UNIVERSITI MALAYSIA TERENGGANU

FACULTY OF COMPUTER SCIENCE AND MATHEMATICS

CSM3123 - NATIVE MOBILE PROGRAMMING

BANCHELOR OF COMPUTER SCIENCE (MOBILE COMPUTING) WITH HONORS

LAB 4

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Link Github: https://github.com/NurEzreena/CSM3123_LAB-NATIVE-PROGRAMMING.git

Activity: To understand and implement a Room database for local data storage in Android applications.

MainActivity.java

```
package com.example.roomdatabasedemo;

import android.os.Bundle;
import android.text.TextUtils;
import android.view.View;
import android.widget.EditText;
import android.widget.Toast;

import androidx.appcompat.app.AppCompatActivity;
import androidx.lifecycle.ViewModelProvider;
import androidx.recyclerview.widget.LinearLayoutManager;
import androidx.recyclerview.widget.RecyclerView;

import java.util.List;

public class MainActivity extends AppCompatActivity {

    private UserViewModel userViewModel;
    private EditText editTextName, editTextAge;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        // Initialize UI components
        editTextName = findViewById(R.id.edit_text_name);
        editTextAge = findViewById(R.id.edit_text_age);
        RecyclerView recyclerView = findViewById(R.id.recycler_view);

        // Setup RecyclerView
        recyclerView.setLayoutManager(new LinearLayoutManager(this));
        recyclerView.setHasFixedSize(true);

        // Initialize the RecyclerView Adapter
        UserAdapter adapter = new UserAdapter();
        recyclerView.setAdapter(adapter);

        // Initialize ViewModel
        userViewModel = new ViewModelProvider(this).get(UserViewModel.class);

        // Observe the LiveData from the ViewModel
        userViewModel.getAllUsers().observe(this, adapter::setUsers);

        // Set the Add button click listener
        findViewById(R.id.button_add).setOnClickListener(v -> addUser());
```

```
    }

    // Method to add a user to the database
    private void addUser() {
        String name = editTextName.getText().toString().trim();
        String ageText = editTextAge.getText().toString().trim();

        // Validate input
        if (TextUtils.isEmpty(name) || TextUtils.isEmpty(ageText)) {
            Toast.makeText(this, "Please enter both name and age!", Toast.LENGTH_SHORT).show();
            return;
        }

        int age;
        try {
            age = Integer.parseInt(ageText);
        } catch (NumberFormatException e) {
            Toast.makeText(this, "Age must be a number!", Toast.LENGTH_SHORT).show();
            return;
        }

        // Add user to the database
        User user = new User(name, age);
        userViewModel.insert(user);

        // Clear the input fields
        editTextName.setText("");
        editTextAge.setText("");

        Toast.makeText(this, "User added successfully!", Toast.LENGTH_SHORT).show();
    }
}
```

User.java

```
package com.example.roomdatabasedemo;

import androidx.room.Entity;
import androidx.room.PrimaryKey;

@Entity(tableName = "user_table")
public class User {
    @PrimaryKey(autoGenerate = true)
    private int id;
    private String name;
    private int age;

    public User(String name, int age) {
        this.name = name;
        this.age = age;
```

```
    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public String getName() {
        return name;
    }

    public int getAge() {
        return age;
    }
}
```

UserAdapter.java

```
package com.example.roomdatabasedemo;

import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;
import android.widget.TextView;

import androidx.annotation.NonNull;
import androidx.recyclerview.widget.RecyclerView;

import java.util.ArrayList;
import java.util.List;

public class UserAdapter extends RecyclerView.Adapter<UserAdapter.UserHolder> {
    private List<User> users = new ArrayList<>();

    @NonNull

    @Override
    public UserHolder onCreateViewHolder(@NonNull ViewGroup parent, int viewType) {
        View itemView = LayoutInflater.from(parent.getContext())
                .inflate(R.layout.user_item, parent, false); // Ensure this matches user_item.xml
        return new UserHolder(itemView);
    }


    @Override
    public void onBindViewHolder(@NonNull UserHolder holder, int position) {
        User currentUser = users.get(position);
```

```
        holder.textViewName.setText(currentUser.getName());
        holder.textViewAge.setText(String.valueOf(currentUser.getAge()));
    }

    @Override
    public int getItemCount() {
        return users.size();
    }

    public void setUsers(List<User> users) {
        this.users = users;
        notifyDataSetChanged();
    }

    static class UserHolder extends RecyclerView.ViewHolder {
        private TextView textViewName;
        private TextView textViewAge;

        public UserHolder(@NonNull View itemView) {
            super(itemView);
            textViewName = itemView.findViewById(R.id.text_view_name);
            textViewAge = itemView.findViewById(R.id.text_view_age);
        }
    }
}
```

UserDao.java

```
package com.example.roomdatabasedemo;

import androidx.lifecycle.LiveData;
import androidx.room.Dao;
import androidx.room.Delete;
import androidx.room.Insert;
import androidx.room.Query;
import androidx.room.Update;

import java.util.List;

@Dao
public interface UserDao {
    @Insert
    void insert(User user);

    @Update
    void update(User user);

    @Delete
    void delete(User user);
```

```
    @Query("SELECT * FROM user_table ORDER BY id ASC")
    LiveData<List<User>> getAllUsers();

    @Query("SELECT * FROM user_table WHERE name LIKE :searchQuery")
    LiveData<List<User>> searchUsers(String searchQuery);
}
```

UserDatabase.java

```
package com.example.roomdatabasedemo;

import android.content.Context;

import androidx.room.Database;
import androidx.room.Room;
import androidx.room.RoomDatabase;

// Annotate the class as a Room Database and declare its entities and version
@Database(entities = {User.class}, version = 1, exportSchema = false)
public abstract class UserDatabase extends RoomDatabase {

    // Singleton instance of the database
    private static UserDatabase instance;

    // Abstract method for accessing DAO
    public abstract UserDao userDao();

    // Synchronized method to get the instance of the database
    public static synchronized UserDatabase getInstance(Context context) {
        if (instance == null) {
            // Create the database if it does not exist
            instance = Room.databaseBuilder(context.getApplicationContext(),
                    UserDatabase.class, "user_database")
                .fallbackToDestructiveMigration() // Handle migrations destructively
                .build();
        }
        return instance;
    }
}
```

UserRepository.java

```
package com.example.roomdatabasedemo;

import android.app.Application;

import androidx.lifecycle.LiveData;

import java.util.List;
```

```
public class UserRepository {
    private UserDao userDao;
    private LiveData<List<User>> allUsers;

    public UserRepository(Application application) {
        UserDatabase database = UserDatabase.getInstance(application);
        userDao = database.userDao();
        allUsers = userDao.getAllUsers();
    }

    public void insert(User user) {
        new Thread(() -> userDao.insert(user)).start();
    }

    public void update(User user) {
        new Thread(() -> userDao.update(user)).start();
    }

    public void delete(User user) {
        new Thread(() -> userDao.delete(user)).start();
    }

    public LiveData<List<User>> getAllUsers() {
        return allUsers;
    }

    public LiveData<List<User>> searchUsers(String query) {
        return userDao.searchUsers(query);
    }
}
```

UserViewModel.java

```
package com.example.roomdatabasedemo;

import android.app.Application;

import androidx.annotation.NonNull;
import androidx.lifecycle.AndroidViewModel;
import androidx.lifecycle.LiveData;

import java.util.List;

public class UserViewModel extends AndroidViewModel {
    private UserRepository repository;
    private LiveData<List<User>> allUsers;

    public UserViewModel(@NonNull Application application) {
        super(application);
```

```
        repository = new UserRepository(application);
        allUsers = repository.getAllUsers();
    }

    public void insert(User user) {
        repository.insert(user);
    }

    public void update(User user) {
        repository.update(user);
    }

    public void delete(User user) {
        repository.delete(user);
    }

    public LiveData<List<User>> getAllUsers() {
        return allUsers;
    }

    public LiveData<List<User>> searchUsers(String query) {
        return repository.searchUsers(query);
    }
}
```

Activity_main.xml

```
<?xml version="1.0" encoding="utf-8"?>
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <!-- Input Fields -->
    <EditText
        android:id="@+id/edit_text_name"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:hint="Enter name"
        android:layout_margin="16dp"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintEnd_toEndOf="parent" />

    <EditText
        android:id="@+id/edit_text_age"
        android:layout_width="0dp"
```

```
        android:layout_height="wrap_content"
        android:hint="Enter age"
        android:inputType="number"
        android:layout_margin="16dp"
        app:layout_constraintTop_toBottomOf="@id/edit_text_name"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintEnd_toEndOf="parent" />

    <!-- Buttons -->
    <Button
        android:id="@+id/button_add"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Add User"
        android:layout_margin="16dp"
        app:layout_constraintTop_toBottomOf="@id/edit_text_age"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintEnd_toEndOf="parent" />

    <!-- RecyclerView -->
    <androidx.recyclerview.widget.RecyclerView
        android:id="@+id/recycler_view"
        android:layout_width="0dp"
        android:layout_height="0dp"
        android:layout_marginTop="16dp"
        app:layout_constraintTop_toBottomOf="@id/button_add"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintBottom_toBottomOf="parent" />

</androidx.constraintlayout.widget.ConstraintLayout>
```

User_item.xml

```
<?xml version="1.0" encoding="utf-8"?>
<LinearLayout xmlns:android="http://schemas.android.com/apk/res/android"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:orientation="vertical"
    android:padding="16dp">

    <TextView
        android:id="@+id/text_view_name"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="User Name"
        android:textSize="18sp"
        android:layout_marginBottom="8dp"/>

    <TextView
```

```
    android:id="@+id/text_view_age"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="User Age"
    android:textSize="16sp"/>
</LinearLayout>
```

Output:

Activity 1: Add Update and Delete Operations

MainActivity.xml

```
package com.example.roomdatabasedemo;

import android.os.Bundle;
import android.text.TextUtils;
import android.view.LayoutInflater;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.LinearLayout;
import android.widget.Toast;
```

```
import androidx.appcompat.app.AlertDialog;
import androidx.appcompat.app.AppCompatActivity;
import androidx.lifecycle.ViewModelProvider;
import androidx.recyclerview.widget.LinearLayoutManager;
import androidx.recyclerview.widget.RecyclerView;

public class MainActivity extends AppCompatActivity {

    private UserViewModel userViewModel;
    private EditText editTextName, editTextAge;
    public Button buttonAddUser;
    private User selectedUserForUpdate; // Tracks the user selected for update

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        // Initialize UI components for adding users
        editTextName = findViewById(R.id.edit_text_name);
        editTextAge = findViewById(R.id.edit_text_age);
        buttonAddUser = findViewById(R.id.button_add);

        RecyclerView recyclerView = findViewById(R.id.recycler_view);
        recyclerView.setLayoutManager(new LinearLayoutManager(this));
        recyclerView.setHasFixedSize(true);

        // Set up Adapter
        UserAdapter adapter = new UserAdapter();
        recyclerView.setAdapter(adapter);

        // Initialize ViewModel
        userViewModel = new ViewModelProvider(this).get(UserViewModel.class);
        userViewModel.getAllUsers().observe(this, adapter::setUsers);

        // Add User button functionality
        buttonAddUser.setOnClickListener(v -> addUser());

        // Handle RecyclerView item click listeners
        adapter.setOnItemClickListener(new UserAdapter.OnItemClickListener() {
            @Override
            public void onUpdateClick(User user) {
                selectedUserForUpdate = user;

                // Show Update dialog
                showUpdateDialog(user);
            }

            @Override
            public void onDeleteClick(User user) {
                userViewModel.delete(user);
```

```
            Toast.makeText(MainActivity.this, "User deleted successfully!",
Toast.LENGTH_SHORT).show();
        }
      });
  }

  // Method to add a new user
  private void addUser() {
    String name = editTextName.getText().toString().trim();
    String ageText = editTextAge.getText().toString().trim();

    if (TextUtils.isEmpty(name) || TextUtils.isEmpty(ageText)) {
      Toast.makeText(this, "Please enter both name and age!", Toast.LENGTH_SHORT).show();
      return;
    }

    int age;
    try {
      age = Integer.parseInt(ageText);
    } catch (NumberFormatException e) {
      Toast.makeText(this, "Age must be a valid number!", Toast.LENGTH_SHORT).show();
      return;
    }

    User user = new User(name, age);
    userViewModel.insert(user);

    // Clear input fields
    editTextName.setText("");
    editTextAge.setText("");

    Toast.makeText(this, "User added successfully!", Toast.LENGTH_SHORT).show();
  }

  // Method to show the Update dialog
  private void showUpdateDialog(User user) {
    // Create an AlertDialog to update user info
    AlertDialog.Builder builder = new AlertDialog.Builder(MainActivity.this);
    builder.setTitle("Update User");

    // Set up the input fields (name and age)
    final EditText inputName = new EditText(MainActivity.this);
    inputName.setText(user.getName()); // Pre-fill with the current name

    final EditText inputAge = new EditText(MainActivity.this);
    inputAge.setText(String.valueOf(user.getAge())); // Pre-fill with the current age
    inputAge.setInputType(android.text.InputType.TYPE_CLASS_NUMBER); // Set input type to
number

    // Create a layout to hold the inputs
    LinearLayout layout = new LinearLayout(MainActivity.this);
```

```
        layout.setOrientation(LinearLayout.VERTICAL);
        layout.addView(inputName);
        layout.addView(inputAge);
        builder.setView(layout);

        // Set up the positive button for updating
        builder.setPositiveButton("Update", (dialog, which) -> {
            String updatedName = inputName.getText().toString().trim();
            String updatedAgeText = inputAge.getText().toString().trim();

            if (TextUtils.isEmpty(updatedName) || TextUtils.isEmpty(updatedAgeText)) {
                Toast.makeText(MainActivity.this, "Please enter both name and age!",
Toast.LENGTH_SHORT).show();
                return;
            }

            int updatedAge;
            try {
                updatedAge = Integer.parseInt(updatedAgeText);
            } catch (NumberFormatException e) {
                Toast.makeText(MainActivity.this, "Age must be a valid number!",
Toast.LENGTH_SHORT).show();
                return;
            }

            // Update the user object
            user.setName(updatedName);
            user.setAge(updatedAge);

            // Call ViewModel to update the user in the database
            userViewModel.update(user);

            // Notify user of success
            Toast.makeText(MainActivity.this, "User updated successfully!",
Toast.LENGTH_SHORT).show();
        });

        // Set up the negative button (cancel)
        builder.setNegativeButton("Cancel", (dialog, which) -> {
            dialog.dismiss();
        });

        // Show the dialog
        builder.show();
    }
}
```

User_item.xml

```
<?xml version="1.0" encoding="utf-8"?>
```

```
<androidx.constraintlayout.widget.ConstraintLayout
xmlns:android="http://schemas.android.com/apk/res/android"
   xmlns:app="http://schemas.android.com/apk/res-auto"
   xmlns:tools="http://schemas.android.com/tools"
   android:layout_width="match_parent"
   android:layout_height="wrap_content"
   android:padding="16dp"
   android:layout_marginTop="8dp"
   android:layout_marginBottom="8dp"
   android:elevation="2dp"
   android:background="?android:attr/selectableItemBackground"
   tools:context=".MainActivity">

   <!-- User Name TextView -->
   <TextView
      android:id="@+id/text_view_name"
      android:layout_width="0dp"
      android:layout_height="wrap_content"
      android:text="User Name"
      android:textSize="18sp"
      android:textColor="#000000"
      android:fontFamily="sans-serif-medium"
      android:layout_marginEnd="8dp"
      app:layout_constraintStart_toStartOf="parent"
      app:layout_constraintTop_toTopOf="parent"
      app:layout_constraintEnd_toStartOf="@id/button_update"/>

   <!-- User Age TextView -->
   <TextView
      android:id="@+id/text_view_age"
      android:layout_width="0dp"
      android:layout_height="wrap_content"
      android:text="User Age"
      android:textSize="14sp"
      android:textColor="#555555"
      app:layout_constraintStart_toStartOf="parent"
      app:layout_constraintTop_toBottomOf="@id/text_view_name"
      app:layout_constraintEnd_toStartOf="@id/button_update"/>

   <!-- Update Button -->
   <Button
      android:id="@+id/button_update"
      android:layout_width="wrap_content"
      android:layout_height="wrap_content"
      android:text="Update"
      android:textSize="12sp"
      android:layout_marginStart="8dp"
      app:layout_constraintStart_toEndOf="@id/text_view_age"
      app:layout_constraintTop_toTopOf="@id/text_view_name"
      app:layout_constraintEnd_toStartOf="@id/button_delete"/>
```

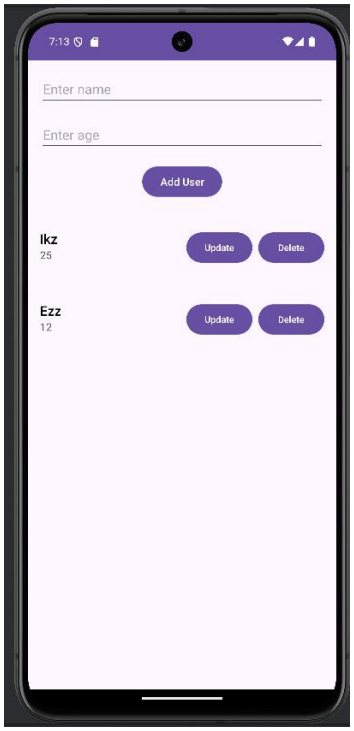
```
    <!-- Delete Button -->
    <Button
        android:id="@+id/button_delete"
        android:layout_width="wrap_content"
        android:layout_height="wrap_content"
        android:text="Delete"
        android:textSize="12sp"
        android:layout_marginStart="8dp"
        app:layout_constraintStart_toEndOf="@id/button_update"
        app:layout_constraintTop_toTopOf="@id/text_view_name"
        app:layout_constraintEnd_toEndOf="parent"/>

</androidx.constraintlayout.widget.ConstraintLayout>
```

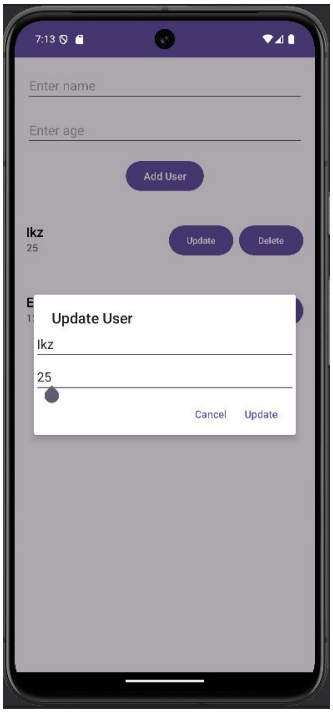
UserAdapter.java

```
package com.example.roomdatabasedemo;

import android.view.LayoutInflater;
import android.view.View;
import android.view.ViewGroup;
import android.widget.Button;
import android.widget.TextView;

import androidx.annotation.NonNull;
import androidx.recyclerview.widget.RecyclerView;

import java.util.ArrayList;
import java.util.List;

public class UserAdapter extends RecyclerView.Adapter<UserAdapter.UserHolder> {

    private List<User> users = new ArrayList<>();
    private OnItemClickListener listener;

    // Interface for button click events
    public interface OnItemClickListener {
        void onUpdateClick(User user);
        void onDeleteClick(User user);
    }

    public void setOnItemClickListener(OnItemClickListener listener) {
        this.listener = listener;
    }

    @NonNull
    @Override
    public UserHolder onCreateViewHolder(@NonNull ViewGroup parent, int viewType) {
        View itemView = LayoutInflater.from(parent.getContext())
                .inflate(R.layout.user_item, parent, false);
```

```
        return new UserHolder(itemView);
    }

    @Override
    public void onBindViewHolder(@NonNull UserHolder holder, int position) {
        User currentUser = users.get(position);
        holder.textViewName.setText(currentUser.getName());
        holder.textViewAge.setText(String.valueOf(currentUser.getAge()));

        // Update button click event
        holder.buttonUpdate.setOnClickListener(v -> {
            if (listener != null) {
                listener.onUpdateClick(currentUser);
            }
        });

        // Delete button click event
        holder.buttonDelete.setOnClickListener(v -> {
            if (listener != null) {
                listener.onDeleteClick(currentUser);
            }
        });
    }

    @Override
    public int getItemCount() {
        return users.size();
    }

    public void setUsers(List<User> users) {
        this.users = users;
        notifyDataSetChanged();
    }

    static class UserHolder extends RecyclerView.ViewHolder {
        private TextView textViewName;
        private TextView textViewAge;
        private Button buttonUpdate;
        private Button buttonDelete;

        public UserHolder(@NonNull View itemView) {
            super(itemView);
            textViewName = itemView.findViewById(R.id.text_view_name);
            textViewAge = itemView.findViewById(R.id.text_view_age);
            buttonUpdate = itemView.findViewById(R.id.button_update);
            buttonDelete = itemView.findViewById(R.id.button_delete);
        }
    }
}
```

Output:





Button update

Button delete

Activity 2: Add a Search Feature

UserDao.java

```
package com.example.roomdatabasedemo;

import androidx.lifecycle.LiveData;
import androidx.room.Dao;
import androidx.room.Delete;
import androidx.room.Insert;
import androidx.room.Query;
import androidx.room.Update;

import java.util.List;

@Dao
public interface UserDao {
   @Insert
   void insert(User user);

   @Update
   void update(User user);


   @Delete
   void delete(User user);
```

```
    @Query("SELECT * FROM user_table ORDER BY id ASC")
    LiveData<List<User>> getAllUsers();

    @Query("SELECT * FROM user_table WHERE name LIKE :searchQuery")
    LiveData<List<User>> searchUsers(String searchQuery);
}
```

UserRepository.java

```
package com.example.roomdatabasedemo;

import android.app.Application;

import androidx.lifecycle.LiveData;

import java.util.List;

public class UserRepository {
    private UserDao userDao;
    private LiveData<List<User>> allUsers;

    public UserRepository(Application application) {
        UserDatabase database = UserDatabase.getInstance(application);
        userDao = database.userDao();
        allUsers = userDao.getAllUsers();
    }

    public void insert(User user) {
        new Thread(() -> userDao.insert(user)).start();
    }

    public void update(User user) {
        new Thread(() -> userDao.update(user)).start();
    }

    public void delete(User user) {
        new Thread(() -> userDao.delete(user)).start();
    }

    public LiveData<List<User>> getAllUsers() {
        return allUsers;
    }

    public LiveData<List<User>> searchUsers(String query) {
        return userDao.searchUsers(query);
    }
}
```

UserViewModel.java

```
package com.example.roomdatabasedemo;

import android.app.Application;

import androidx.annotation.NonNull;
import androidx.lifecycle.AndroidViewModel;
import androidx.lifecycle.LiveData;

import java.util.List;

public class UserViewModel extends AndroidViewModel {
    private UserRepository repository;
    private LiveData<List<User>> allUsers;

    public UserViewModel(@NonNull Application application) {
        super(application);
        repository = new UserRepository(application);
        allUsers = repository.getAllUsers();
    }

    public void insert(User user) {
        repository.insert(user);
    }

    public void update(User user) {
        repository.update(user);
    }

    public void delete(User user) {
        repository.delete(user);
    }

    public LiveData<List<User>> getAllUsers() {
        return allUsers;
    }

    public LiveData<List<User>> searchUsers(String query) {
        return repository.searchUsers(query);
    }
}
```

MainActivity.java

```
package com.example.roomdatabasedemo;

import android.annotation.SuppressLint;
import android.os.Bundle;
import android.text.Editable;
```

```
import android.text.TextUtils;
import android.text.TextWatcher;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

import androidx.appcompat.app.AppCompatActivity;
import androidx.lifecycle.ViewModelProvider;
import androidx.recyclerview.widget.LinearLayoutManager;
import androidx.recyclerview.widget.RecyclerView;

public class MainActivity extends AppCompatActivity {

   private UserViewModel userViewModel;
   private EditText editTextName, editTextAge, editTextSearch, editTextUpdateName,
editTextUpdateAge;
   private Button buttonAddUser, buttonUpdateUser;
   private User selectedUserForUpdate; // Tracks the user selected for update

   @SuppressLint("MissingInflatedId")
   @Override
   protected void onCreate(Bundle savedInstanceState) {
      super.onCreate(savedInstanceState);
      setContentView(R.layout.activity_main);

      // Initialize UI components
      editTextName = findViewById(R.id.edit_text_name);
      editTextAge = findViewById(R.id.edit_text_age);
      editTextSearch = findViewById(R.id.editTextSearch);
      editTextUpdateName = findViewById(R.id.edit_text_update_name); // Initialize the update
name EditText
      editTextUpdateAge = findViewById(R.id.edit_text_update_age); // Initialize the update age
EditText
      buttonAddUser = findViewById(R.id.button_add);
      buttonUpdateUser = findViewById(R.id.button_update_user);

      RecyclerView recyclerView = findViewById(R.id.recycler_view);
      recyclerView.setLayoutManager(new LinearLayoutManager(this));
      recyclerView.setHasFixedSize(true);

      // Set up Adapter
      UserAdapter adapter = new UserAdapter();
      recyclerView.setAdapter(adapter);

      // Initialize ViewModel
      userViewModel = new ViewModelProvider(this).get(UserViewModel.class);
      userViewModel.getAllUsers().observe(this, adapter::setUsers);

      // Add User button functionality
      buttonAddUser.setOnClickListener(v -> addUser());
```

```
    // Update User button functionality
    buttonUpdateUser.setOnClickListener(v -> updateUser());

    // Handle RecyclerView item click listeners for update and delete
    adapter.setOnItemClickListener(new UserAdapter.OnItemClickListener() {
        @Override
        public void onUpdateClick(User user) {
            selectedUserForUpdate = user;

            // Show Update fields and populate with selected user data
            editTextUpdateName.setVisibility(View.VISIBLE);
            editTextUpdateAge.setVisibility(View.VISIBLE);
            buttonUpdateUser.setVisibility(View.VISIBLE);

            editTextUpdateName.setText(user.getName());
            editTextUpdateAge.setText(String.valueOf(user.getAge()));
        }

        @Override
        public void onDeleteClick(User user) {
            userViewModel.delete(user);
            Toast.makeText(MainActivity.this, "User deleted successfully!",
Toast.LENGTH_SHORT).show();
        }
    });

    // Search functionality
    editTextSearch.addTextChangedListener(new TextWatcher() {
        @Override
        public void beforeTextChanged(CharSequence charSequence, int start, int count, int after) {}

        @Override
        public void onTextChanged(CharSequence charSequence, int start, int before, int count) {
            String searchQuery = charSequence.toString().trim();
            if (TextUtils.isEmpty(searchQuery)) {
                // If search is cleared, show all users
                userViewModel.getAllUsers().observe(MainActivity.this, adapter::setUsers);
            } else {
                // If search query is not empty, show filtered users
                userViewModel.searchUsers(searchQuery).observe(MainActivity.this,
adapter::setUsers);
            }
        }

        @Override
        public void afterTextChanged(Editable editable) {}
    });
  }

  // Method to add a new user
```

```
    private void addUser() {
        String name = editTextName.getText().toString().trim();
        String ageText = editTextAge.getText().toString().trim();

        if (TextUtils.isEmpty(name) || TextUtils.isEmpty(ageText)) {
            Toast.makeText(this, "Please enter both name and age!", Toast.LENGTH_SHORT).show();
            return;
        }

        int age;
        try {
            age = Integer.parseInt(ageText);
        } catch (NumberFormatException e) {
            Toast.makeText(this, "Age must be a valid number!", Toast.LENGTH_SHORT).show();
            return;
        }

        User user = new User(name, age);
        userViewModel.insert(user);

        // Clear input fields after adding user
        editTextName.setText("");
        editTextAge.setText("");

        Toast.makeText(this, "User added successfully!", Toast.LENGTH_SHORT).show();
    }

    // Method to update an existing user
    private void updateUser() {
        if (selectedUserForUpdate == null) {
            Toast.makeText(this, "No user selected for update!", Toast.LENGTH_SHORT).show();
            return;
        }

        String updatedName = editTextUpdateName.getText().toString().trim();
        String updatedAgeText = editTextUpdateAge.getText().toString().trim();

        if (TextUtils.isEmpty(updatedName) || TextUtils.isEmpty(updatedAgeText)) {
            Toast.makeText(this, "Update fields cannot be empty!", Toast.LENGTH_SHORT).show();
            return;
        }

        int updatedAge;
        try {
            updatedAge = Integer.parseInt(updatedAgeText);
        } catch (NumberFormatException e) {
            Toast.makeText(this, "Age must be a valid number!", Toast.LENGTH_SHORT).show();
            return;
        }

        // Update the user object with the new name and age
```

```
        selectedUserForUpdate.setName(updatedName);
        selectedUserForUpdate.setAge(updatedAge);
        userViewModel.update(selectedUserForUpdate);

        // Hide the update fields and clear them
        editTextUpdateName.setVisibility(View.GONE);
        editTextUpdateAge.setVisibility(View.GONE);
        buttonUpdateUser.setVisibility(View.GONE);

        editTextUpdateName.setText("");
        editTextUpdateAge.setText("");
        selectedUserForUpdate = null;

        Toast.makeText(this, "User updated successfully!", Toast.LENGTH_SHORT).show();
    }
}
```

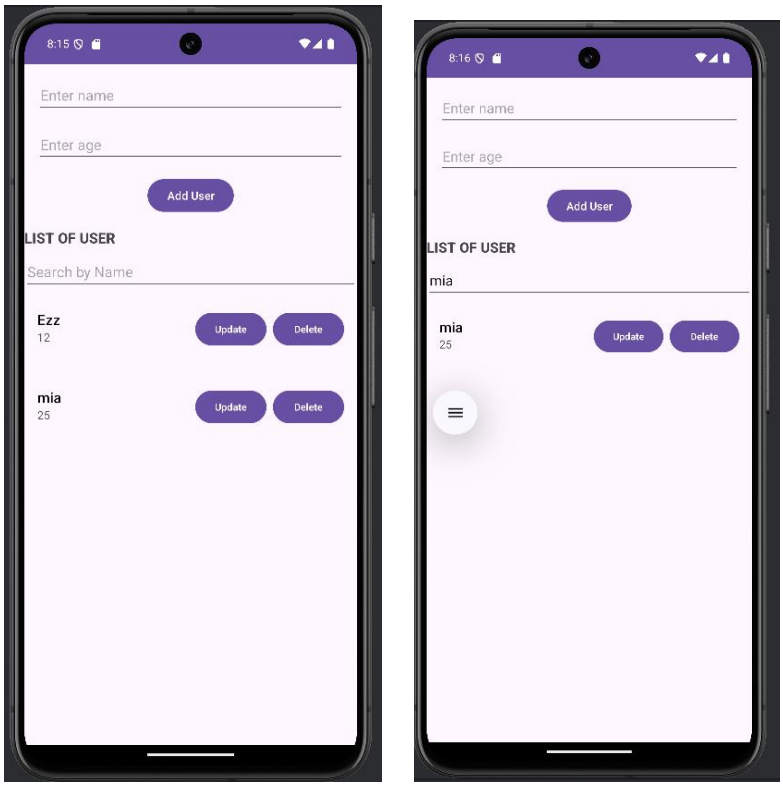
Activity_main.java

```
<androidx.constraintlayout.widget.ConstraintLayout
    xmlns:android="http://schemas.android.com/apk/res/android"
    xmlns:app="http://schemas.android.com/apk/res-auto"
    xmlns:tools="http://schemas.android.com/tools"
    android:layout_width="match_parent"
    android:layout_height="match_parent"
    tools:context=".MainActivity">

    <!-- Input Fields -->
    <EditText
        android:id="@+id/edit_text_name"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:hint="Enter name"
        android:layout_margin="16dp"
        app:layout_constraintTop_toTopOf="parent"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintEnd_toEndOf="parent" />

    <EditText
        android:id="@+id/edit_text_age"
        android:layout_width="0dp"
        android:layout_height="wrap_content"
        android:hint="Enter age"
        android:inputType="number"
        android:layout_margin="16dp"
        app:layout_constraintTop_toBottomOf="@id/edit_text_name"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintEnd_toEndOf="parent" />

    <!-- Add User Button -->
    <Button
```

```
    android:id="@+id/button_add"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Add User"
    android:layout_margin="16dp"
    app:layout_constraintTop_toBottomOf="@id/edit_text_age"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintEnd_toEndOf="parent" />

<!-- Update Fields -->
<EditText
    android:id="@+id/edit_text_update_name"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:hint="Update Name"
    android:visibility="gone" />

<EditText
    android:id="@+id/edit_text_update_age"
    android:layout_width="match_parent"
    android:layout_height="wrap_content"
    android:hint="Update Age"
    android:visibility="gone" />

<Button
    android:id="@+id/button_update_user"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="Update User"
    android:visibility="gone" />

<!-- List Title -->
<TextView
    android:id="@+id/titleTextView"
    android:layout_width="wrap_content"
    android:layout_height="wrap_content"
    android:text="LIST OF USER"
    android:textSize="18sp"
    android:textStyle="bold"
    android:fontFamily="sans-serif-medium"
    android:paddingTop="16dp"
    app:layout_constraintTop_toBottomOf="@id/button_add"
    app:layout_constraintStart_toStartOf="parent"
    app:layout_constraintEnd_toEndOf="parent"
    app:layout_constraintHorizontal_bias="0.0" />

<!-- Search Bar -->
<EditText
    android:id="@+id/editTextSearch"
    android:layout_width="0dp"
    android:layout_height="wrap_content"
```

```
        android:hint="Search by Name"
        android:inputType="text"
        android:layout_marginTop="8dp"
        app:layout_constraintTop_toBottomOf="@id/titleTextView"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintEnd_toEndOf="parent" />

    <!-- RecyclerView for displaying users -->
    <androidx.recyclerview.widget.RecyclerView
        android:id="@+id/recycler_view"
        android:layout_width="0dp"
        android:layout_height="0dp"
        app:layout_constraintTop_toBottomOf="@id/editTextSearch"
        app:layout_constraintStart_toStartOf="parent"
        app:layout_constraintEnd_toEndOf="parent"
        app:layout_constraintBottom_toBottomOf="parent" />

</androidx.constraintlayout.widget.ConstraintLayout>
```

Output:



Search bar

Activity 3: Add Relationships Between Entities

MainActivity.java

```
package com.example.roomdatabasedemo;

import android.os.Bundle;
import android.text.TextUtils;
import android.view.View;
import android.widget.Button;
import android.widget.EditText;
import android.widget.Toast;

import androidx.appcompat.app.AppCompatActivity;
import androidx.lifecycle.ViewModelProvider;
import androidx.recyclerview.widget.LinearLayoutManager;
import androidx.recyclerview.widget.RecyclerView;

public class MainActivity extends AppCompatActivity {

    private UserViewModel userViewModel;
    private EditText editTextName, editTextAge, editTextSearch;
    private Button buttonAddUser;
    private RecyclerView recyclerView;
    private UserAdapter adapter;

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);

        // Initialize UI components
        editTextName = findViewById(R.id.edit_text_name);
        editTextAge = findViewById(R.id.edit_text_age);
        editTextSearch = findViewById(R.id.editTextSearch);
        buttonAddUser = findViewById(R.id.button_add);

        recyclerView = findViewById(R.id.recycler_view);
        recyclerView.setLayoutManager(new LinearLayoutManager(this));
        recyclerView.setHasFixedSize(true);

        // Set up Adapter
        adapter = new UserAdapter();
        recyclerView.setAdapter(adapter);

        // Initialize ViewModel
        userViewModel = new ViewModelProvider(this).get(UserViewModel.class);
        userViewModel.getAllUsers().observe(this, adapter::setUsers);
```

```
        // Add User button functionality
        buttonAddUser.setOnClickListener(v -> addUser());

        // Handle RecyclerView item click listeners for user and task display
        adapter.setOnItemClickListener(new UserAdapter.OnItemClickListener() {
            @Override
            public void onUpdateClick(User user) {
                // Handle user update functionality if needed
            }

            @Override
            public void onDeleteClick(User user) {
                userViewModel.delete(user);
                Toast.makeText(MainActivity.this, "User deleted successfully!",
Toast.LENGTH_SHORT).show();
            }
        });
    }

    // Method to add a new user
    private void addUser() {
        String name = editTextName.getText().toString().trim();
        String ageText = editTextAge.getText().toString().trim();

        if (TextUtils.isEmpty(name) || TextUtils.isEmpty(ageText)) {
            Toast.makeText(this, "Please enter both name and age!", Toast.LENGTH_SHORT).show();
            return;
        }

        int age;
        try {
            age = Integer.parseInt(ageText);
        } catch (NumberFormatException e) {
            Toast.makeText(this, "Age must be a valid number!", Toast.LENGTH_SHORT).show();
            return;
        }

        User user = new User(name, age);
        userViewModel.insert(user);

        // Clear input fields after adding user
        editTextName.setText("");
        editTextAge.setText("");

        Toast.makeText(this, "User added successfully!", Toast.LENGTH_SHORT).show();
    }
}
```

Task.java

```
package com.example.roomdatabasedemo;

import androidx.room.Entity;
import androidx.room.PrimaryKey;
import androidx.room.ForeignKey;

@Entity(tableName = "task_table", foreignKeys = @ForeignKey(entity = User.class, parentColumns
= "id", childColumns = "user_id", onDelete = ForeignKey.CASCADE))
public class Task {
    @PrimaryKey(autoGenerate = true)
    private int id;

    private String taskName;
    private String taskDescription;

    // Foreign key for the User that the task belongs to
    private int userId;

    // Constructor, getters, and setters
    public Task(String taskName, String taskDescription, int userId) {
        this.taskName = taskName;
        this.taskDescription = taskDescription;
        this.userId = userId;
    }

    public int getId() {
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    public String getTaskName() {
        return taskName;
    }

    public void setTaskName(String taskName) {
        this.taskName = taskName;
    }

    public String getTaskDescription() {
        return taskDescription;
    }

    public void setTaskDescription(String taskDescription) {
        this.taskDescription = taskDescription;
    }

    public int getUserId() {
        return userId;
```

```
    }

    public void setUserId(int userId) {
        this.userId = userId;
    }
}
```

UserWithTask.java

```
package com.example.roomdatabasedemo;

import androidx.room.Embedded;
import androidx.room.Relation;

import java.util.List;

public class UserWithTask {

    @Embedded
    public User user;

    @Relation(
            parentColumn = "id",
            entityColumn = "userId"
    )
    public List<Task> tasks;
}
```

User.java

```
package com.example.roomdatabasedemo;

import androidx.room.Entity;
import androidx.room.PrimaryKey;

@Entity(tableName = "user_table")
public class User {
    @PrimaryKey(autoGenerate = true)
    private int id;
    private String name;
    private int age;

    public User(String name, int age) {
        this.name = name;
        this.age = age;
    }

    // Getter and Setter for ID
    public int getId() {
```

```
        return id;
    }

    public void setId(int id) {
        this.id = id;
    }

    // Getter and Setter for Name
    public String getName() {
        return name;
    }

    public void setName(String name) {
        this.name = name;
    }

    // Getter and Setter for Age
    public int getAge() {
        return age;
    }

    public void setAge(int age) {
        this.age = age;
    }
}
```

UserDao.java

```
package com.example.roomdatabasedemo;

import androidx.lifecycle.LiveData;
import androidx.room.Dao;
import androidx.room.Delete;
import androidx.room.Insert;
import androidx.room.Query;
import androidx.room.Update;
import androidx.room.Transaction;

import java.util.List;

@Dao
public interface UserDao {

    @Insert
    void insert(User user);

    @Update
    void update(User user);

    @Delete
```

```
    void delete(User user);

    @Query("SELECT * FROM user_table ORDER BY id ASC")
    LiveData<List<User>> getAllUsers();

    @Query("SELECT * FROM user_table WHERE name LIKE :searchQuery")
    LiveData<List<User>> searchUsers(String searchQuery);

    // Insert task
    @Insert
    void insertTask(Task task);

    // Get tasks for a specific user
    @Transaction
    @Query("SELECT * FROM user_table WHERE id = :userId")

    LiveData<List<UserWithTask>> getUserWithTask(int userId);
}
```

UserRepository.java

```
package com.example.roomdatabasedemo;

import android.app.Application;

import androidx.lifecycle.LiveData;

import java.util.List;

public class UserRepository {
    private UserDao userDao;
    private LiveData<List<User>> allUsers;

    public UserRepository(Application application) {
        UserDatabase database = UserDatabase.getInstance(application);
        userDao = database.userDao();
        allUsers = userDao.getAllUsers();
    }

    // Insert User
    public void insert(User user) {
        new Thread(() -> userDao.insert(user)).start();
    }

    // Update User
    public void update(User user) {
        new Thread(() -> userDao.update(user)).start();
    }

    // Delete User
```

```
    public void delete(User user) {
        new Thread(() -> userDao.delete(user)).start();
    }

    // Get all users
    public LiveData<List<User>> getAllUsers() {
        return allUsers;
    }

    // Search users
    public LiveData<List<User>> searchUsers(String query) {
        return userDao.searchUsers(query);
    }

    // Insert Task
    public void insertTask(Task task) {
        new Thread(() -> userDao.insertTask(task)).start();
    }

    // Get tasks for a specific user
    public LiveData<List<UserWithTask>> getUserWithTasks(int userId) {
        return userDao.getUserWithTask(userId);
    }
}
```

UserViewModel.java

```
package com.example.roomdatabasedemo;

import android.app.Application;

import androidx.annotation.NonNull;
import androidx.lifecycle.AndroidViewModel;
import androidx.lifecycle.LiveData;

import java.util.List;

public class UserViewModel extends AndroidViewModel {
    private UserRepository repository;
    private LiveData<List<User>> allUsers;

    public UserViewModel(@NonNull Application application) {
        super(application);
        repository = new UserRepository(application);
        allUsers = repository.getAllUsers();
    }

    // Insert User
    public void insert(User user) {
        repository.insert(user);
```

```
    }

    // Update User
    public void update(User user) {
        repository.update(user);
    }

    // Delete User
    public void delete(User user) {
        repository.delete(user);
    }

    // Get all users
    public LiveData<List<User>> getAllUsers() {
        return allUsers;
    }

    // Search users
    public LiveData<List<User>> searchUsers(String query) {
        return repository.searchUsers(query);
    }

    // Insert Task
    public void insertTask(Task task) {
        repository.insertTask(task);
    }

    // Get tasks for a specific user
    public LiveData<List<UserWithTask>> getUserWithTasks(int userId) {
        return repository.getUserWithTasks(userId);
    }
}
```