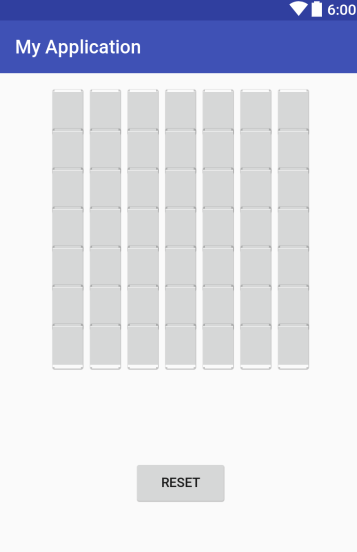
**xml 화면**

*<?***xml version="1.0" encoding="utf-8"***?>*<**LinearLayout  
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 android:id="@+id/activity\_main"  
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 android:layout\_height="match\_parent"  
 android:orientation="vertical"  
 android:gravity="center"**>  
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 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn12"** />  
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 android:layout\_height="60dp"  
 android:id="@+id/result\_btn13"** />  
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 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn14"** />  
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 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn15"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn16"** />  
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 android:layout\_height="60dp"  
 android:id="@+id/result\_btn17"** />  
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 android:layout\_marginRight="10dp"  
 android:layout\_weight="1"  
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 android:id="@+id/result\_btn22"** />  
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 android:id="@+id/result\_btn26"** />  
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 android:layout\_height="60dp"  
 android:id="@+id/result\_btn27"** />  
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 android:layout\_marginRight="10dp"  
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 android:id="@+id/result\_btn33"** />  
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 android:layout\_height="60dp"  
 android:id="@+id/result\_btn34"** />  
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 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
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 android:layout\_height="60dp"  
 android:id="@+id/result\_btn36"** />  
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 android:layout\_width="40dp"  
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 android:id="@+id/result\_btn37"** />  
 </**LinearLayout**>  
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 android:id="@+id/result\_btn42"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn43"** />  
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 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn44"** />  
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 android:layout\_height="60dp"  
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 android:id="@+id/result\_btn46"** />  
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 android:layout\_height="60dp"  
 android:id="@+id/result\_btn47"** />  
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 android:layout\_marginRight="10dp"  
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 android:id="@+id/result\_btn51"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn52"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn53"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn54"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn55"** />  
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 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn56"** />  
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 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn57"** />  
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 <**LinearLayout  
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 android:layout\_marginRight="10dp"  
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 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn63"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn64"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn65"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn66"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn67"** />  
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 android:layout\_marginRight="10dp"  
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 android:id="@+id/result\_btn74"** />  
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 android:id="@+id/result\_btn75"** />  
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 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn76"** />  
 <**Button  
 android:layout\_width="40dp"  
 android:layout\_height="60dp"  
 android:id="@+id/result\_btn77"** />  
  
 </**LinearLayout**>  
 <**LinearLayout  
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 android:orientation="horizontal"  
 android:layout\_marginLeft="10dp"  
 android:layout\_marginRight="10dp"  
 android:layout\_weight="1"  
 android:layout\_marginTop="-50dp"  
 android:layout\_marginBottom="40dp"  
 android:gravity="center"**>  
 <**Button  
 android:layout\_width="100dp"  
 android:layout\_height="50dp"  
 android:text="RESET"  
 android:id="@+id/btnReset"**/>  
 </**LinearLayout**>  
 </**LinearLayout**>  
  
</**LinearLayout**>

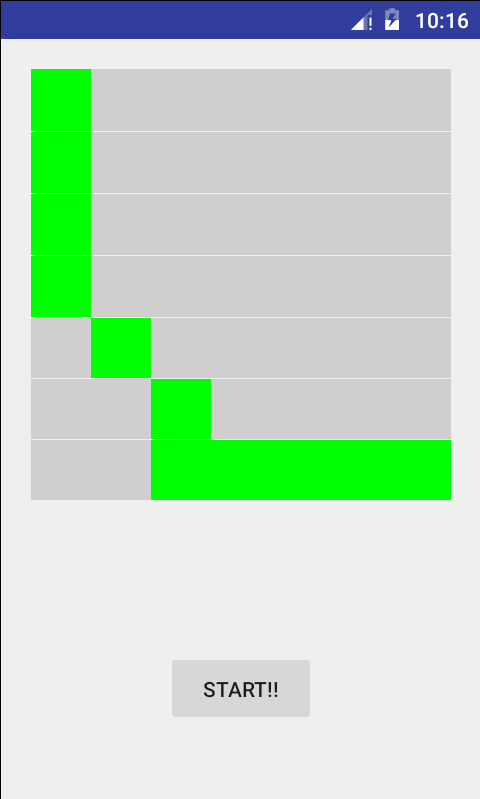
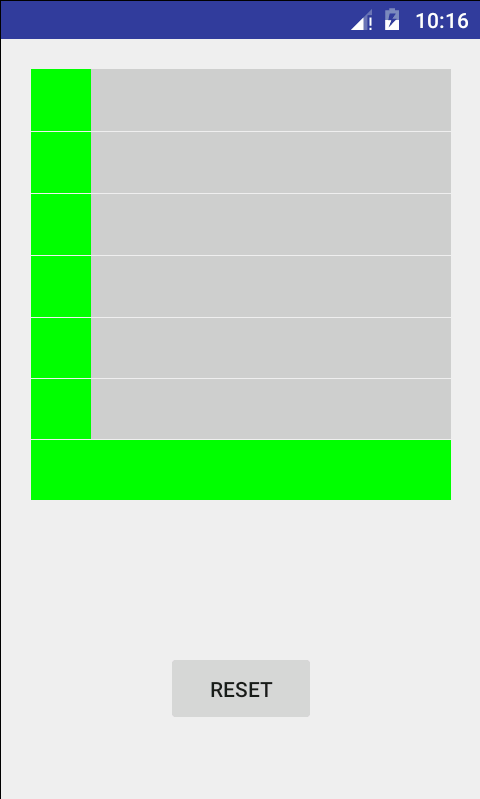
SubActivity.java

**package** com.example.jungwan.myapplication;  
  
**import** android.app.Activity;  
**import** android.content.Intent;  
**import** android.graphics.Color;  
**import** android.os.Bundle;  
**import** android.util.Log;  
**import** android.view.View;  
**import** android.widget.Button;  
**import** java.lang.Math.\*;  
  
*/\*\*  
 \* Created by JungWan on 2016-11-25.  
 \*/***public class** SubActivity **extends** Activity {  
 Button **btn\_output**[] = **new** Button[49]; *//생성한 버튼들의 id를 저장* Button **btnReset**; *//reset버튼* **double pattern1**[] = { *//ㄱ 패턴* 1,1,1,1,1,1,1,  
 0,0,0,0,0,0,1,  
 0,0,0,0,0,0,1,  
 0,0,0,0,0,0,1,  
 0,0,0,0,0,0,1,  
 0,0,0,0,0,0,1,  
 0,0,0,0,0,0,1  
 };  
 **double pattern2**[] = { *//ㄴ 패턴* 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,1,1,1,1,1,1  
 };  
 **double pattern3**[] = { *//ㄷ 패턴* 1,1,1,1,1,1,1,  
 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,1,1,1,1,1,1  
 };  
  
 **double pattern4**[] = { *//ㄹ 패턴* 1,1,1,1,1,1,1,  
 0,0,0,0,0,0,1,  
 0,0,0,0,0,0,1,  
 1,1,1,1,1,1,1,  
 1,0,0,0,0,0,0,  
 1,0,0,0,0,0,0,  
 1,1,1,1,1,1,1  
 };  
  
 **double pattern5**[] = { *//ㅁ 패턴* 1,1,1,1,1,1,1,  
 1,0,0,0,0,0,1,  
 1,0,0,0,0,0,1,  
 1,0,0,0,0,0,1,  
 1,0,0,0,0,0,1,  
 1,0,0,0,0,0,1,  
 1,1,1,1,1,1,1  
 };  
  
 **double pattern6**[] = { *//ㅂ 패턴* 1,0,0,0,0,0,0,1,  
 1,0,0,0,0,0,0,1,  
 1,0,0,0,0,0,0,1,  
 1,1,1,1,1,1,1,1,  
 1,0,0,0,0,0,0,1,  
 1,0,0,0,0,0,0,1,  
 1,1,1,1,1,1,1,1  
 };  
  
 **double pattern7**[] = { *//ㅅ 패턴* 0,0,0,1,0,0,0,  
 0,0,0,1,0,0,0,  
 0,0,1,0,1,0,0,  
 0,0,1,0,1,0,0,  
 0,1,0,0,0,1,0,  
 0,1,0,0,0,1,0,  
 1,0,0,0,0,0,1  
 };  
  
 **double pattern8**[] = { *//ㅇ 패턴* 0,0,1,1,1,0,0,  
 0,1,0,0,0,1,0,  
 1,0,0,0,0,0,1,  
 1,0,0,0,0,0,1,  
 1,0,0,0,0,0,1,  
 0,1,0,0,0,1,0,  
 0,0,1,1,1,0,0  
 };  
  
 *//각 패턴들을 출력패턴 8가지로 임의설정* **double pattern1\_outputLayer**[] = {  
 1,0,0,0,0,0,0,0  
 };  
 **double pattern2\_outputLayer**[] = {  
 0,1,0,0,0,0,0,0  
 };  
 **double pattern3\_outputLayer**[] = {  
 0,0,1,0,0,0,0,0  
 };  
 **double pattern4\_outputLayer**[] = {  
 0,0,0,1,0,0,0,0  
 };  
 **double pattern5\_outputLayer**[] = {  
 0,0,0,0,1,0,0,0  
 };  
 **double pattern6\_outputLayer**[] = {  
 0,0,0,0,0,1,0,0  
 };  
 **double pattern7\_outputLayer**[] = {  
 0,0,0,0,0,0,1,0  
 };  
 **double pattern8\_outputLayer**[] = {  
 0,0,0,0,0,0,0,1  
 };  
  
 *//은닉층 -> 출력층과정에서의 크기사이즈 설정* **int output\_size** = 8;  
  
 *//은닉층의 노드들을 생성* **double pattern\_hiddenLayer1**[] = **new double**[49];  
 **double pattern\_hiddenLayer2**[] = **new double**[49];  
  
 *//입력층의 노드들을 생성* **double pattern\_outputLayer1**[] = **new double**[49];  
 **double pattern\_outputLayer2**[] = **new double**[49];  
 **double pattern\_outputLayer3**[] = **new double**[49];  
 **double pattern\_outputLayer4**[] = **new double**[49];  
 **double pattern\_outputLayer5**[] = **new double**[49];  
 **double pattern\_outputLayer6**[] = **new double**[49];  
 **double pattern\_outputLayer7**[] = **new double**[49];  
 **double pattern\_outputLayer8**[] = **new double**[49];  
  
 *//가중치값을 설정* **double weight1** = 0.001;  
 **double weight2** = 0.003;  
  
 *//입력층 -> 은닉층의 출력값을 구하기 위한 변수 설정* **double total\_inputLayerValue1** = 0.0;  
 **double total\_inputLayerValue2** = 0.0;  
  
 *//은닉층 -> 출력층의 출력값을 구하기 위한 변수 설정* **double total\_outputLayerValue1** = 0.0;  
 **double total\_outputLayerValue2** = 0.0;  
 **double total\_outputLayerValue3** = 0.0;  
 **double total\_outputLayerValue4** = 0.0;  
 **double total\_outputLayerValue5** = 0.0;  
 **double total\_outputLayerValue6** = 0.0;  
 **double total\_outputLayerValue7** = 0.0;  
 **double total\_outputLayerValue8** = 0.0;  
  
 *//입력층 -> 은닉층에 나오는 출력값에서 시그모이드 함수 적용을 하기위한 변수* **double input\_sigmoid1** = 0.0;  
 **double input\_sigmoid2** = 0.0;  
  
 *//은닉층 -> 출력층에 나오는 출력값에서 시그모이드 함수 적용을 하기위한 변수* **double output\_sigmoid1** = 0.0;  
 **double output\_sigmoid2** = 0.0;  
 **double output\_sigmoid3** = 0.0;  
 **double output\_sigmoid4** = 0.0;  
 **double output\_sigmoid5** = 0.0;  
 **double output\_sigmoid6** = 0.0;  
 **double output\_sigmoid7** = 0.0;  
 **double output\_sigmoid8** = 0.0;  
  
 *//출력층 오차계산(델타)한 변수* **double output\_errorCalValue1** = 0.0;  
 **double output\_errorCalValue2** = 0.0;  
 **double output\_errorCalValue3** = 0.0;  
 **double output\_errorCalValue4** = 0.0;  
 **double output\_errorCalValue5** = 0.0;  
 **double output\_errorCalValue6** = 0.0;  
 **double output\_errorCalValue7** = 0.0;  
 **double output\_errorCalValue8** = 0.0;  
  
 *//은닉층 오차계산(델타)한 변수* **double hidden\_errorCalValue1** = 0.0;  
 **double hidden\_errorCalValue2** = 0.0;  
  
 *//출력되는 값을 배열로 저장* **int result\_array**[] = **new int**[49];  
  
 @Override  
 **protected void** onCreate(Bundle savedInstanceState) {  
  
 **super**.onCreate(savedInstanceState);  
 setContentView(R.layout.***activity\_sub***);  
  
 *//버튼들이 기능을 적용시키기 위해 아이디들을 배열로 저장* **int** btn\_id[] = {  
 R.id.***result\_btn11***, R.id.***result\_btn12***, R.id.***result\_btn13***, R.id.***result\_btn14***, R.id.***result\_btn15***, R.id.***result\_btn16***, R.id.***result\_btn17***,  
 R.id.***result\_btn21***, R.id.***result\_btn22***, R.id.***result\_btn23***, R.id.***result\_btn24***, R.id.***result\_btn25***, R.id.***result\_btn26***, R.id.***result\_btn27***,  
 R.id.***result\_btn31***, R.id.***result\_btn32***, R.id.***result\_btn33***, R.id.***result\_btn34***, R.id.***result\_btn35***, R.id.***result\_btn36***, R.id.***result\_btn37***,  
 R.id.***result\_btn41***, R.id.***result\_btn42***, R.id.***result\_btn43***, R.id.***result\_btn44***, R.id.***result\_btn45***, R.id.***result\_btn46***, R.id.***result\_btn47***,  
 R.id.***result\_btn51***, R.id.***result\_btn52***, R.id.***result\_btn53***, R.id.***result\_btn54***, R.id.***result\_btn55***, R.id.***result\_btn56***, R.id.***result\_btn57***,  
 R.id.***result\_btn61***, R.id.***result\_btn62***, R.id.***result\_btn63***, R.id.***result\_btn64***, R.id.***result\_btn65***, R.id.***result\_btn66***, R.id.***result\_btn67***,  
 R.id.***result\_btn71***, R.id.***result\_btn72***, R.id.***result\_btn73***, R.id.***result\_btn74***, R.id.***result\_btn75***, R.id.***result\_btn76***, R.id.***result\_btn77*** };  
  
 *//사용자가 클릭한 버튼들의 값을 넘겨받아 대입하는 변수* Intent intent = getIntent();  
 **double** getResult[] = intent.getDoubleArrayExtra(**"array"**);  
  
 *//각 버튼들의 id등록* **for**(**int** i=0; i<**btn\_output**.**length**; i++){  
 **btn\_output**[i] = (Button)findViewById(btn\_id[i]);  
 }  
  
 **while**(**true**) {  
 pattern1\_function(getResult);  
 pattern2\_function(getResult);  
 pattern3\_function(getResult);  
 pattern4\_function(getResult);  
 pattern5\_function(getResult);  
 pattern6\_function(getResult);  
 pattern7\_function(getResult);  
 pattern8\_function(getResult);  
 **if**(**hidden\_errorCalValue1** < -1.0 || **hidden\_errorCalValue1** > 1.0){  
 *//hidden\_errorCalValue1 = 1 - hidden\_errorCalValue1;* **weight1** += 0.001;  
 **continue**;  
 }**else if**(**hidden\_errorCalValue2** < -1.0 || **hidden\_errorCalValue2** > 1.0) {  
 *//hidden\_errorCalValue2 = 1 - hidden\_errorCalValue2;* **weight2** += 0.001;  
 **continue**;  
 }**else if**((**hidden\_errorCalValue1** > -1.0 && **hidden\_errorCalValue2** > -1.0) || ((**weight1** > 1) || (**weight2** > 1)) )  
 **break**;  
 }  
  
 **for**(**int** i=0; i<**btn\_output**.**length**; i++){  
 **if**(getResult[i] == 0){  
 **btn\_output**[i].setBackgroundColor(Color.*rgb*(204,204,204));  
 **result\_array**[i] = 0;  
 }**else**{  
 **btn\_output**[i].setBackgroundColor(Color.*rgb*(0,255,0));  
 **result\_array**[i] = 1;  
 }  
 }  
  
 *//reset버튼의 기능을 부가하기 위한 설정* **btnReset** = (Button)findViewById(R.id.***btnReset***);  
  
 *//reset버튼의 적용* **btnReset**.setOnClickListener(**new** View.OnClickListener() {  
 @Override  
 **public void** onClick(View view) {  
 Intent intent = **new** Intent(SubActivity.**this**, MainActivity.**class**);  
 startActivity(intent);  
 finish();  
 }  
 });  
 }  
  
 *//패턴1의 오류역전파 알고리즘을 적용* **public void** pattern1\_function(**double**[] result){  
 **for**(**int** i=0; i<**btn\_output**.**length**; i++){  
 **pattern\_hiddenLayer1**[i] = (**weight1**\*result[i]) \* 1;  
 **total\_inputLayerValue1** += **pattern\_hiddenLayer1**[i];  
 **pattern\_hiddenLayer2**[i] = (**weight2**\*result[i]) \* 1;  
 **total\_inputLayerValue2** += **pattern\_hiddenLayer2**[i];  
  
 }  
  
 *//입력층 -> 은닉층으로 시그모이드함수 적용한 값* **input\_sigmoid1** = sigmoid\_function(**total\_inputLayerValue1**);  
 **input\_sigmoid2** = sigmoid\_function(**total\_inputLayerValue2**);  
  
 *//은닉층 -> 출력층으로 시그모이드함수 적용한 값* **for**(**int** i=0; i<**output\_size**; i++){  
 **pattern\_outputLayer1**[i] = ((**input\_sigmoid1**\***weight1**)+(**input\_sigmoid2**\***weight2**));  
 **total\_outputLayerValue1** += **pattern\_outputLayer1**[i];  
 **pattern\_outputLayer2**[i] = ((**input\_sigmoid1**\***weight1**)+(**input\_sigmoid2**\***weight2**));  
 **total\_outputLayerValue2** += **pattern\_outputLayer2**[i];  
 **pattern\_outputLayer3**[i] = ((**input\_sigmoid1**\***weight1**)+(**input\_sigmoid2**\***weight2**));  
 **total\_outputLayerValue3** += **pattern\_outputLayer3**[i];  
 **pattern\_outputLayer4**[i] = ((**input\_sigmoid1**\***weight1**)+(**input\_sigmoid2**\***weight2**));  
 **total\_outputLayerValue4** += **pattern\_outputLayer4**[i];  
 **pattern\_outputLayer5**[i] = ((**input\_sigmoid1**\***weight1**)+(**input\_sigmoid2**\***weight2**));  
 **total\_outputLayerValue5** += **pattern\_outputLayer5**[i];  
 **pattern\_outputLayer6**[i] = ((**input\_sigmoid1**\***weight1**)+(**input\_sigmoid2**\***weight2**));  
 **total\_outputLayerValue6** += **pattern\_outputLayer6**[i];  
 **pattern\_outputLayer7**[i] = ((**input\_sigmoid1**\***weight1**)+(**input\_sigmoid2**\***weight2**));  
 **total\_outputLayerValue7** += **pattern\_outputLayer7**[i];  
 **pattern\_outputLayer8**[i] = ((**input\_sigmoid1**\***weight1**)+(**input\_sigmoid2**\***weight2**));  
 **total\_outputLayerValue8** += **pattern\_outputLayer8**[i];  
 }  
  
 *//각 출력층에서 시그모이드 식을 적용* **output\_sigmoid1** = sigmoid\_function(**total\_outputLayerValue1**);  
 **output\_sigmoid2** = sigmoid\_function(**total\_outputLayerValue2**);  
 **output\_sigmoid3** = sigmoid\_function(**total\_outputLayerValue3**);  
 **output\_sigmoid4** = sigmoid\_function(**total\_outputLayerValue4**);  
 **output\_sigmoid5** = sigmoid\_function(**total\_outputLayerValue5**);  
 **output\_sigmoid6** = sigmoid\_function(**total\_outputLayerValue6**);  
 **output\_sigmoid7** = sigmoid\_function(**total\_outputLayerValue7**);  
 **output\_sigmoid8** = sigmoid\_function(**total\_outputLayerValue8**);  
  
 *//출력층 오차계산(델타)한 결과를 저장* **output\_errorCalValue1** = (**output\_sigmoid1**\*(1-**output\_sigmoid1**)\*(**pattern1\_outputLayer**[0]-**output\_sigmoid1**));  
 **output\_errorCalValue2** = (**output\_sigmoid2**\*(1-**output\_sigmoid2**)\*(**pattern1\_outputLayer**[1]-**output\_sigmoid2**));  
 **output\_errorCalValue3** = (**output\_sigmoid3**\*(1-**output\_sigmoid3**)\*(**pattern1\_outputLayer**[2]-**output\_sigmoid3**));  
 **output\_errorCalValue4** = (**output\_sigmoid4**\*(1-**output\_sigmoid4**)\*(**pattern1\_outputLayer**[3]-**output\_sigmoid4**));  
 **output\_errorCalValue5** = (**output\_sigmoid5**\*(1-**output\_sigmoid5**)\*(**pattern1\_outputLayer**[4]-**output\_sigmoid5**));  
 **output\_errorCalValue6** = (**output\_sigmoid6**\*(1-**output\_sigmoid6**)\*(**pattern1\_outputLayer**[5]-**output\_sigmoid6**));  
 **output\_errorCalValue7** = (**output\_sigmoid7**\*(1-**output\_sigmoid7**)\*(**pattern1\_outputLayer**[6]-**output\_sigmoid7**));  
 **output\_errorCalValue8** = (**output\_sigmoid8**\*(1-**output\_sigmoid8**)\*(**pattern1\_outputLayer**[7]-**output\_sigmoid8**));  
  
 *//은닉층 오차계산(델타)한 결과들을 저장* **hidden\_errorCalValue1** = (**total\_inputLayerValue1** \* (1-**total\_inputLayerValue1**)  
 + ((**output\_errorCalValue1**\*1) + (**output\_errorCalValue2**\*1) + (**output\_errorCalValue3**\*1) + (**output\_errorCalValue4**\*1)  
 + (**output\_errorCalValue5**\*1) + (**output\_errorCalValue6**\*1) + (**output\_errorCalValue7**\*1) + (**output\_errorCalValue8**\*1)));  
  
  
 **hidden\_errorCalValue2** = (**total\_inputLayerValue2** \* (1-**total\_inputLayerValue2**)  
 + ((**output\_errorCalValue1**\*1) + (**output\_errorCalValue2**\*1) + (**output\_errorCalValue3**\*1) + (**output\_errorCalValue4**\*1)  
 + (**output\_errorCalValue5**\*1) + (**output\_errorCalValue6**\*1) + (**output\_errorCalValue7**\*1) + (**output\_errorCalValue8**\*1)));  
   
 }

}

=> 패턴 ㄴ,ㄷ….마찬가지로 함수에 적용

결과화면



입력층의 노드 수 : 49개

은닉층의 노드 수 : 2개

출력층의 노드 수 : 8개

Weight 수의 변화 : 시그모이드 활성화 함수를 통해서 값들이 변화

변경 전

D/final\_result1: -0.601137263913642

변경 후

D/final\_result2: -0.482865263913642