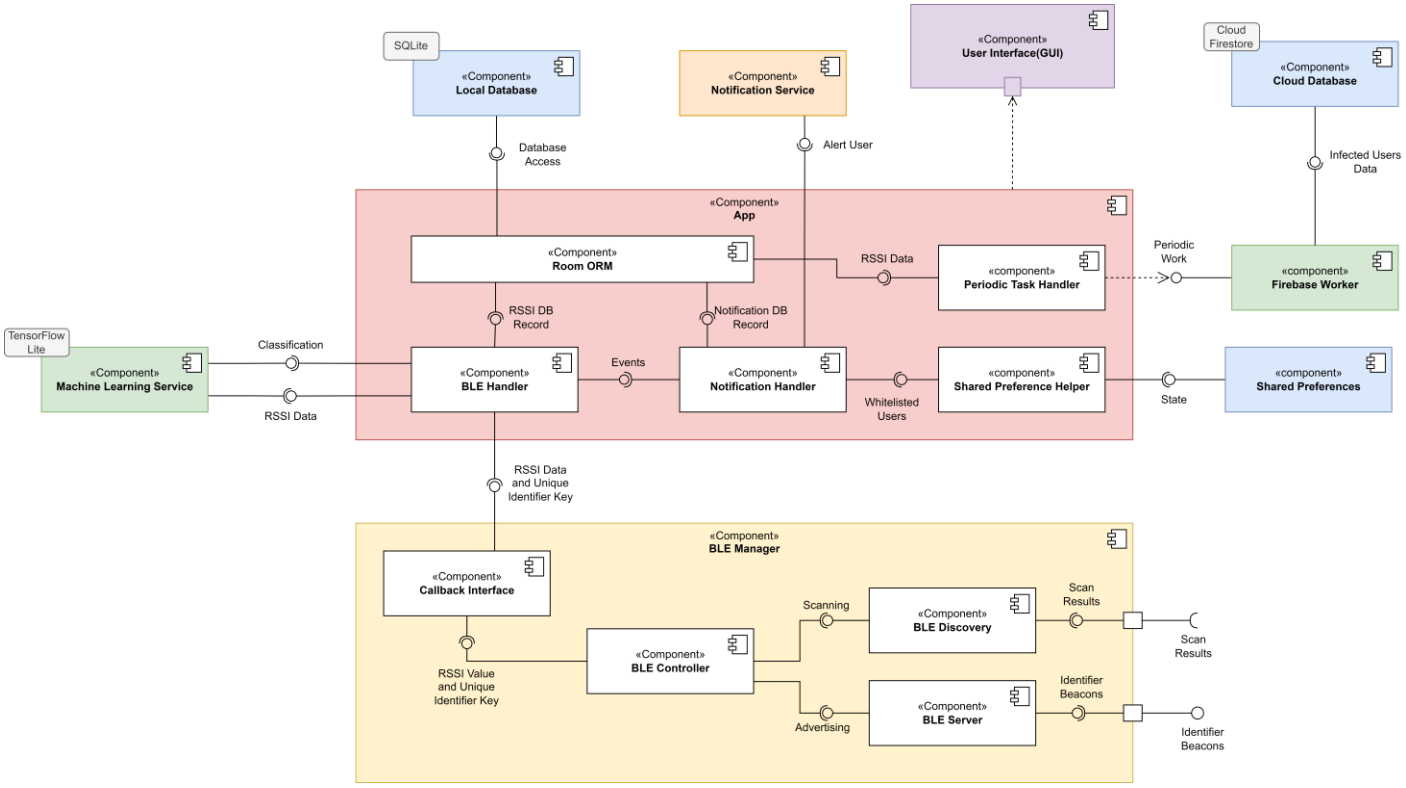
1. Components of the Proposed Application



2. Interfaces Between Components



3. Technologies

3.1. Android

A Java-based Android application will be developed. The implementations will be carried out on Android Studio.

3.2. Bluetooth Low Energy [1]

Bluetooth Low Energy (BLE, also known as Bluetooth Smart) was introduced as a part of the Bluetooth 4.0 Core Specification.

There are two ways, namely **broadcasting** and **connections**, that a Bluetooth Low Energy device uses to communicate with the outside world. You are capable of sending out data to any scanning device or receiver in listening range with the use of connectionless broadcasting. This mechanism basically lets you send unidirectional data to anyone or anything which can pick up the transmitted data. Broadcasting defines two separate roles:

Broadcaster – Sends advertising packets periodically to anyone willing to receive them.

Observer – Repeatedly scans the preset frequencies to receive any advertising packets currently being broadcasted.

Broadcasting is the only way for a device to transmit data to more than one peer at a time. Therefore, we will be using BLE broadcasting in our application to advertise and scan anonymous identifier beacons.

3.3. Deep Neural Networks

In order to classify whether two devices are within 6 feet proximity or not, we will be building a feed-forward sequential deep neural network.

RSSI between two devices at varying distances for varying scenarios will be collected and this dataset will be used to train the model.

4. Libraries and APIs

4.1. Android Jetpack [2]

The Jetpack suite of libraries allows the developers to write code which is compatible across different Android version and devices while adhering to best practices & eliminating boilerplate code.

4.1.1. Room

The Room library is an abstraction layer built on top of SQLite to improve the interactions with the database while experiencing all the features of SQLite.

4.1.2. WorkManager

The WorkManager API provides reliable and efficient means to schedule asynchronous tasks to run in the background. Once you handoff a task (created using these APIs) to the WorkManager, it will run it when the work constraints are met.

4.2. Cloud Firestore [3]

Cloud Firestore is a NoSQL document database that can easily store, sync, and query data. Firestore will store the health status of app users, that are regularly downloaded by the application to match with local database.

4.3. Keras [4]

Keras is a Python based API which runs on the TensorFlow platform. It provides more convenient and simpler means to build and train various types of deep-learning models.

4.4. TensorFlow Lite [5]

TensorFlow Lite is a toolkit which facilitates on-device machine learning by providing means to execute machine learning models on mobile, embedded or IoT devices. Keras model will be converted into a TensorFlow Lite model using the TensorFlow Lite converter API.

References

[1] K. Townsend and R. Davidson, "Getting Started with Bluetooth Low Energy," p. 180, 2014, Accessed: Feb. 13, 2022. [Online]. Available: https://www.oreilly.com/library/view/getting-started-with/9781491900550/.

[2] "Android Jetpack | Android Developers." https://developer.android.com/jetpack(accessed Feb. 13, 2022).

[3] "Cloud Firestore | Firebase Documentation." https://firebase.google.com/docs/firestore (accessed Feb. 13, 2022).

[4] "Keras: the Python deep learning API." https://keras.io/ (accessed Feb. 13, 2022).

[5] "TensorFlow Lite | ML for Mobile and Edge Devices." https://www.tensorflow.org/lite (accessed Feb. 13, 2022).