ITW202: Mobile Application

Unit IV: Developing for Android

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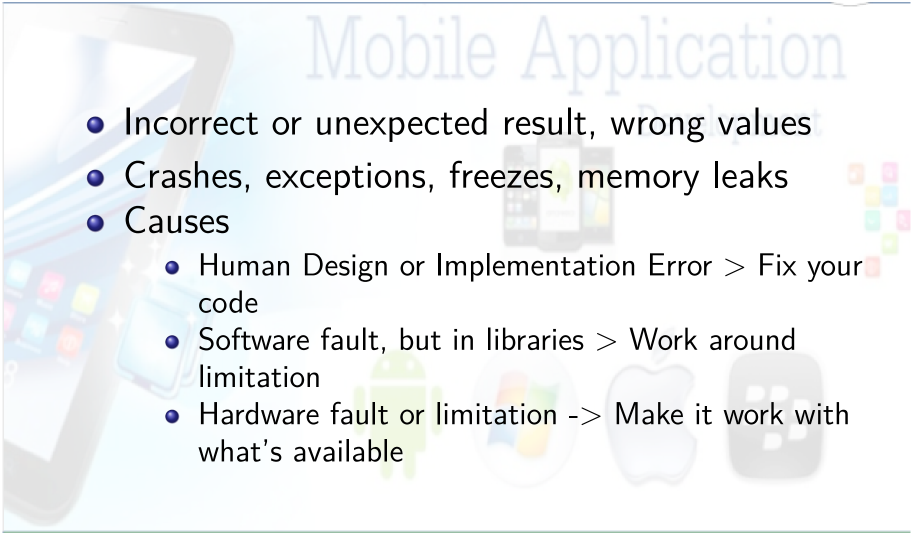
The Android Studio debugger

The Android Studio debugger

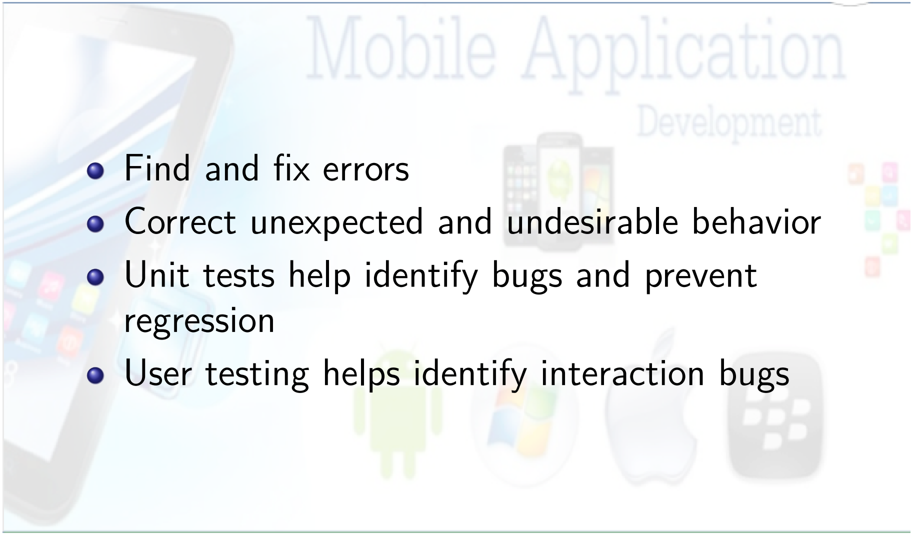
All Code Has Bugs

Bugs



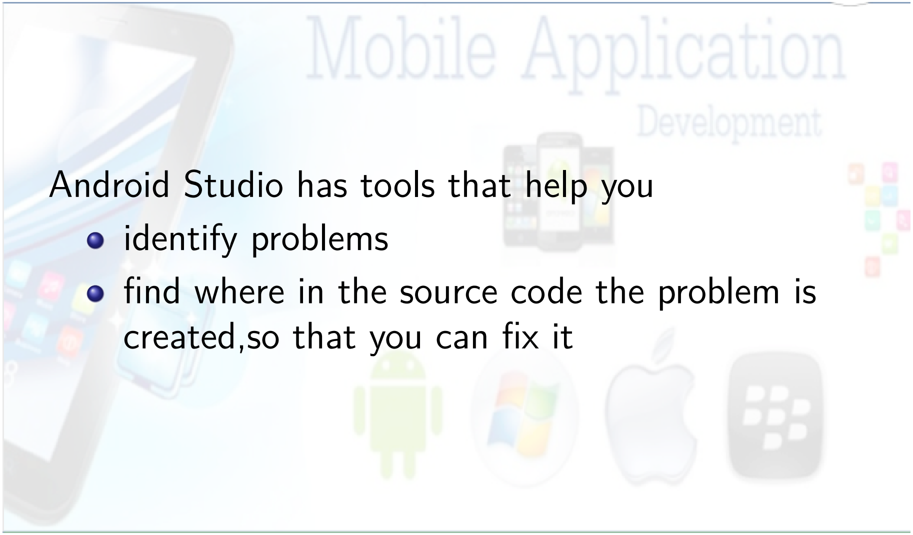
- Incorrect or unexpected result, wrong values
- Crashes, exceptions, freezes, memory leaks
- Causes
  - Human Design or Implementation Error > Fix your code
  - Software fault, but in libraries > Work around limitation
  - Hardware fault or limitation -> Make it work with what's available

Debugging



- Find and fix errors
- Correct unexpected and undesirable behavior
- Unit tests help identify bugs and prevent regression
- User testing helps identify interaction bugs

Android Studio debugging tools



Android Studio has tools that help you

- identify problems
- find where in the source code the problem is created,so that you can fix it

Logging with Android Studio

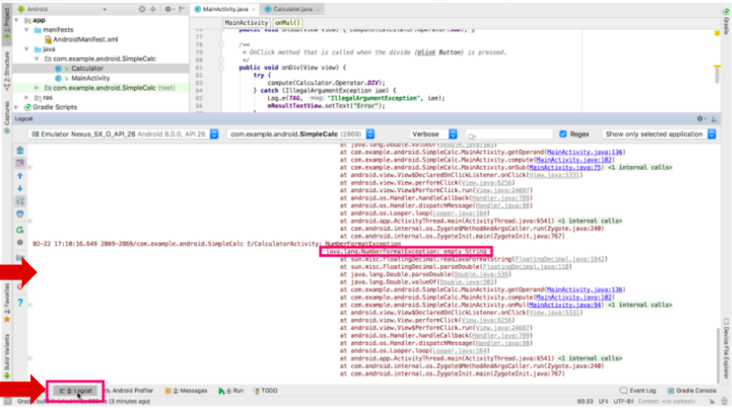
Add Log messages to your code

```
import android.util.Log;
// Use class variable with class name as tag
private static final String TAG =
MainActivity.class.getSimpleName();
// Show message in Logcat pane of Android Studio
// Log.<log-level>(TAG, "Message");
Log.d(TAG, “Hello World”);
```

Open Logcat pane

Logcat pane

Logcat tab



```
    /**
     * OnClick method that is called when the divide {@link Button} is pressed.
     */
    public void onDiv(View view) {
        try {
            compute(Calculator.Operator.DIV);
        } catch (IllegalArgumentException iae) {
            Log.e(TAG, msg: "IllegalArgumentException", iae);
            mResultTextView.setText("Error");
```

```
        at java.lang.Double.valueOf(Double.java:583)
        at com.example.android.SimpleCalc.MainActivity.getOperand(MainActivity.java:136)
        at com.example.android.SimpleCalc.MainActivity.compute(MainActivity.java:102)
        at com.example.android.SimpleCalc.MainActivity.onSub(MainActivity.java:75) <1 internal calls>
        at android.view.View$DeclaredOnClickListener.onClick(View.java:5331)
        at android.view.View.performClick(View.java:6256)
        at android.view.View$PerformClick.run(View.java:24697)
        at android.os.Handler.handleCallback(Handler.java:789)
        at android.os.Handler.dispatchMessage(Handler.java:98)
        at android.os.Looper.loop(Looper.java:164)
        at android.app.ActivityThread.main(ActivityThread.java:6541) <1 internal calls>
        at com.android.internal.os.Zygote$MethodAndArgsCaller.run(Zygote.java:240)
        at com.android.internal.os.ZygoteInit.main(ZygoteInit.java:767)
02-22 17:10:16.649 2869-2869/com.example.android.SimpleCalc E/CalculatorActivity: NumberFormatException
    java.lang.NumberFormatException: empty String
        at sun.misc.FloatingDecimal.readJavaFormatString(FloatingDecimal.java:1842)
        at sun.misc.FloatingDecimal.parseDouble(FloatingDecimal.java:110)
        at java.lang.Double.parseDouble(Double.java:539)
        at java.lang.Double.valueOf(Double.java:583)
        at com.example.android.SimpleCalc.MainActivity.getOperand(MainActivity.java:136)
        at com.example.android.SimpleCalc.MainActivity.compute(MainActivity.java:102)
        at com.example.android.SimpleCalc.MainActivity.onMul(MainActivity.java:94) <1 internal calls>
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        at android.app.ActivityThread.main(ActivityThread.java:6541) <1 internal calls>
        at com.android.internal.os.Zygote$MethodAndArgsCaller.run(Zygote.java:240)
        at com.android.internal.os.ZygoteInit.main(ZygoteInit.java:767)
```
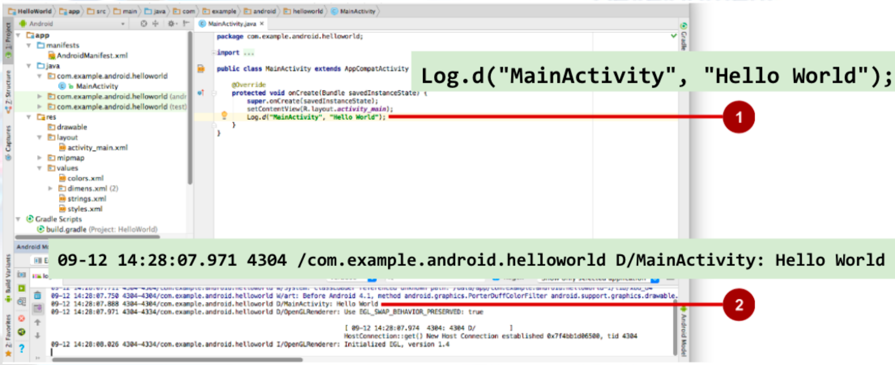

Inspect logging messages



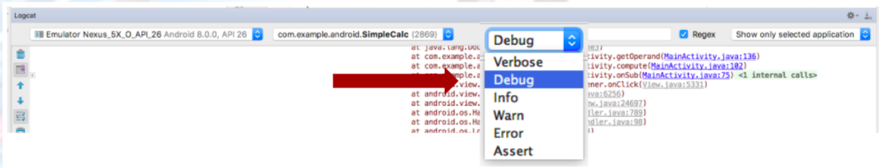
```
package com.example.android.helloworld;

import ...

public class MainActivity extends AppCompatActivity

    @Override
    protected void onCreate(Bundle savedInstanceState) {
        super.onCreate(savedInstanceState);
        setContentView(R.layout.activity_main);
        Log.d("MainActivity", "Hello World");
    }
}
```

```
Log.d("MainActivity", "Hello World");
```

```
09-12 14:28:07.971 4304 /com.example.android.helloworld D/MainActivity: Hello World
```

```
09-12 14:28:07.750 4304-4304/com.example.android.helloworld W/art: Before Android 4.1, method android.graphics.PorterDuffColorFilter android.support.graphics.drawable.
09-12 14:28:07.888 4304-4304/com.example.android.helloworld D/MainActivity: Hello World
09-12 14:28:07.971 4304-4334/com.example.android.helloworld D/OpenGLRenderer: Use EGL_SWAP_BEHAVIOR_PRESERVED: true

                                                                              [ 09-12 14:28:07.974  4304: 4304 D/         ]
                                                                              HostConnection::get() New Host Connection established 0x7f4bb1d06500, tid 4304
09-12 14:28:08.026 4304-4334/com.example.android.helloworld I/OpenGLRenderer: Initialized EGL, version 1.4
```

Choose visible logging level


Logcat
Emulator Nexus_5X_O_API_26 Android 8.0.0, API 26
com.example.android.SimpleCalc (2869)
Debug
Verbose
Debug
Info
Warn
Error
Assert
Regex
Show only selected application

```
at java.lang.Dou
at com.example.a                        tivity.getOperand(MainActivity.java:136)
at com.example.a                        tivity.compute(MainActivity.java:102)
at com.example.a                        tivity.onSub(MainActivity.java:75) <1 internal calls>
             .view.                     ener.onClick(View.java:5331)
at android.view.                        va:6256)
at android.view.                        w.java:24697)
at android.os.Ha                        ler.java:789)
at android.os.Ha                        dler.java:98)
at android.os.Lo
```

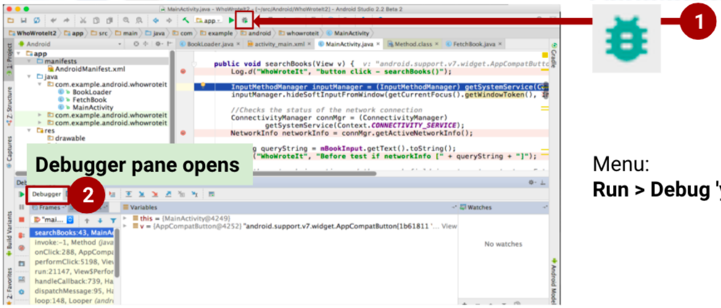
Displays logs with levels at this level or higher

Log Levels

- Verbose - All verbose log statements and comprehensive system
- Debug - All debug logs, variable values, debugging notes
- Info - Status info, such as database connection
- Warning - Unexpected behavior, non-fatal issues
- Error - Serious error conditions, exceptions, crashes only

Debugging with Android Studio

Run in debug mode



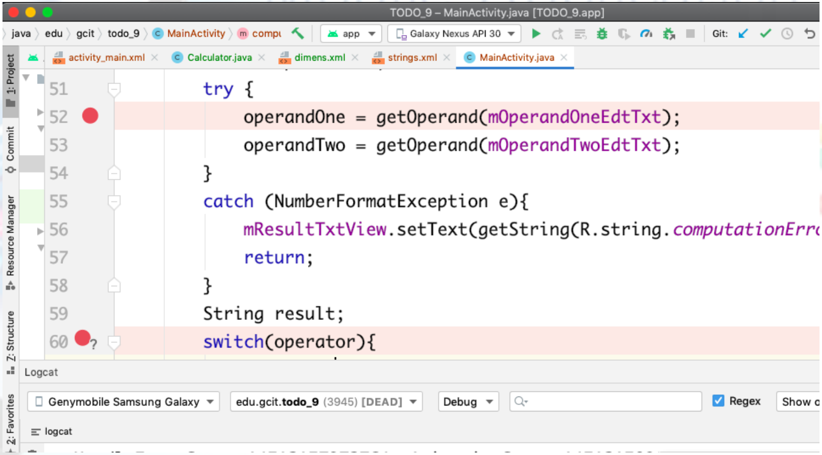
```
public void searchBooks(View v) {   v: "android.support.v7.widget.AppCompatButto
    Log.d("WhoWroteIt", "button click - searchBooks()");

    InputMethodManager inputManager = (InputMethodManager) getSystemService(C
    inputManager.hideSoftInputFromWindow(getCurrentFocus().getWindowToken(), I

    //Checks the status of the network connection
    ConnectivityManager connMgr = (ConnectivityManager)
            getSystemService(Context.CONNECTIVITY_SERVICE);
    NetworkInfo networkInfo = connMgr.getActiveNetworkInfo();

    g queryString = mBookInput.getText().toString();
    ("WhoWroteIt", "Before test if networkInfo [" + queryString + "]");
```

```
searchBooks:43, MainA
invoke:-1, Method (java
onClick:288, AppCompa
performClick:5198, View
run:21147, View$Perfor
handleCallback:739, Ha
dispatchMessage:95, Ha
loop:148, Looper (andr
```

```
this = {MainActivity@4249}
v = {AppCompatButton@4252} "android.support.v7.widget.AppCompatButton{1b61811 '... View
```

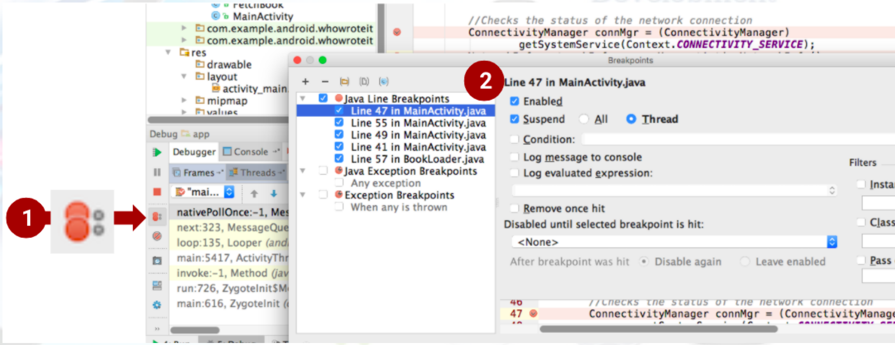
Menu:
Run > Debug 'your app'

Set breakpoints



```
        try {
            operandOne = getOperand(mOperandOneEdtTxt);
            operandTwo = getOperand(mOperandTwoEdtTxt);
        }
        catch (NumberFormatException e){
            mResultTxtView.setText(getString(R.string.computationErr
            return;
        }
        String result;
        switch(operator){
```

Edit breakpoint properties



```
//Checks the status of the network connection
ConnectivityManager connMgr = (ConnectivityManager)
        getSystemService(Context.CONNECTIVITY_SERVICE);
```

Java Line Breakpoints
- ✓ Line 47 in MainActivity.java
- ✓ Line 55 in MainActivity.java
- ✓ Line 49 in MainActivity.java
- ✓ Line 41 in MainActivity.java
- ✓ Line 57 in BookLoader.java

Java Exception Breakpoints
- Any exception

Exception Breakpoints
- When any is thrown

Line 47 in MainActivity.java

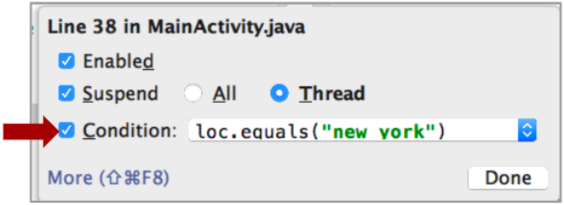
- ✓ Enabled
- ✓ Suspend ○ All [✓ Thread]
- Condition:
- Log message to console
- Log evaluated expression:
- Remove once hit

Disabled until selected breakpoint is hit: <None>

After breakpoint was hit [✓ Disable again] ○ Leave enabled

Make breakpoints conditional

- In properties dialog or right -click existing breakpoint
- Any Java expression that returns a boolean
- Code completion helps you write conditions

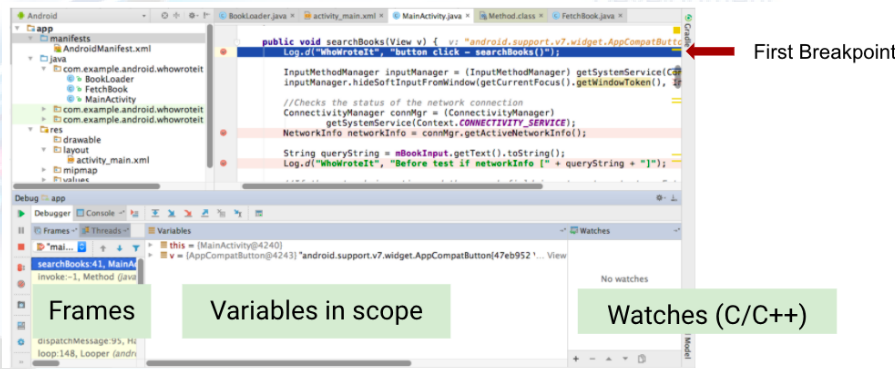

Line 38 in MainActivity.java

☑ Enabled

☑ Suspend ○ All ● Thread

☑ Condition: `loc.equals("new york")`

Run until app stops at breakpoint



```
public void searchBooks(View v) {  v: "android.support.v7.widget.AppCompatButto
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    ConnectivityManager connMgr = (ConnectivityManager)
            getSystemService(Context.CONNECTIVITY_SERVICE);
    NetworkInfo networkInfo = connMgr.getActiveNetworkInfo();

    String queryString = mBookInput.getText().toString();
    Log.d("WhoWroteIt", "Before test if networkInfo [" + queryString + "]");
```
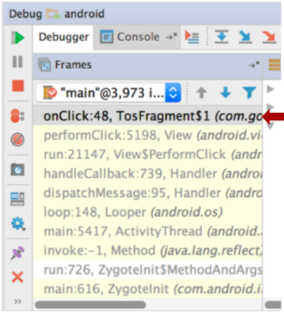

```
searchBooks:41, MainA
invoke:-1, Method (java
dispatchMessage:95, Ha
loop:148, Looper (andr
```

```
this = {MainActivity@4240}
v = {AppCompatButton@4243} "android.support.v7.widget.AppCompatButton{47eb952 '... View
```

Inspect frames


Debug android

Debugger Console

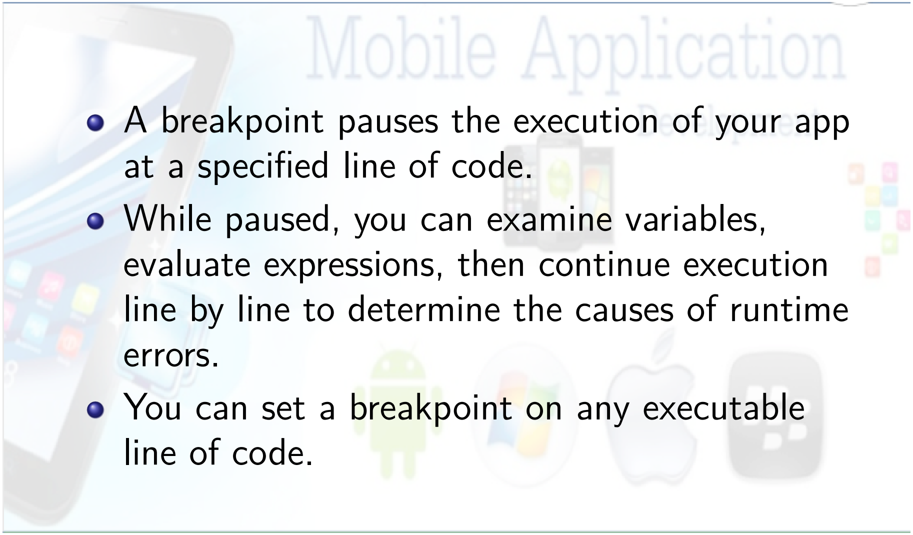
Frames

"main"@3,973 i...

```
onClick:48, TosFragment$1 (com.go
performClick:5198, View (android.vi
run:21147, View$PerformClick (andr
handleCallback:739, Handler (andro
dispatchMessage:95, Handler (andro
loop:148, Looper (android.os)
main:5417, ActivityThread (android.
invoke:-1, Method (java.lang.reflect)
run:726, ZygoteInit$MethodAndArgs
main:616, ZygoteInit (com.android.i
```

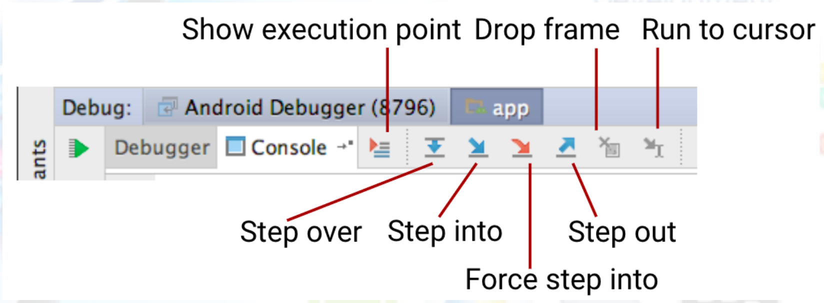
Top frame is where execution is halted in your code

Breakpoint

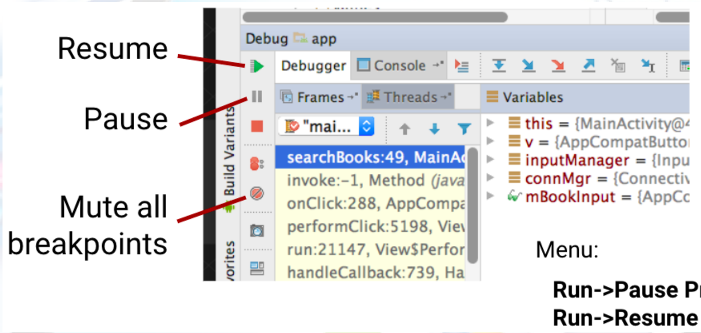


- A breakpoint pauses the execution of your app at a specified line of code.
- While paused, you can examine variables, evaluate expressions, then continue execution line by line to determine the causes of runtime errors.
- You can set a breakpoint on any executable line of code.

Stepping through code



Resume and Pause



```
searchBooks:49, MainAc
invoke:-1, Method (java
onClick:288, AppCompa
performClick:5198, Viev
run:21147, View$Perfor
handleCallback:739, Ha
```

```
this = {MainActivity@4
v = {AppCompatButto
inputManager = {Inpu
connMgr = {Connectiv
mBookInput = {AppCc
```

Menu:

Run->Pause Program...
Run->Resume Program...

THANK YOU