# LAB ASSIGNMENT 2

## R Project

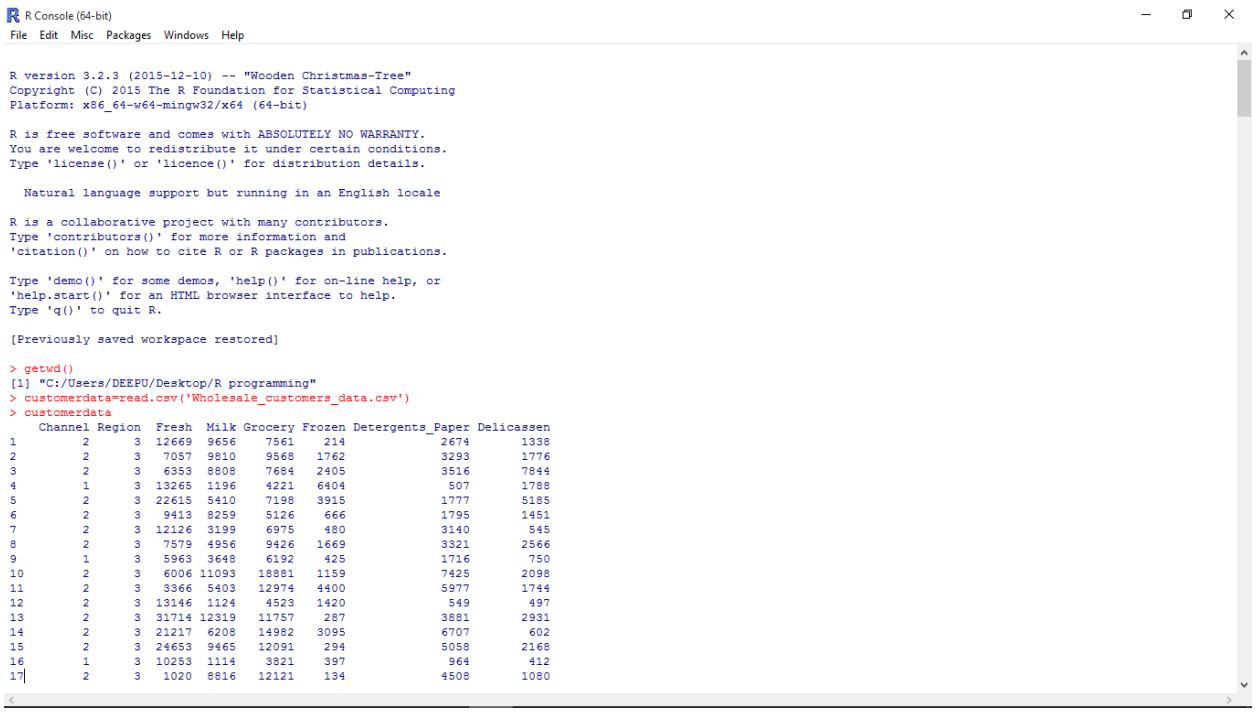
Prepare a dataset and perform k-means clustering.

**A**.

**Description**: K-means cluster partitions the data with N observations into K clusters in which the observations belong to the cluster with nearest mean, which serves as a prototype for the cluster.

The K means clustering is performed on whole sale customer's data. The results are shown below.

**Screen shots**:



R Console (64-bit)

File Edit Misc Packages Windows Help

```
426       1      3  11243  2408    2593  15348              108       1886
427       1      3  13134  9347   14316   3141             5079       1894
428       1      3  31012 16687    5429  15082              439       1163
429       1      3   3047  5970    4910   2198              850        317
430       1      3   8607  1750    3580     47               84       2501
431       1      3   3097  4230   16483    575              241       2080
432       1      3   8533  5506    5160  13486             1377       1498
433       1      3  21117  1162    4754    269             1328        395
434       1      3   1982  3218    1493   1541              356       1449
435       1      3  16731  3922    7994    688             2371        838
436       1      3  29703 12051   16027  13135              182       2204
437       1      3  39228  1431     764   4510               93       2346
438       2      3  14531 15488   30243    437            14841       1867
439       1      3  10290  1981    2232   1038              168       2125
440       1      3   2787  1698    2510     65              477         52
> cdata.features=customerdata
> cdata.features$channel<-NULL
> cdata.features$Region<-NULL
> cdata.features
    Channel  Fresh  Milk Grocery Frozen Detergents_Paper Delicassen
1         2  12669  9656    7561    214              2674       1338
2         2   7057  9810    9568   1762              3293       1776
3         2   6353  8808    7684   2405              3516       7844
4         1  13265  1196    4221   6404               507       1788
5         2  22615  5410    7198   3915              1777       5185
6         2   9413  8259    5126    666              1795       1451
7         2  12126  3199    6975    480              3140        545
8         2   7579  4956    9426   1669              3321       2566
9         1   5963  3648    6192    425              1716        750
10        2   6006 11093   18881   1159              7425       2098
11        2   3366  5403   12974   4400              5977       1744
12        2  13146  1124    4523   1420               549        497
13        2  31714 12319   11757    287              3881       2931
14        2  21217  6208   14982   3095              6707        602
15        2  24653  9465   12091    294              5058       2168
16        1  10253  1114    3821    397               964        412
17        2   1020  8816   12121    134              4508       1080
18        1   5876  6157    2933    839               370       4478
19        2  18601  6327   10099   2205              2767       3181
20        1   7780  2495    9464    669              2518        501
21        2  17546  4519    4602   1066              2259       2124
22        1   5567   871    2010   3383               375        569
23        1  31276  1917    4469   9408              2381       4334
```

R Console (64-bit)

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```
424       2  17565  3686    4657   1059              1803        668
425       2  16980  2884   12232    874              3213        249
426       1  11243  2408    2593  15348               108       1886
427       1  13134  9347   14316   3141              5079       1894
428       1  31012 16687    5429  15082               439       1163
429       1   3047  5970    4910   2198               850        317
430       1   8607  1750    3580     47                84       2501
431       1   3097  4230   16483    575               241       2080
432       1   8533  5506    5160  13486              1377       1498
433       1  21117  1162    4754    269              1328        395
434       1   1982  3218    1493   1541               356       1449
435       1  16731  3922    7994    688              2371        838
436       1  29703 12051   16027  13135               182       2204
437       1  39228  1431     764   4510                93       2346
438       2  14531 15488   30243    437             14841       1867
439       1  10290  1981    2232   1038               168       2125
440       1   2787  1698    2510     65               477         52
> result<-kmeans(cdata.features,3)
> result
K-means clustering with 3 clusters of sizes 60, 330, 50

Cluster means:
   Channel    Fresh      Milk   Grocery   Frozen Detergents_Paper Delicassen
1 1.133333 35941.40  6044.450  6288.617 6713.967        1039.667   3049.467
2 1.260606  8253.47  3824.603  5280.455 2572.661        1773.058   1137.497
3 1.960000  8000.04 18511.420 27573.900 1996.680       12407.360   2252.020

Clustering vector:
  [1] 2 2 2 2 1 2 2 2 2 3 2 2 1 2 1 2 2 2 2 2 2 2 2 1 3 1 2 2 2 3 1 2 2 2 1 2 2 1 2 3 1 1 2 2 3 2 3 3 3 2 3 2 2 1 2 1 2 3 2 2 2 2 3 2 2 2 3 2 2 2 2 2 2 2 2 2 2 2 2 3 2 2 2
 [82] 2 2 2 2 2 3 3 1 2 1 2 2 3 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 3 2 3 2 2 2 2 2 2 2 2 2 2 2 2 1 1 2 2 2 1 2 2 2 2 2 2 2 2 2 1 1 2 2 3 2 2 2 1 2 2 2 2 2 3 2 2 2 2 2 2
[163] 2 3 2 3 2 2 2 2 2 2 3 2 3 2 2 1 2 2 2 2 2 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 3 3 1 2 2 3 2 2 2 3 2 3 2 2 2 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 1 1 1 2
[244] 2 2 2 2 2 2 2 2 3 2 1 2 1 2 2 1 1 2 2 1 2 2 3 3 2 3 2 2 2 2 1 2 2 1 2 2 2 2 2 2 1 1 1 1 2 2 2 1 2 2 2 2 2 2 2 2 2 2 3 2 2 3 2 3 2 2 3 2 1 3 2 2 2 2 2 2 3 2 2 2 2
[325] 1 1 2 2 2 2 2 3 2 3 2 1 2 2 2 2 2 2 2 3 2 2 2 1 2 3 2 3 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 1 2 2 1 2 1 2 1 3 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 1 1 1 2
[406] 2 1 3 2 2 2 2 2 2 2 2 2 2 3 2 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 1 1 3 2 2

Within cluster sum of squares by cluster:
[1] 25765310319 28184318917 26382784680
 (between_SS / total_SS =  49.0 %)

Available components:

[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss" "betweenss"    "size"         "iter"         "ifault"
> |
```

```
R Console (64-bit)
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Within cluster sum of squares by cluster:
[1] 25765310319 28184318917 26382784680
 (between_SS / total_SS =  49.0 %)

Available components:

[1] "cluster"      "centers"      "totss"        "withinss"     "tot.withinss" "betweenss"    "size"         "iter"         "ifault"
> result$size
[1]  60 330  50
> result$cluster
  [1] 2 2 2 2 1 2 2 2 2 3 2 2 1 2 1 2 2 2 2 2 2 2 2 1 3 1 2 2 2 3 1 2 2 2 2 1 2 2 1 2 2 2 1 2 3 1 1 2 2 3 2 3 3 3 2 3 2 2 1 2 1 2 3 2 2 2 2 3 2 2 2 3 2 2 2 2 2 2 2 2 2 2 2 2 3 2 2 2
 [82] 2 2 2 2 3 3 1 2 1 2 2 3 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 3 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 1 2 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 1 1 2 2 3 2 2 2 1 2 2 2 2 2 3 2 2 2 2 2 2
[163] 2 3 2 3 2 2 2 2 2 3 2 3 2 2 1 2 2 2 2 2 1 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 3 3 1 2 2 3 2 2 2 3 2 3 2 2 2 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 1 1 1 2
[244] 2 2 2 2 2 2 2 2 3 2 1 2 1 2 2 1 1 2 2 1 2 2 3 3 2 3 2 2 2 2 1 2 2 1 2 2 2 2 2 2 1 1 1 1 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 3 2 2 3 2 3 2 2 3 2 1 3 2 2 2 2 2 3 2 2 2 2
[325] 1 1 2 2 2 2 2 2 3 2 3 2 1 2 2 2 2 2 2 2 2 3 2 2 2 1 2 3 2 3 2 3 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 1 2 2 2 2 2 2 2 2 2 2 2 2 2 1 1 1 2
[406] 2 1 3 2 2 2 2 2 2 2 2 2 2 3 2 2 2 1 2 2 2 2 1 2 2 2 2 2 2 2 1 1 3 2 2
> result$center
   Channel    Fresh      Milk   Grocery   Frozen Detergents_Paper Delicassen
1 1.133333 35941.40  6044.450  6288.617 6713.967         1039.667   3049.467
2 1.260606  8253.47  3824.603  5280.455 2572.661         1773.058   1137.497
3 1.960000  8000.04 18511.420 27573.900 1996.680        12407.360   2252.020
> result$totss
[1] 157595857262
> result$withinss
[1] 25765310319 28184318917 26382784680
> result$betweenss
[1] 77263443346
> result$iter
[1] 3
> result$ifault
[1] 0
> table(customerdata$Region,results$cluster)
Error in table(customerdata$Region, results$cluster) :
  object 'results' not found
> table(customerdata$Region,result$cluster)

     1   2   3
  1 11  56  10
  2  4  35   8
  3 45 239  32
> plot(customerdata[c("Fresh","Milk")],col=result$cluster)
>
```
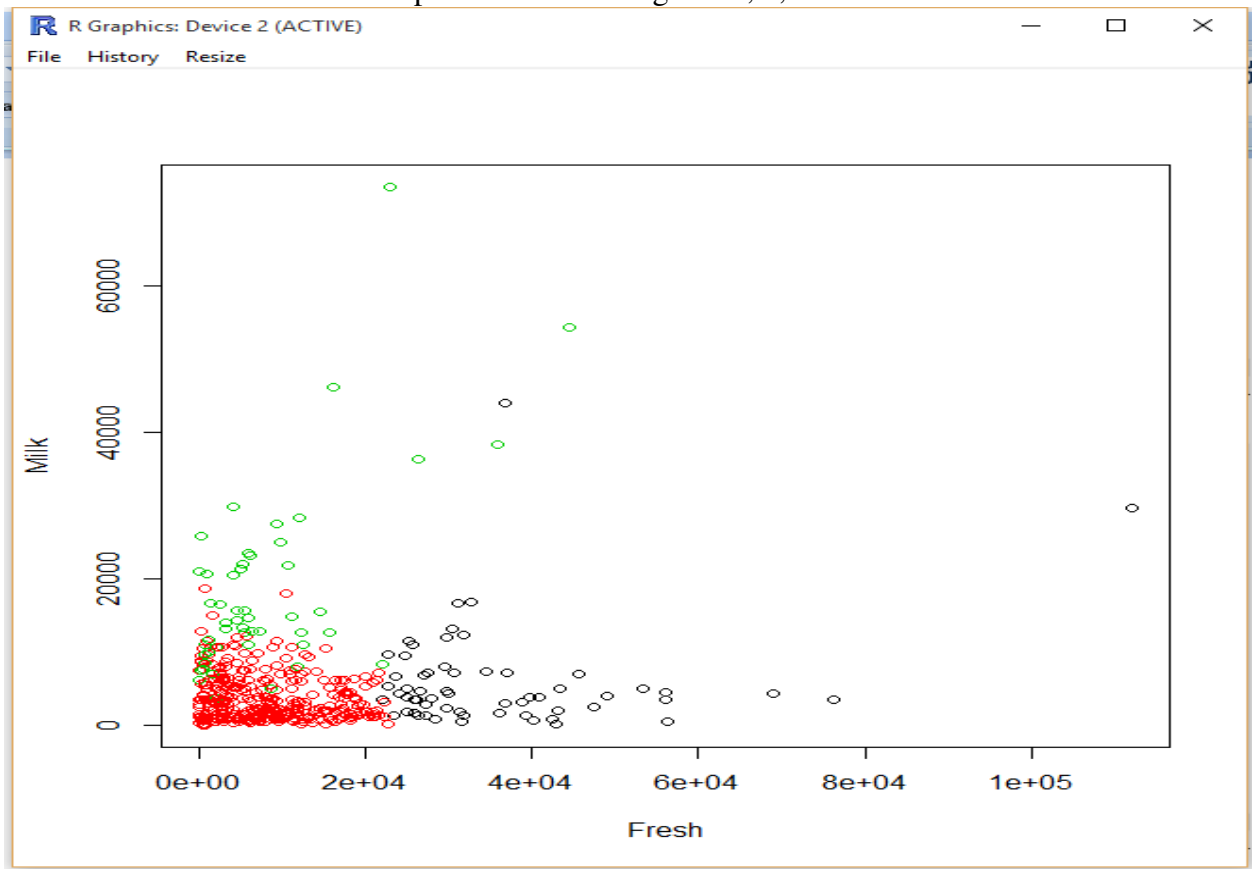
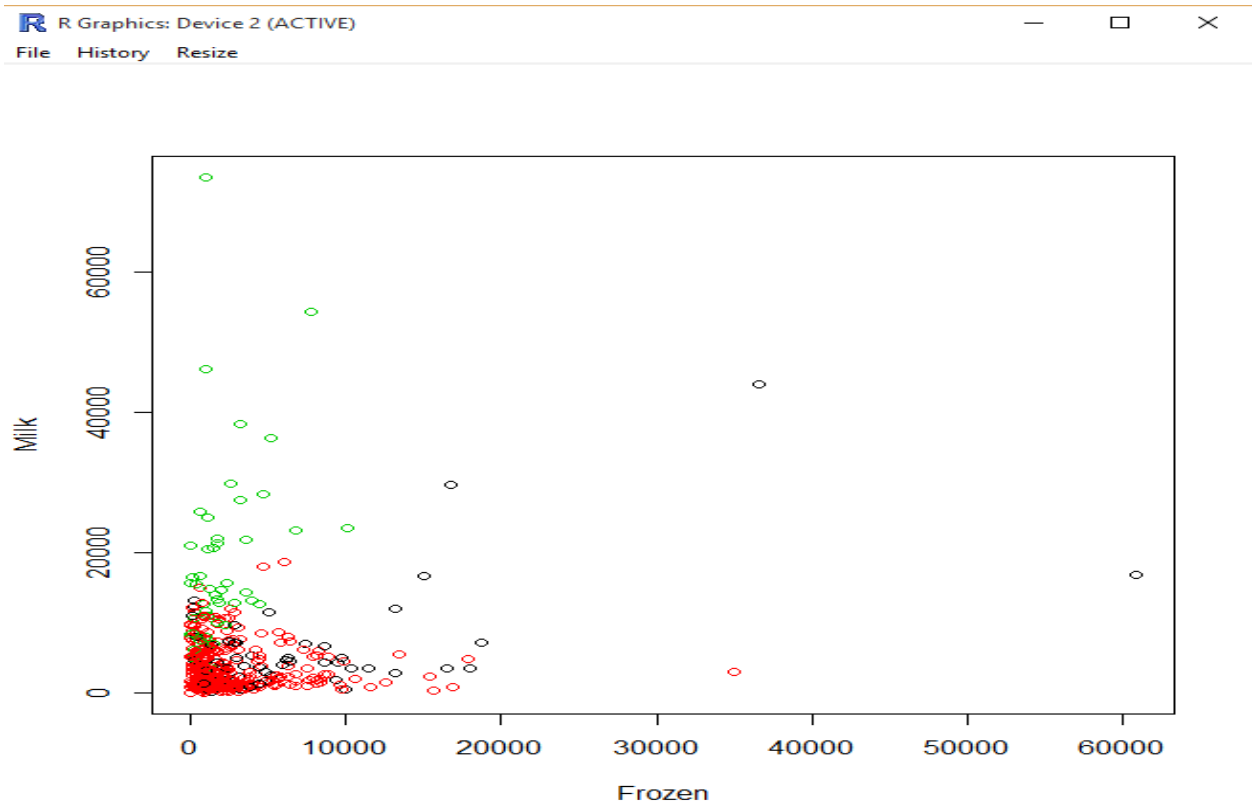
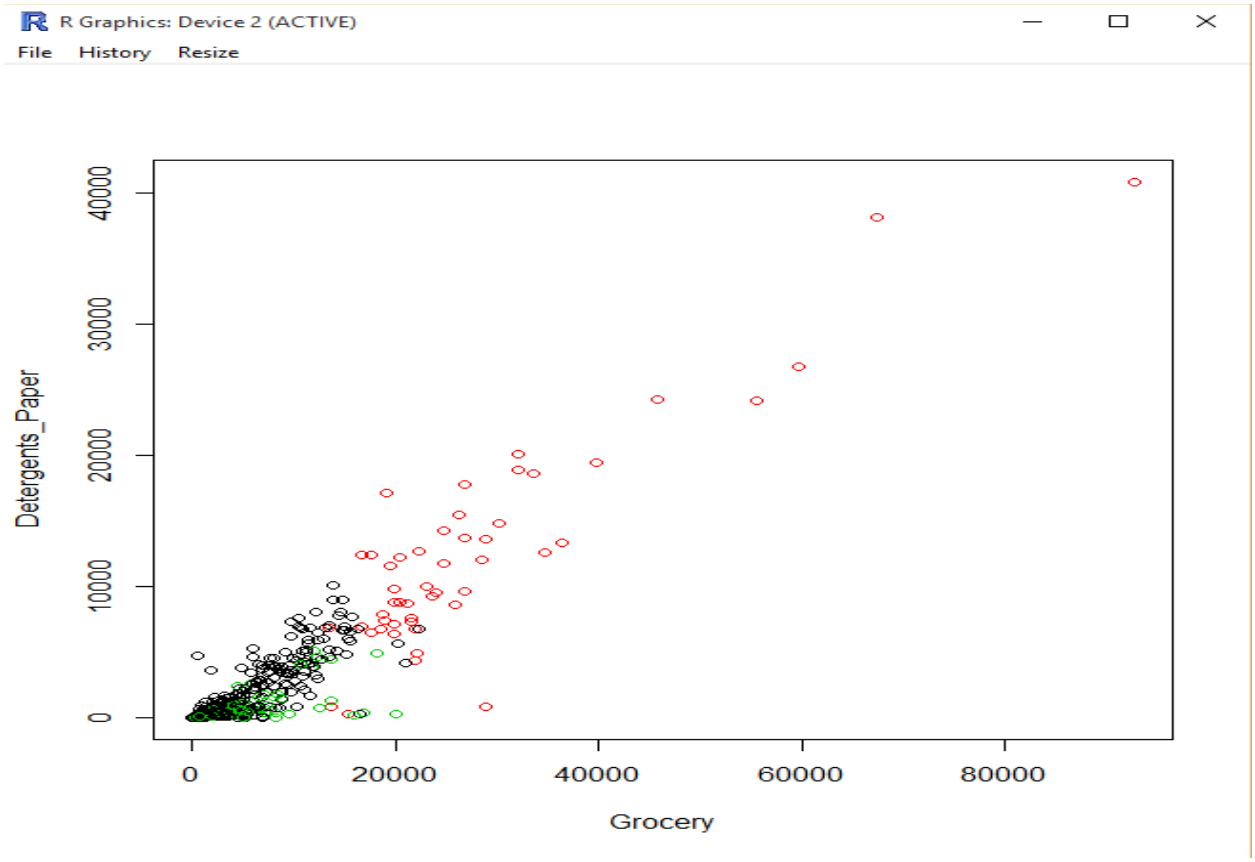
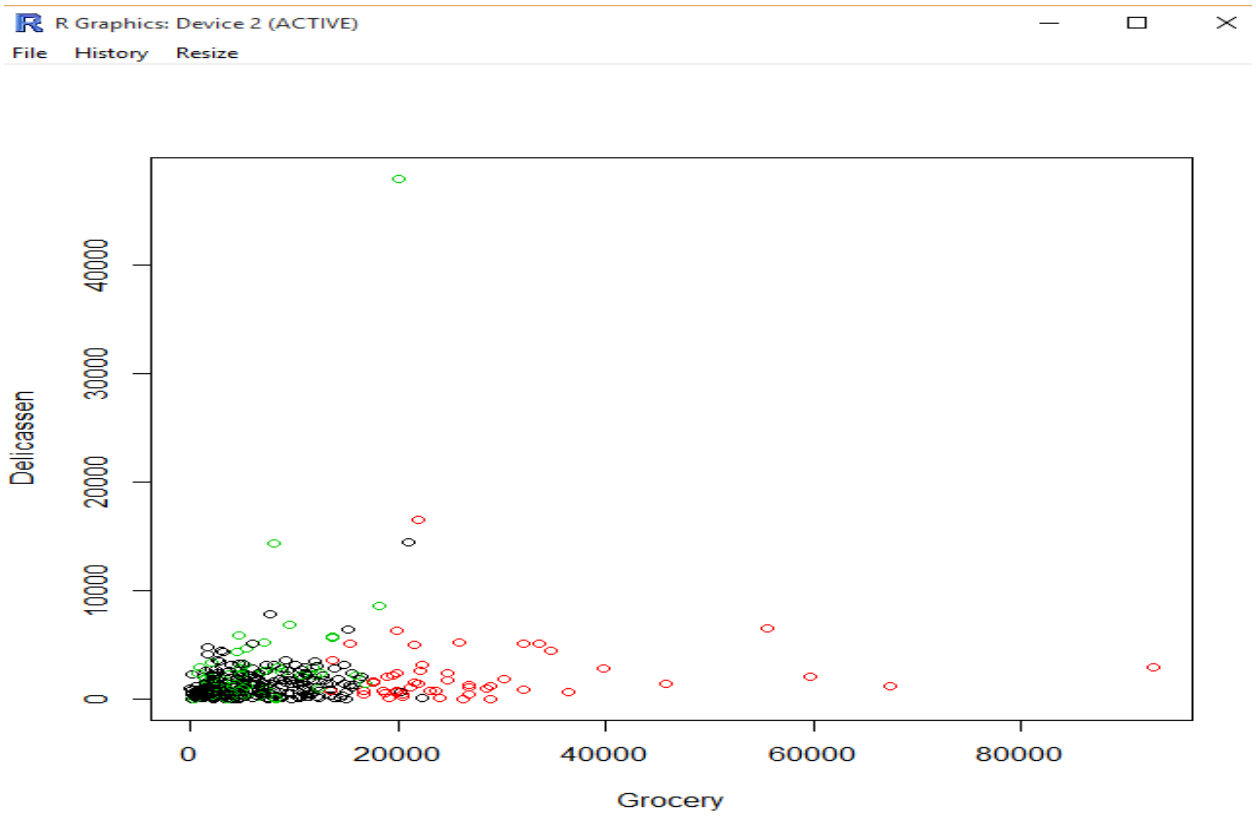
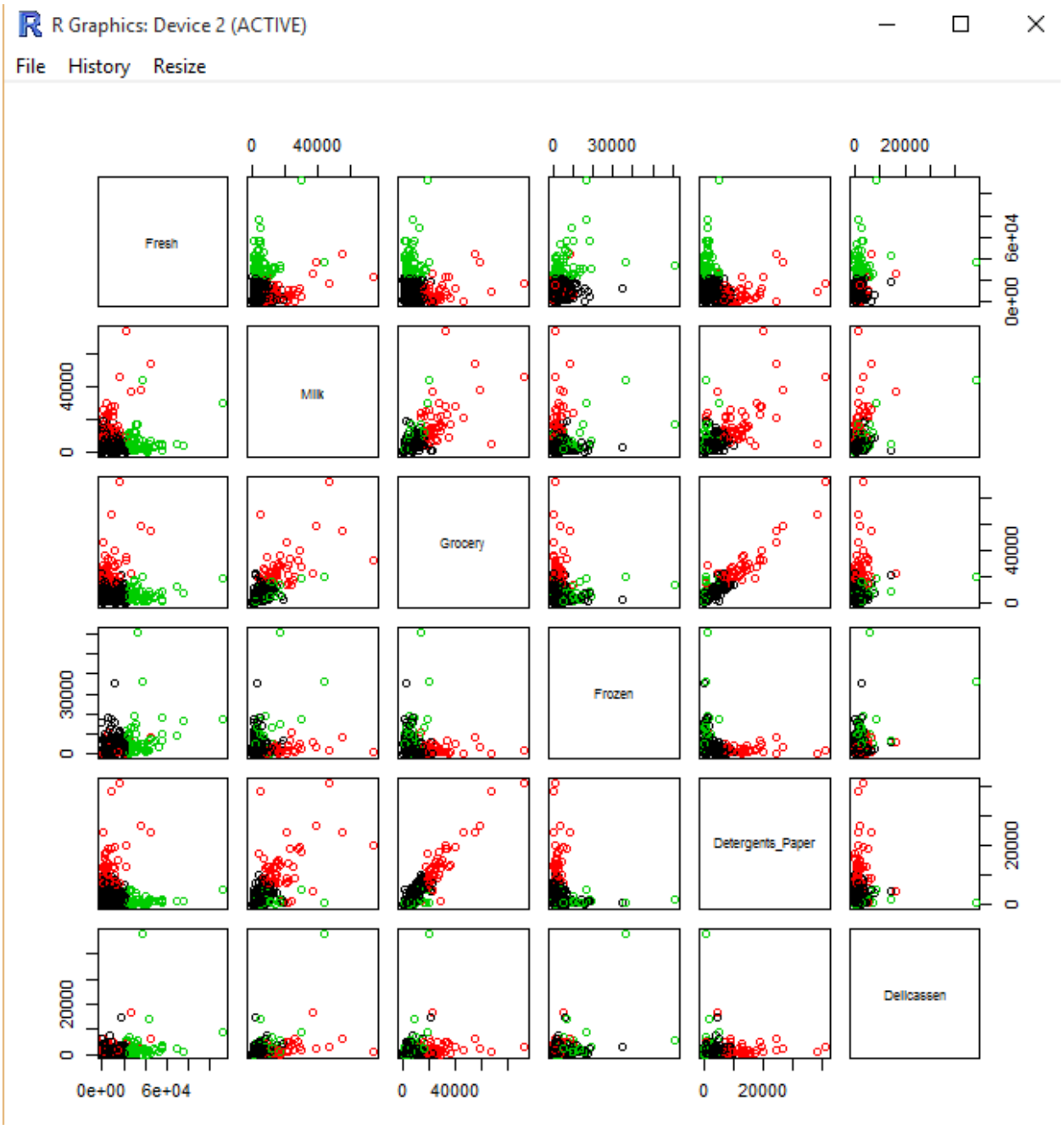

The three different colors in the plot indicate the regions 1, 2, 3.




R Graphics: Device 2 (ACTIVE)
File History Resize
Milk
Frozen
0
20000
40000
60000
0
10000
20000
30000
40000
50000
60000


R Graphics: Device 2 (ACTIVE)
File History Resize
Detergents_Paper
Grocery
0
10000
20000
30000
40000
0
20000
40000
60000
80000


R Graphics: Device 2 (ACTIVE)
File History Resize
Delicassen
0
10000
20000
30000
40000
0
20000
40000
60000
80000
Grocery


R Graphics: Device 2 (ACTIVE)
File History Resize
Fresh
Milk
Grocery
Frozen
Detergents_Paper
Delicassen
0 40000
0 30000
0 20000
0e+00 6e+04
0 40000
0 20000
0e+00 6e+04
0 40000
0 30000
0 20000

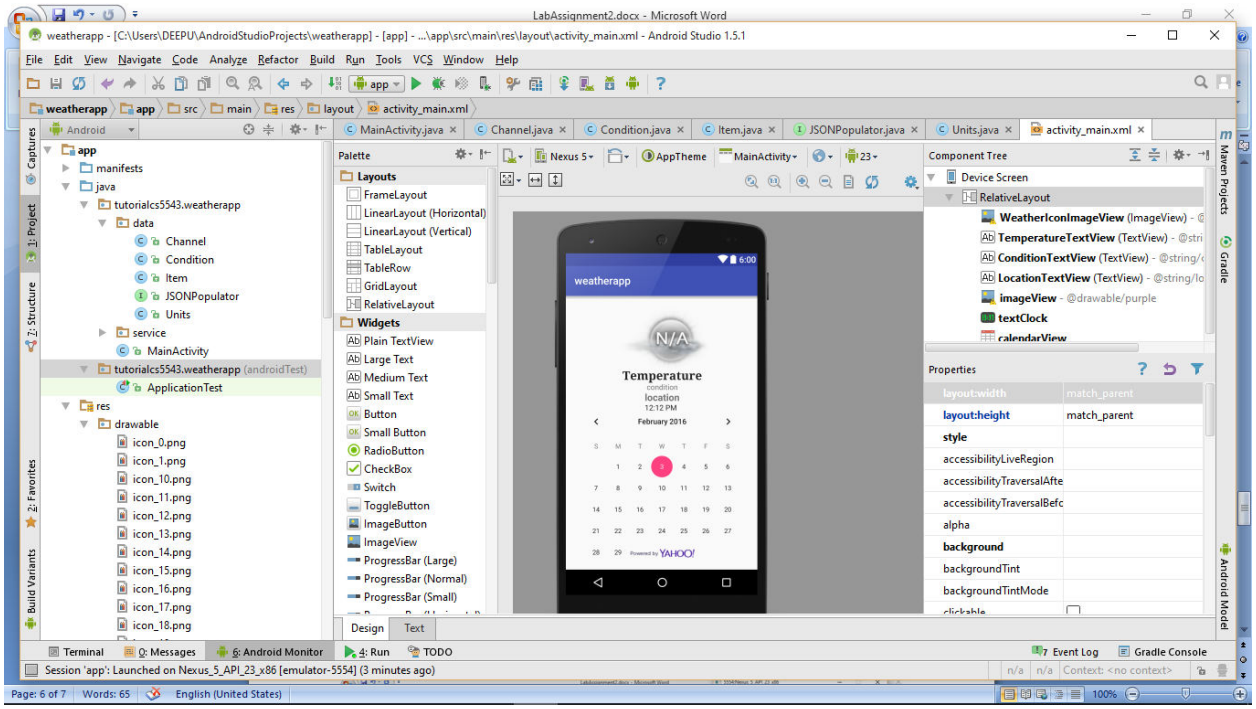
**RoboMe and Watch App**

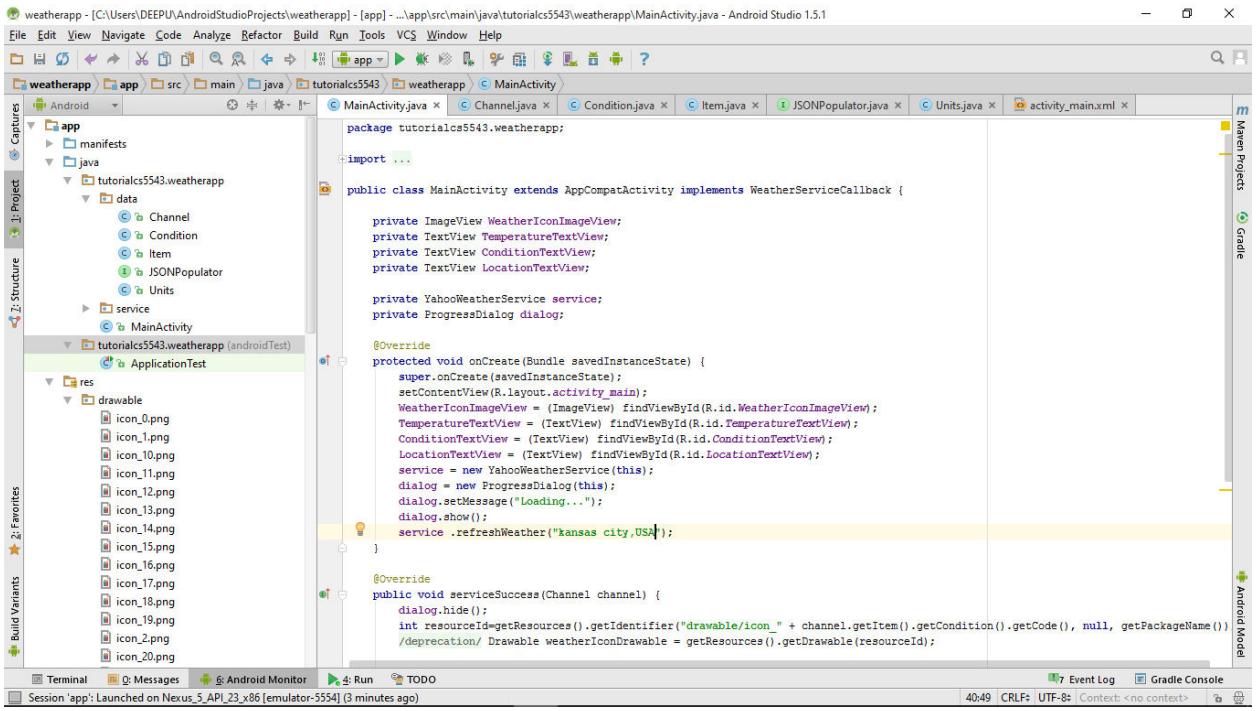
Create a RoboMe and Watch App that uses weather API.

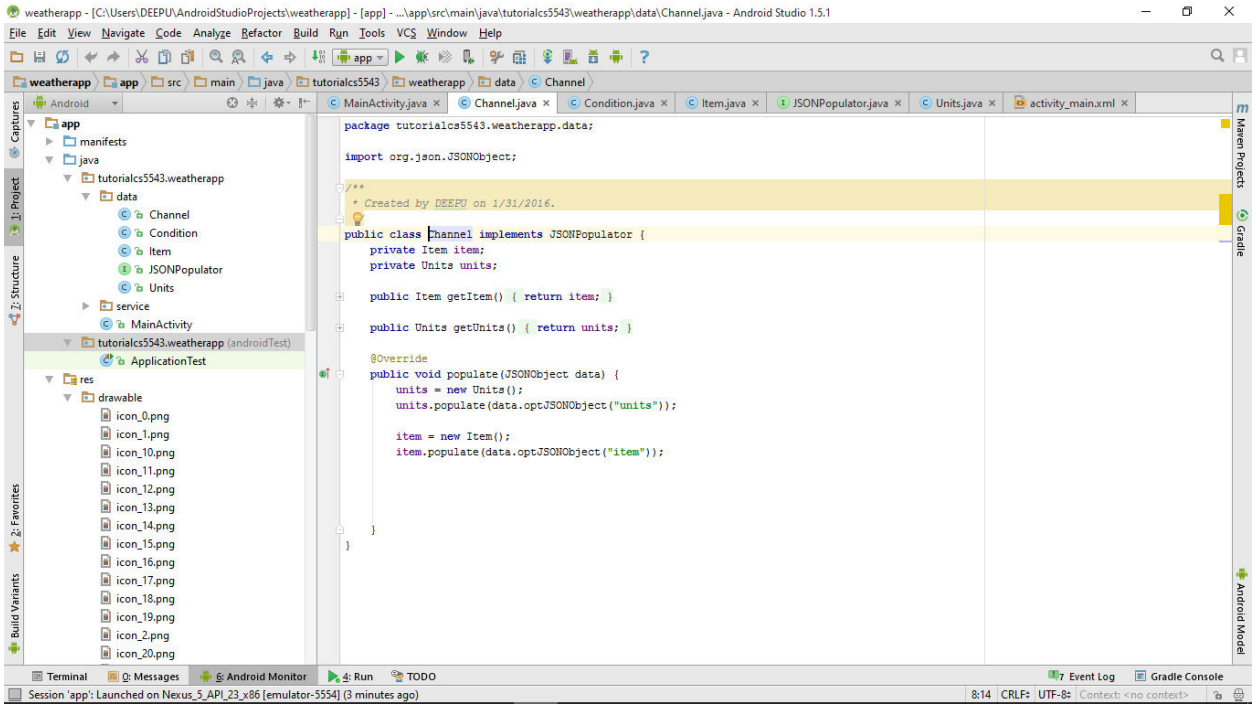
A.

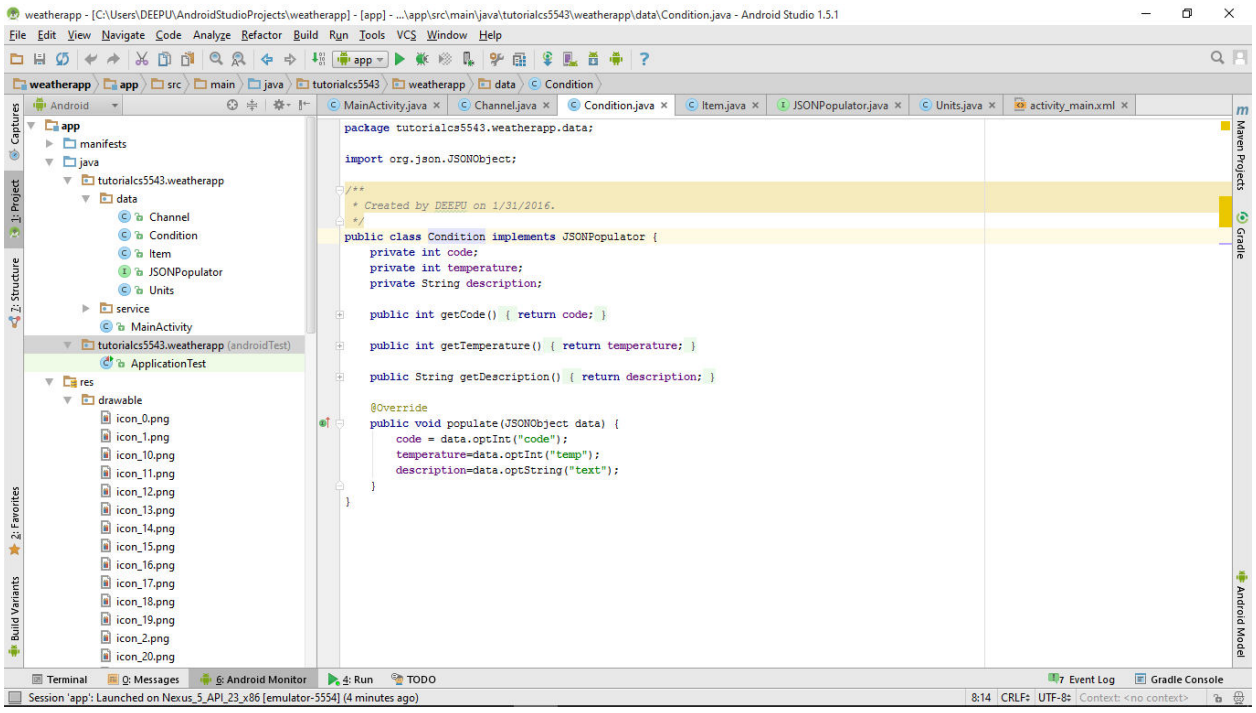
**Description**: This android app uses yahoo weather API. The results are shown below.

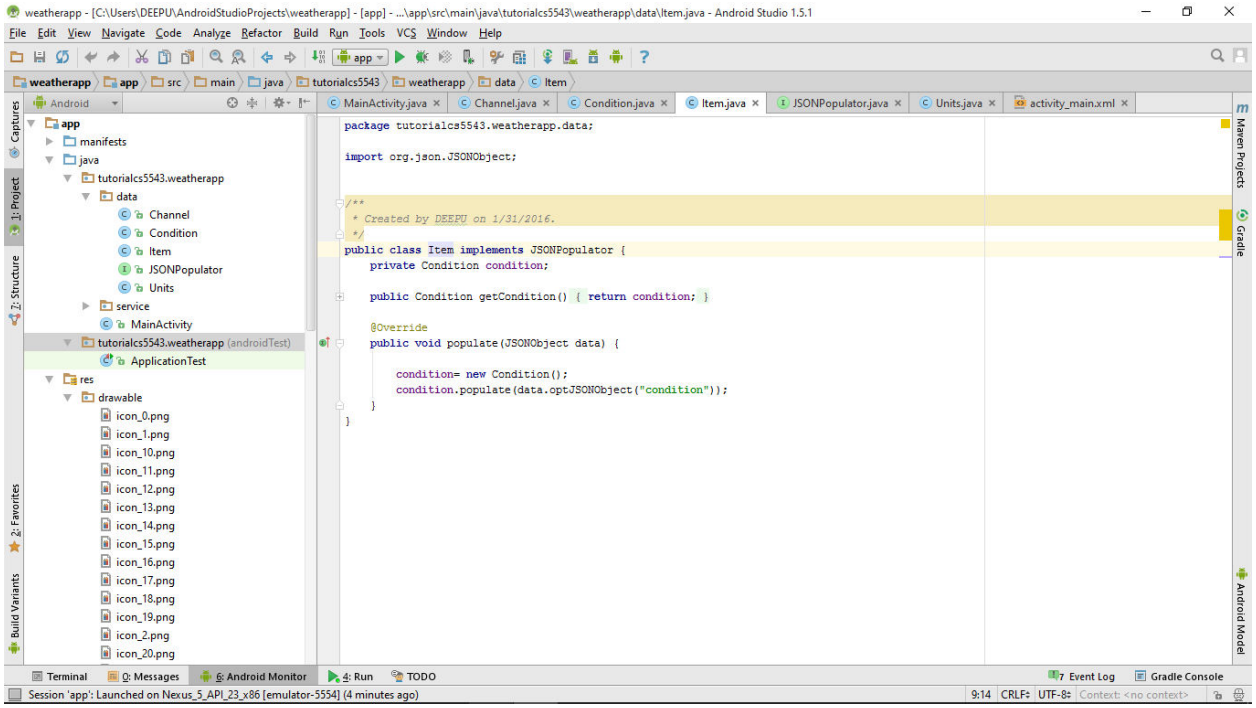
**Screen Shots**:

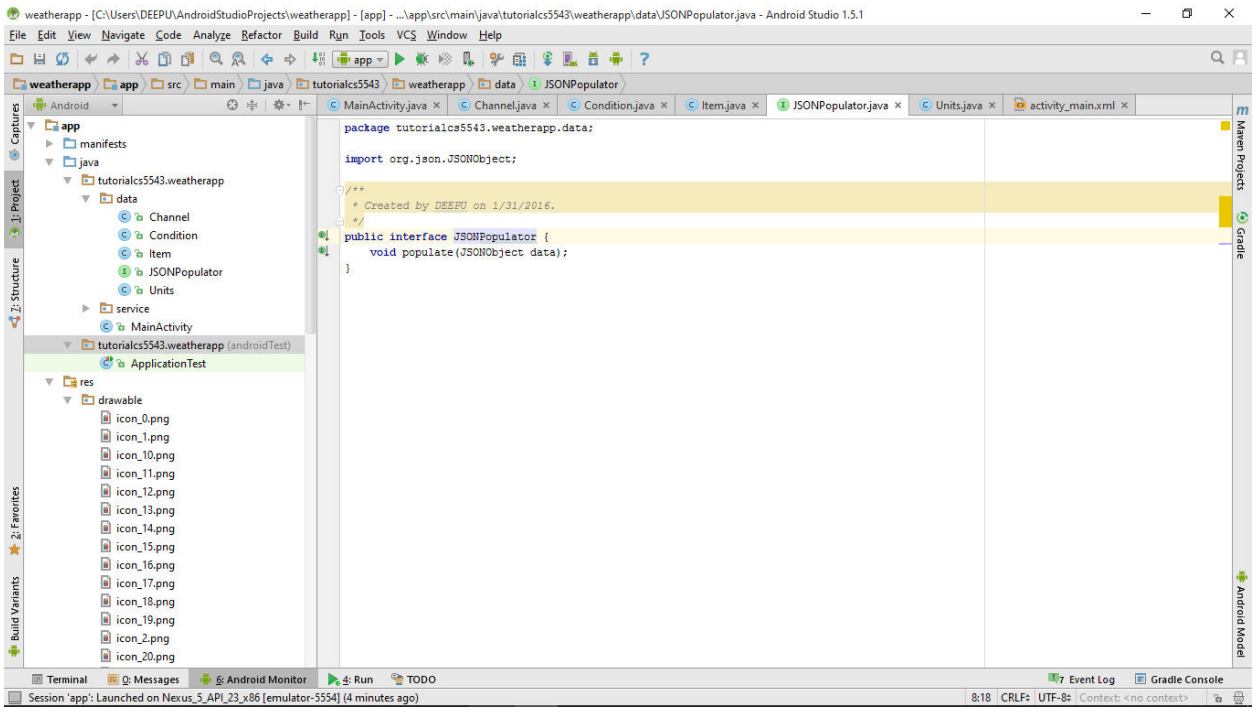


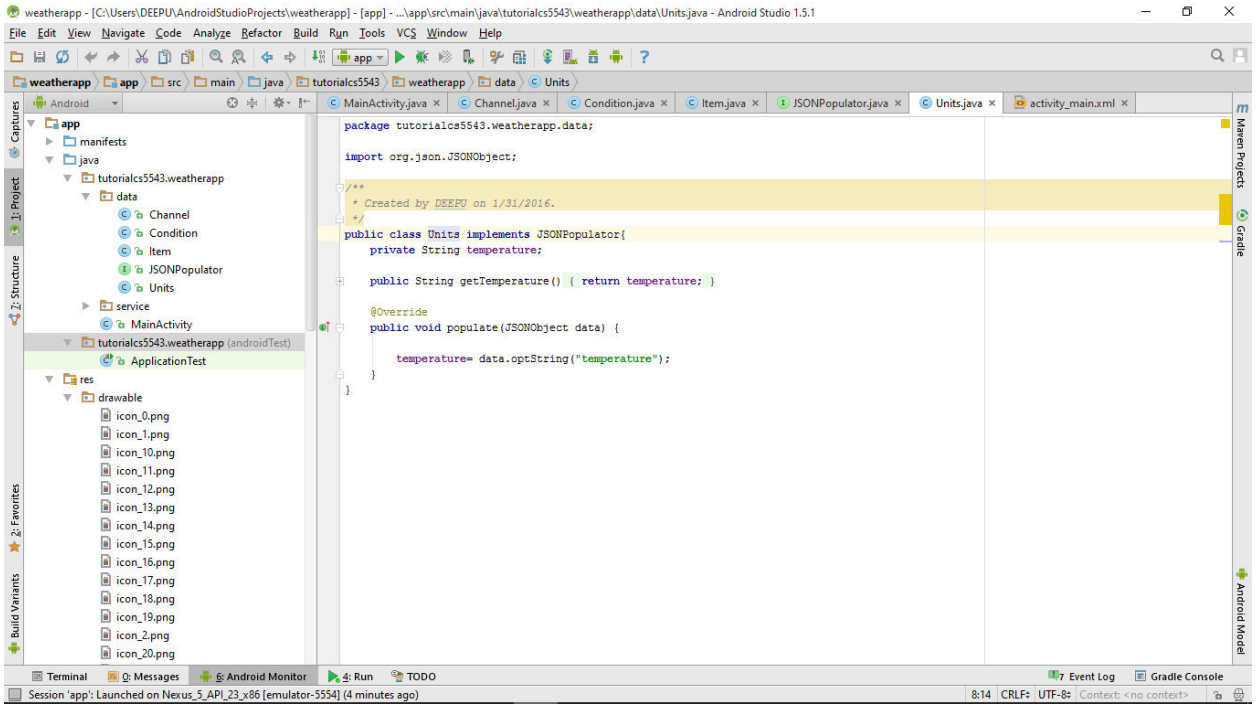

weatherapp - [C:\Users\DEEPU\AndroidStudioProjects\weatherapp] - [app] - ...\app\src\main\java\tutorialcs5543\weatherapp\MainActivity.java - Android Studio 1.5.1
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
MainActivity.java
Channel.java
Condition.java
Item.java
JSONPopulator.java
Units.java
activity_main.xml
package tutorialcs5543.weatherapp;
import ...
public class MainActivity extends AppCompatActivity implements WeatherServiceCallback {
private ImageView WeatherIconImageView;
private TextView TemperatureTextView;
private TextView ConditionTextView;
private TextView LocationTextView;
private YahooWeatherService service;
private ProgressDialog dialog;
@Override
protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
setContentView(R.layout.activity_main);
WeatherIconImageView = (ImageView) findViewById(R.id.WeatherIconImageView);
TemperatureTextView = (TextView) findViewById(R.id.TemperatureTextView);
ConditionTextView = (TextView) findViewById(R.id.ConditionTextView);
LocationTextView = (TextView) findViewById(R.id.LocationTextView);
service = new YahooWeatherService(this);
dialog = new ProgressDialog(this);
dialog.setMessage("Loading...");
dialog.show();
service .refreshWeather("kansas city,USA");
}
@Override
public void serviceSuccess(Channel channel) {
dialog.hide();
int resourceId=getResources().getIdentifier("drawable/icon_" + channel.getItem().getCondition().getCode(), null, getPackageName())
/deprecation/ Drawable weatherIconDrawable = getResources().getDrawable(resourceId);
Terminal
0: Messages
6: Android Monitor
4: Run
TODO
7 Event Log
Gradle Console
Session 'app': Launched on Nexus_5_API_23_x86 [emulator-5554] (3 minutes ago)
40:49
CRLF:
UTF-8:

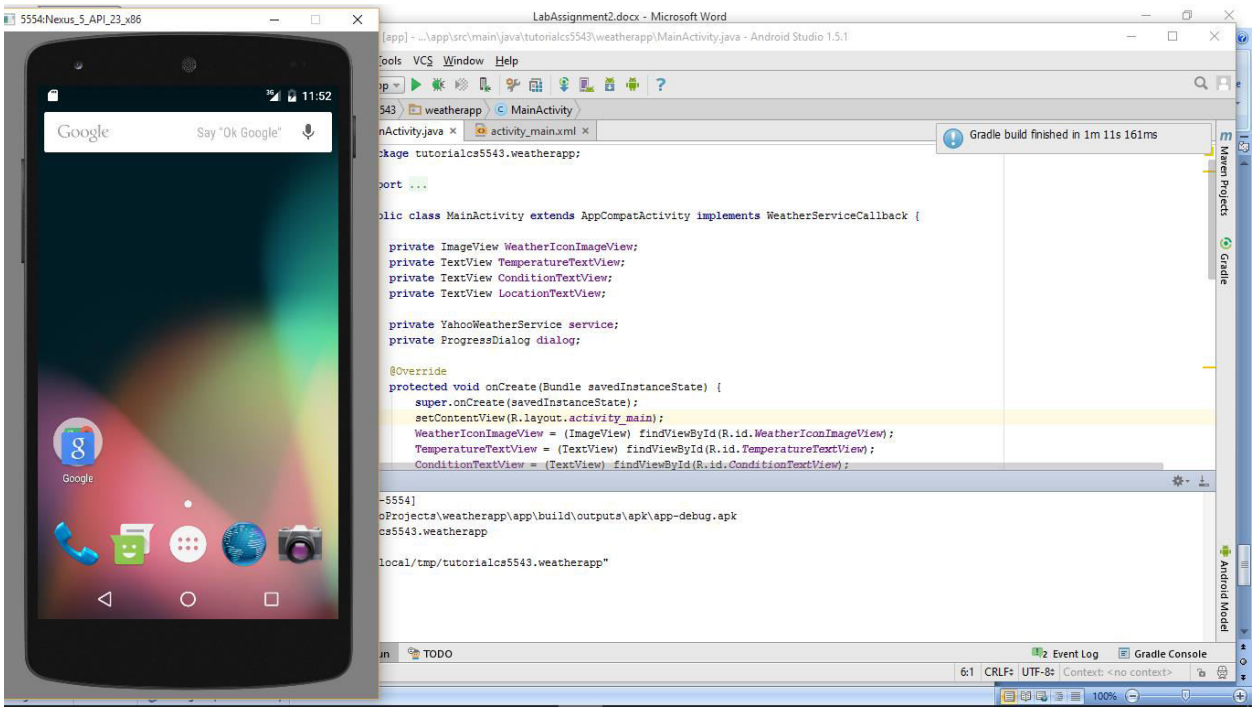

weatherapp - [C:\Users\DEEPU\AndroidStudioProjects\weatherapp] - [app] - ...\app\src\main\java\tutorialcs5543\weatherapp\data\Channel.java - Android Studio 1.5.1
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
MainActivity.java
Channel.java
Condition.java
Item.java
JSONPopulator.java
Units.java
activity_main.xml
package tutorialcs5543.weatherapp.data;
import org.json.JSONObject;
/**
* Created by DEEPU on 1/31/2016.
*/
public class Channel implements JSONPopulator {
private Item item;
private Units units;
public Item getItem() { return item; }
public Units getUnits() { return units; }
@Override
public void populate(JSONObject data) {
units = new Units();
units.populate(data.optJSONObject("units"));
item = new Item();
item.populate(data.optJSONObject("item"));
}
}
Terminal
0: Messages
6: Android Monitor
4: Run
TODO
7 Event Log
Gradle Console
Session 'app': Launched on Nexus_5_API_23_x86 [emulator-5554] (3 minutes ago)
8:14
CRLF:
UTF-8:

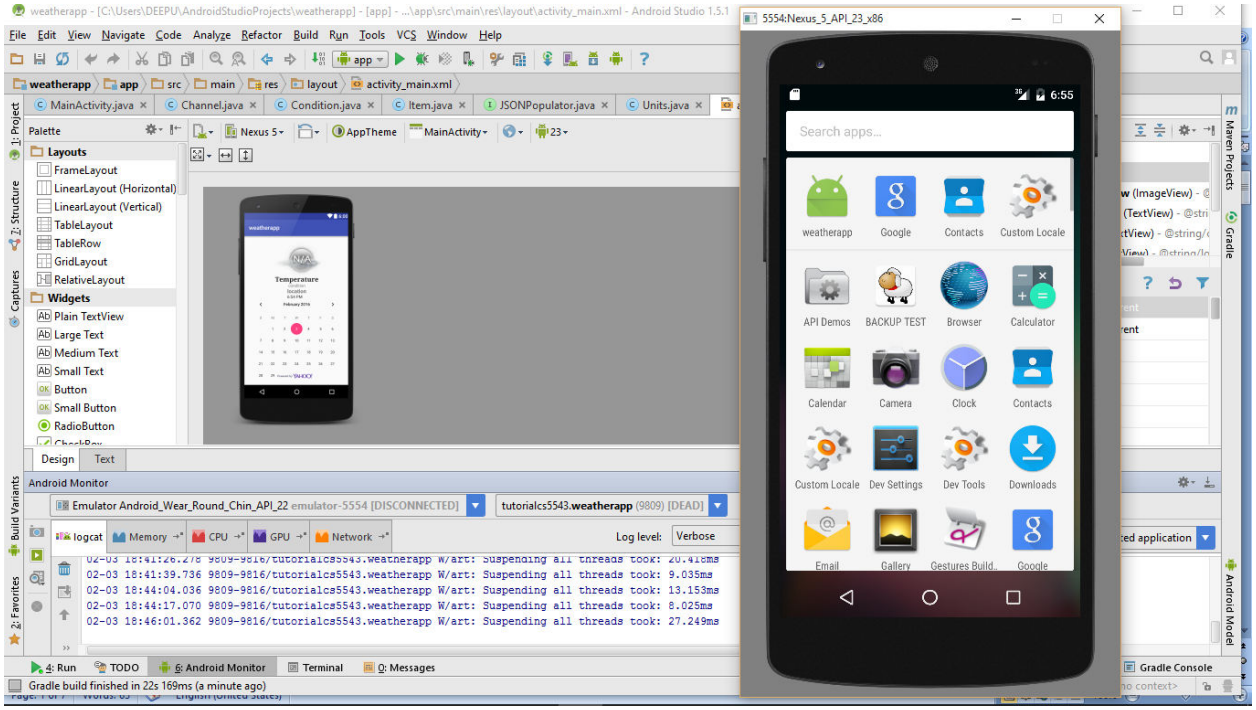

weatherapp - [C:\Users\DEEPU\AndroidStudioProjects\weatherapp] - [app] - ...\app\src\main\java\tutorialcs5543\weatherapp\data\Condition.java - Android Studio 1.5.1
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
MainActivity.java Channel.java Condition.java Item.java JSONPopulator.java Units.java activity_main.xml
package tutorialcs5543.weatherapp.data;
import org.json.JSONObject;
/**
* Created by DEEPU on 1/31/2016.
*/
public class Condition implements JSONPopulator {
private int code;
private int temperature;
private String description;
public int getCode() { return code; }
public int getTemperature() { return temperature; }
public String getDescription() { return description; }
@Override
public void populate(JSONObject data) {
code = data.optInt("code");
temperature=data.optInt("temp");
description=data.optString("text");
}
}
Terminal 0: Messages 6: Android Monitor 4: Run TODO 7 Event Log Gradle Console
Session 'app': Launched on Nexus_5_API_23_x86 [emulator-5554] (4 minutes ago)
8:14 CRLF: UTF-8:

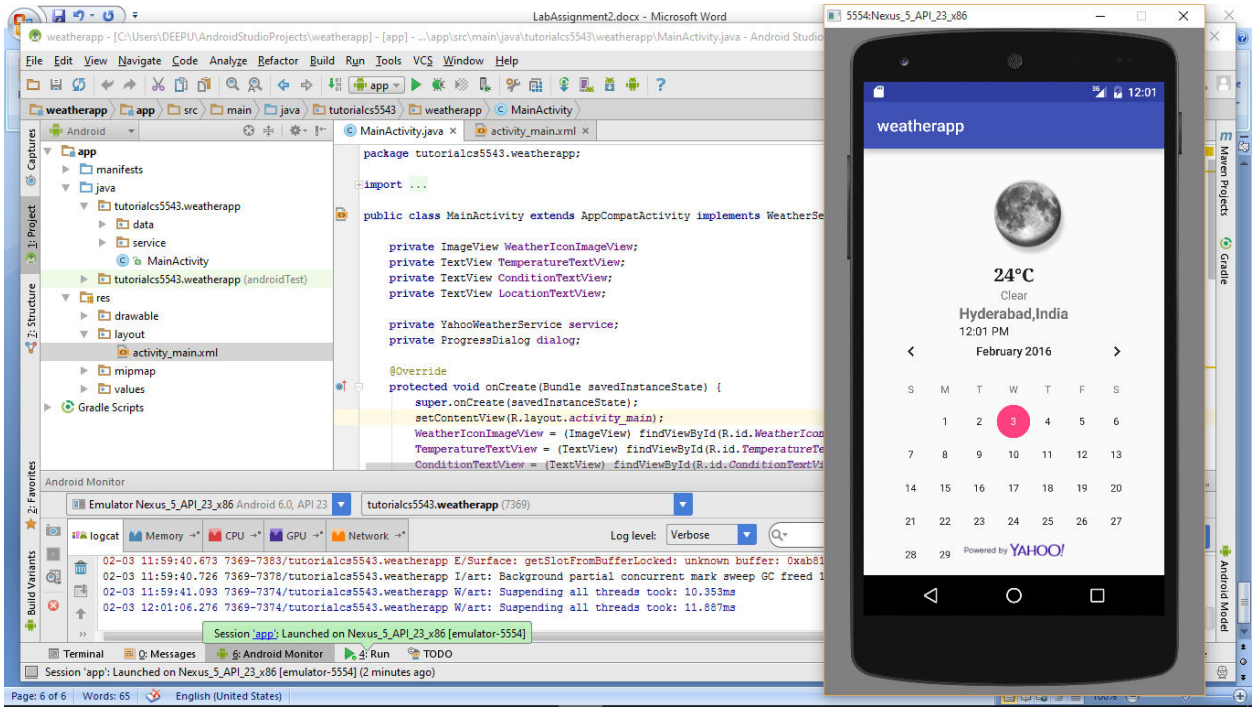

weatherapp - [C:\Users\DEEPU\AndroidStudioProjects\weatherapp] - [app] - ...\app\src\main\java\tutorialcs5543\weatherapp\data\Item.java - Android Studio 1.5.1
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
MainActivity.java Channel.java Condition.java Item.java JSONPopulator.java Units.java activity_main.xml
package tutorialcs5543.weatherapp.data;
import org.json.JSONObject;
/**
* Created by DEEPU on 1/31/2016.
*/
public class Item implements JSONPopulator {
private Condition condition;
public Condition getCondition() { return condition; }
@Override
public void populate(JSONObject data) {
condition= new Condition();
condition.populate(data.optJSONObject("condition"));
}
}
Terminal 0: Messages 6: Android Monitor 4: Run TODO 7 Event Log Gradle Console
Session 'app': Launched on Nexus_5_API_23_x86 [emulator-5554] (4 minutes ago)
9:14 CRLF: UTF-8:

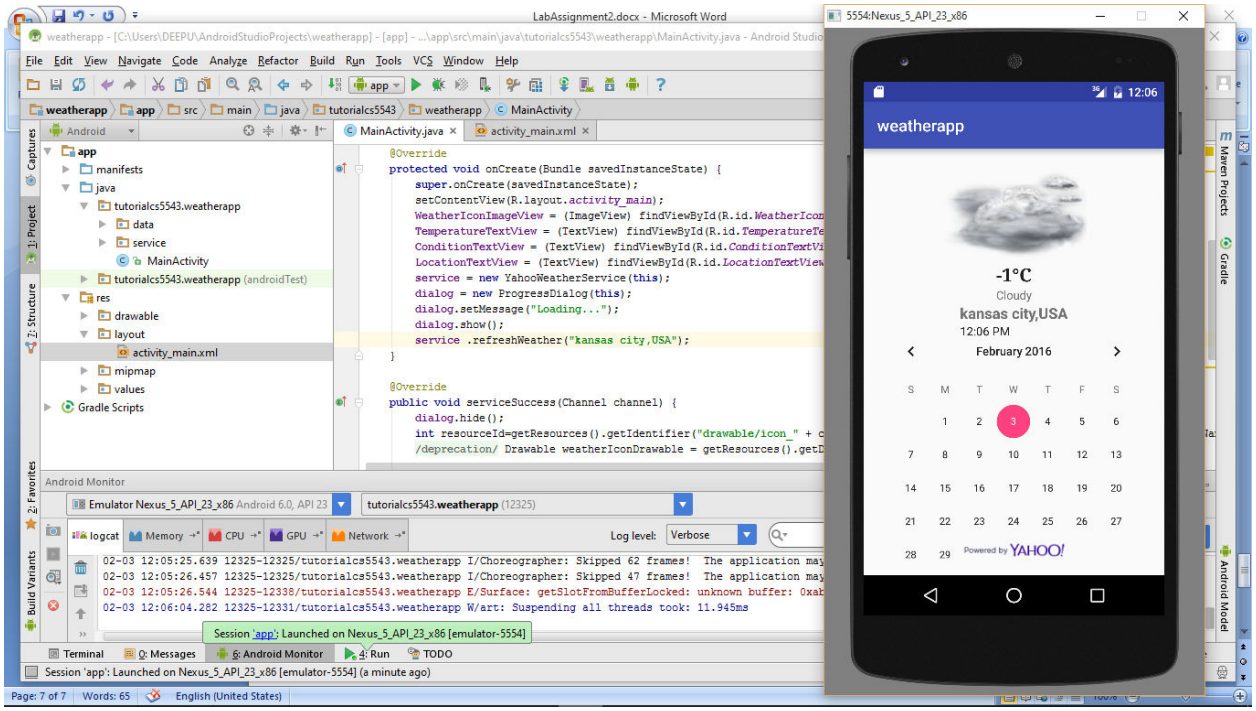

weatherapp - [C:\Users\DEEPU\AndroidStudioProjects\weatherapp] - [app] - ...\app\src\main\java\tutorialcs5543\weatherapp\data\JSONPopulator.java - Android Studio 1.5.1
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
MainActivity.java Channel.java Condition.java Item.java JSONPopulator.java Units.java activity_main.xml
package tutorialcs5543.weatherapp.data;
import org.json.JSONObject;
/**
* Created by DEEPU on 1/31/2016.
*/
public interface JSONPopulator {
void populate(JSONObject data);
}
Terminal 0: Messages 6: Android Monitor 4: Run TODO 7 Event Log Gradle Console
Session 'app': Launched on Nexus_5_API_23_x86 [emulator-5554] (4 minutes ago)

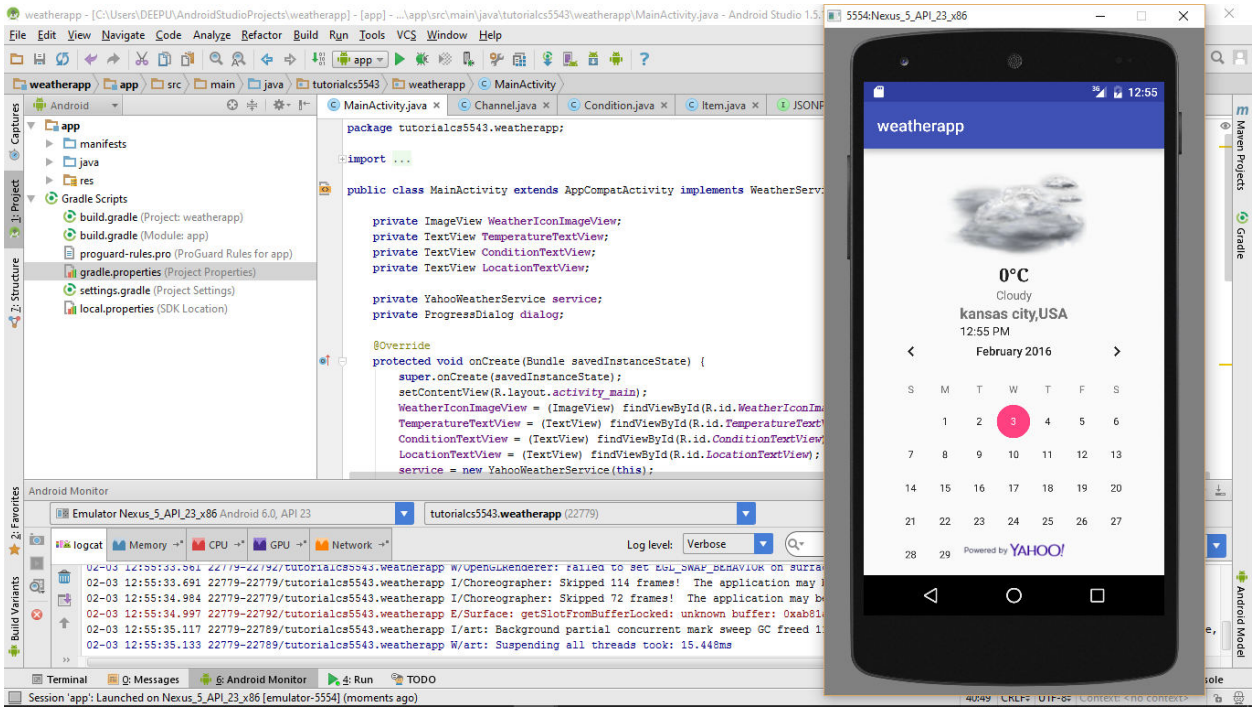

weatherapp - [C:\Users\DEEPU\AndroidStudioProjects\weatherapp] - [app] - ...\app\src\main\java\tutorialcs5543\weatherapp\data\Units.java - Android Studio 1.5.1
File Edit View Navigate Code Analyze Refactor Build Run Tools VCS Window Help
MainActivity.java Channel.java Condition.java Item.java JSONPopulator.java Units.java activity_main.xml
package tutorialcs5543.weatherapp.data;
import org.json.JSONObject;
/**
* Created by DEEPU on 1/31/2016.
*/
public class Units implements JSONPopulator{
private String temperature;
public String getTemperature() { return temperature; }
@Override
public void populate(JSONObject data) {
temperature= data.optString("temperature");
}
}
Terminal 0: Messages 6: Android Monitor 4: Run TODO 7 Event Log Gradle Console
Session 'app': Launched on Nexus_5_API_23_x86 [emulator-5554] (4 minutes ago)

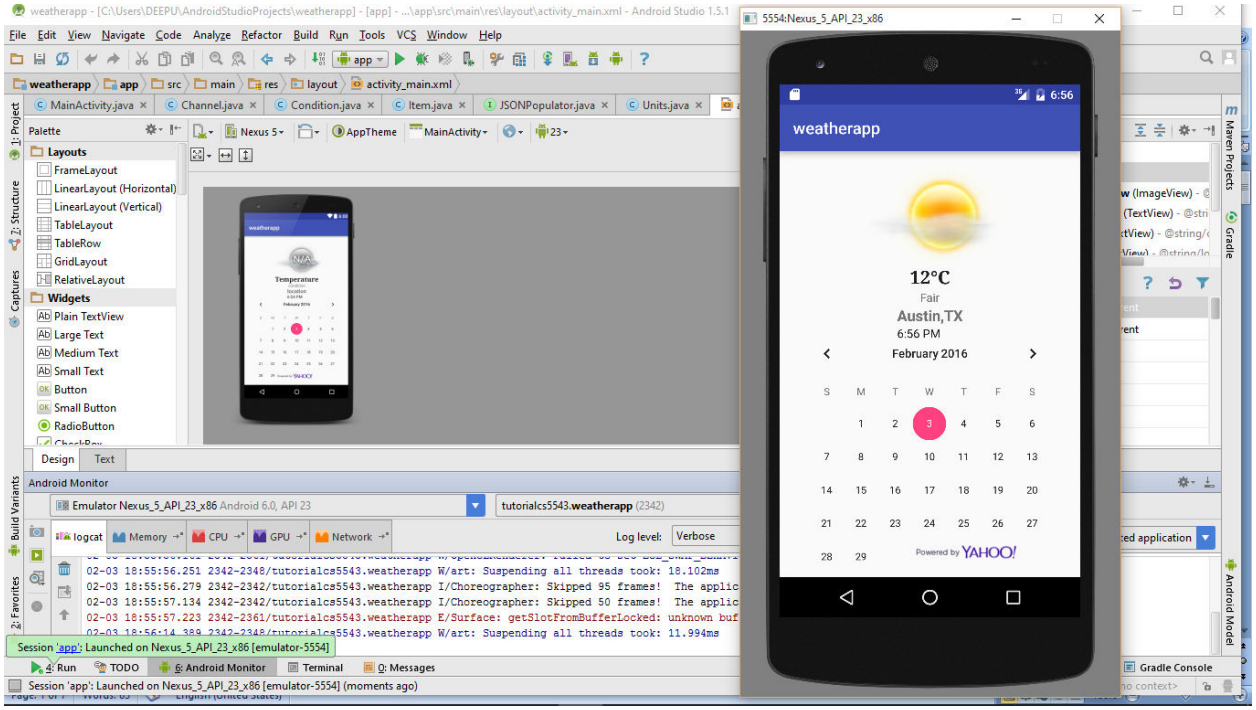

5554:Nexus_5_API_23_x86
LabAssignment2.docx - Microsoft Word
Gradle build finished in 1m 11s 161ms
package tutorialcs5543.weatherapp;
public class MainActivity extends AppCompatActivity implements WeatherServiceCallback {
private ImageView WeatherIconImageView;
private TextView TemperatureTextView;
private TextView ConditionTextView;
private TextView LocationTextView;
private YahooWeatherService service;
private ProgressDialog dialog;
@Override
protected void onCreate(Bundle savedInstanceState) {
super.onCreate(savedInstanceState);
setContentView(R.layout.activity_main);
WeatherIconImageView = (ImageView) findViewById(R.id.WeatherIconImageView);
TemperatureTextView = (TextView) findViewById(R.id.TemperatureTextView);
ConditionTextView = (TextView) findViewById(R.id.ConditionTextView);

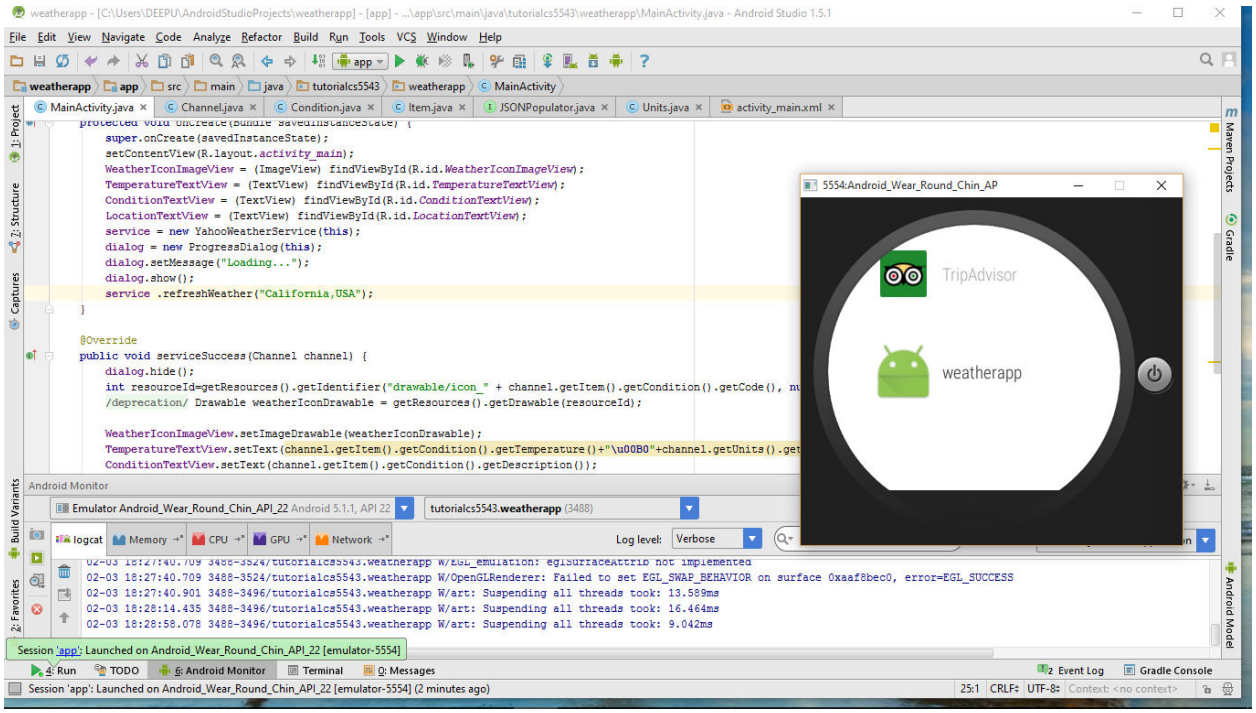

5554:Nexus_5_API_23_x86
Search apps...
weatherapp
Google
Contacts
Custom Locale
API Demos
BACKUP TEST
Browser
Calculator
Calendar
Camera
Clock
Contacts
Custom Locale
Dev Settings
Dev Tools
Downloads
Email
Gallery
Gestures Build
Google
Android Monitor
02-03 18:41:39.736 9809-9816/tutorialcs5543.weatherapp W/art: Suspending all threads took: 9.035ms
02-03 18:44:04.036 9809-9816/tutorialcs5543.weatherapp W/art: Suspending all threads took: 13.153ms
02-03 18:44:17.070 9809-9816/tutorialcs5543.weatherapp W/art: Suspending all threads took: 8.025ms
02-03 18:46:01.362 9809-9816/tutorialcs5543.weatherapp W/art: Suspending all threads took: 27.249ms
Gradle build finished in 22s 169ms (a minute ago)


LabAssignment2.docx - Microsoft Word
5554:Nexus_5_API_23_x86
12:01
weatherapp
24°C
Clear
Hyderabad,India
12:01 PM
February 2016
Powered by YAHOO!

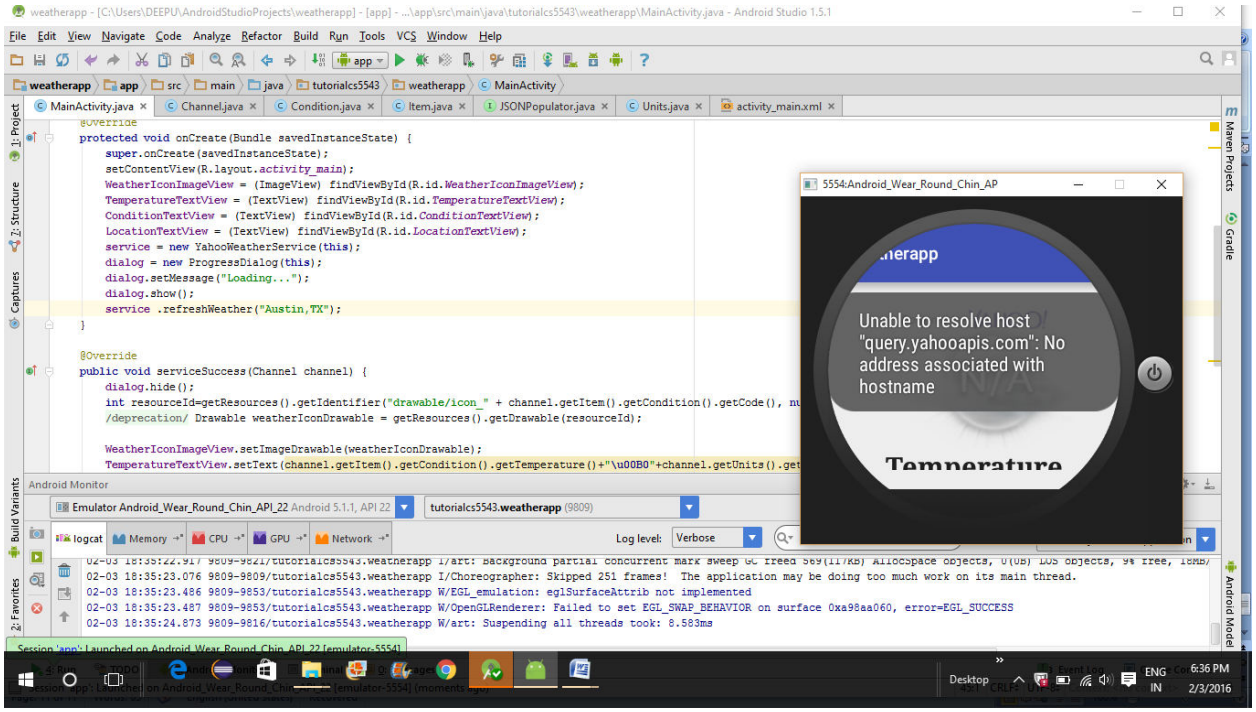

LabAssignment2.docx - Microsoft Word
5554:Nexus_5_API_23_x86
12:06
weatherapp
-1°C
Cloudy
kansas city,USA
12:06 PM
February 2016
Powered by YAHOO!

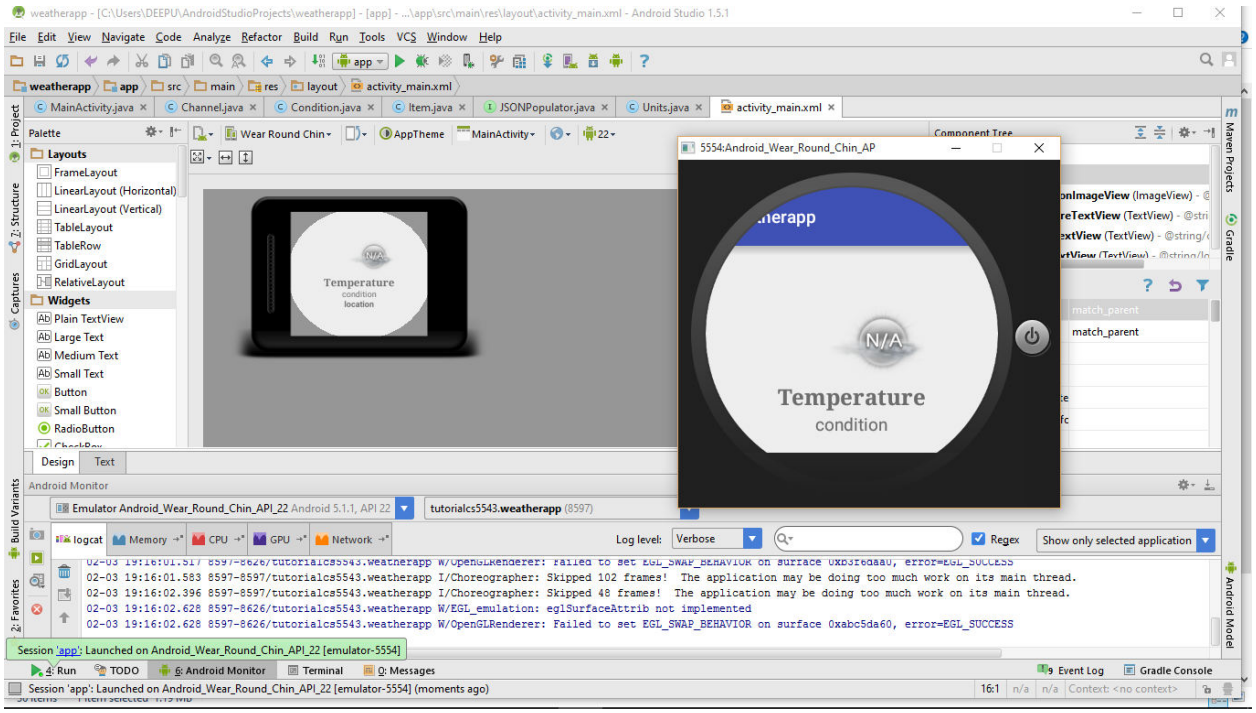

5554:Nexus_5_API_23_x86
12:55
weatherapp
0°C
Cloudy
kansas city,USA
12:55 PM
February 2016
Powered by YAHOO!


5554:Nexus_5_API_23_x86
6:56
weatherapp
12°C
Fair
Austin,TX
6:56 PM
February 2016
Powered by YAHOO!




Although the Application works fine with Android phone, there is some problem with smart watch. There is no error in the code, but its saying unable to resolve host in smart watch.






**Reference**: https://www.youtube.com/watch?v=FkT1kwtYSFU

https://en.wikipedia.org/wiki/K-means_clustering