

Part 1: Pattern File Creation

a. Seven-Segment Display Encoding

Using the segment numbering from the display (segments 1-7), I'll encode each character as a 7-bit binary vector where 1 means the segment is lit:

Numbers:

- **0:** Segments 1,2,3,4,5,6 \rightarrow 1 1 1 1 1 1 0
- **1:** Segments 2,3 \rightarrow 0 1 1 0 0 0 0
- **2:** Segments 1,2,4,5,7 \rightarrow 1 1 0 1 1 0 1
- **3:** Segments 1,2,3,4,7 \rightarrow 1 1 1 1 0 0 1
- **4:** Segments 2,3,6,7 \rightarrow 0 1 1 0 0 1 1
- **5:** Segments 1,3,4,6,7 \rightarrow 1 0 1 1 0 1 1
- **6:** Segments 1,3,4,5,6,7 \rightarrow 1 0 1 1 1 1 1
- **7:** Segments 1,2,3 \rightarrow 1 1 1 0 0 0 0
- **8:** Segments 1,2,3,4,5,6,7 \rightarrow 1 1 1 1 1 1 1
- **9:** Segments 1,2,3,4,6,7 \rightarrow 1 1 1 1 0 1 1

Letters:

- **A:** Segments 1,2,3,5,6,7 \rightarrow 1 1 1 0 1 1 1
- **B:** Segments 3,4,5,6,7 \rightarrow 0 0 1 1 1 1 1
- **C:** Segments 1,4,5,6 \rightarrow 1 0 0 1 1 1 0
- **D:** Segments 2,3,4,5,7 \rightarrow 0 1 1 1 1 0 1
- **E:** Segments 1,4,5,6,7 \rightarrow 1 0 0 1 1 1 1
- **F:** Segments 1,5,6,7 \rightarrow 1 0 0 0 1 1 1
- **H:** Segments 2,3,5,6,7 \rightarrow 0 1 1 0 1 1 1

b. ASCII Binary Encoding (7-bit)

Converting ASCII values to 7-bit binary:

- **0** (48): 0110000
- **1** (49): 0110001
- **2** (50): 0110010
- **3** (51): 0110011
- **4** (52): 0110100
- **5** (53): 0110101
- **6** (54): 0110110
- **7** (55): 0110111
- **8** (56): 0111000
- **9** (57): 0111001
- **A** (65): 1000001
- **B** (66): 1000010
- **C** (67): 1000011
- **D** (68): 1000100
- **E** (69): 1000101
- **F** (70): 1000110
- **H** (72): 1001000

C. COMPLETE PATTERN FILE

Number of patterns = 17

Number of inputs = 7

Number of outputs = 7

[patterns]

```

1 1 1 1 1 1 0  0 1 1 0 0 0 0
0 1 1 0 0 0 0  0 1 1 0 0 0 1
1 1 0 1 1 0 1  0 1 1 0 0 1 0
1 1 1 1 0 0 1  0 1 1 0 0 1 1
0 1 1 0 0 1 1  0 1 1 0 1 0 0
1 0 1 1 0 1 1  0 1 1 0 1 0 1
1 0 1 1 1 1 1  0 1 1 0 1 1 0

```

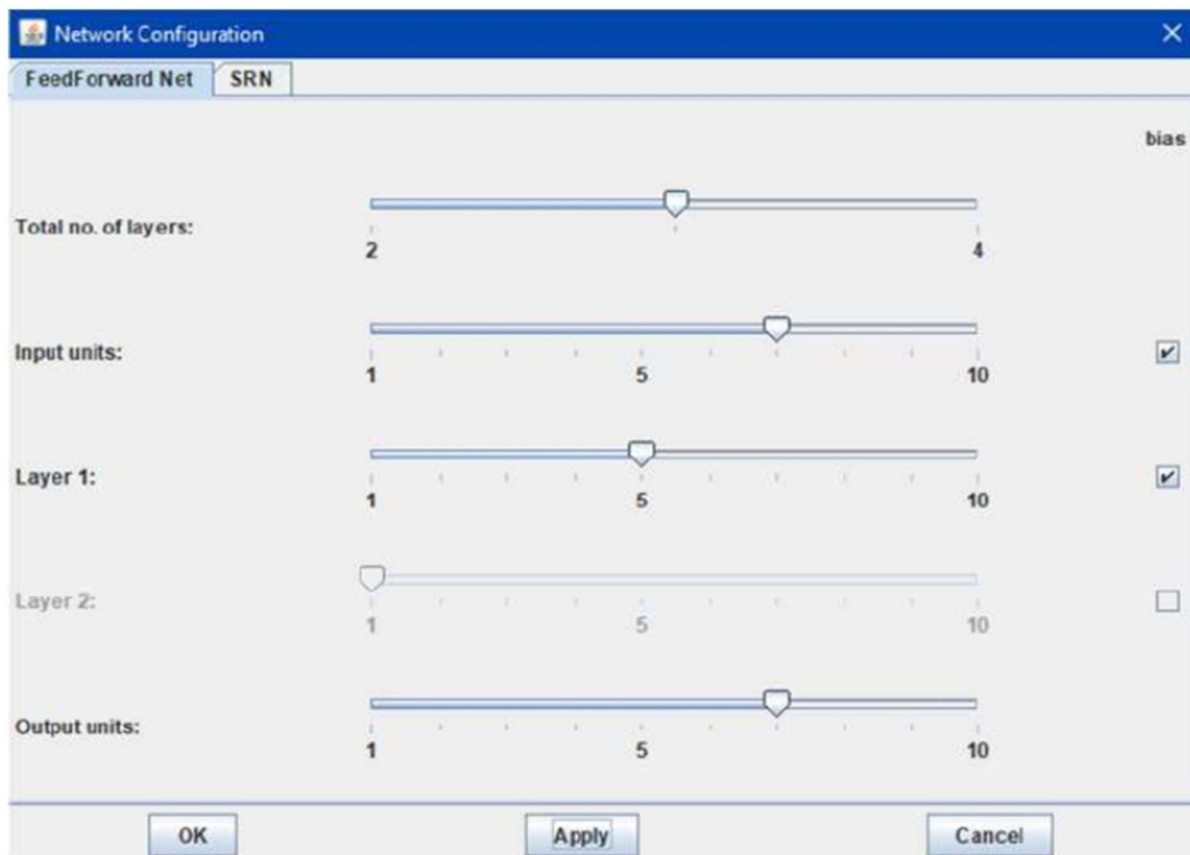
```

1 1 1 0 0 0 0 0 1 1 0 1 1 1
1 1 1 1 1 1 1 1 0 1 1 1 0 0 0
1 1 1 1 0 1 1 1 0 1 1 1 0 0 1
1 1 1 0 1 1 1 1 1 0 0 0 0 0 1
0 0 1 1 1 1 1 1 1 0 0 0 0 1 0
1 0 0 1 1 1 0 1 1 0 0 0 0 1 1
0 1 1 1 1 0 1 1 1 0 0 0 1 0 0
1 0 0 1 1 1 1 1 1 0 0 0 1 0 1
1 0 0 0 1 1 1 1 1 0 0 0 1 1 0
0 1 1 0 1 1 1 1 1 0 0 1 0 0 0

```

Part 2: Create the network

- Configure the network by going to the network menu and choosing configure network from the list of options.



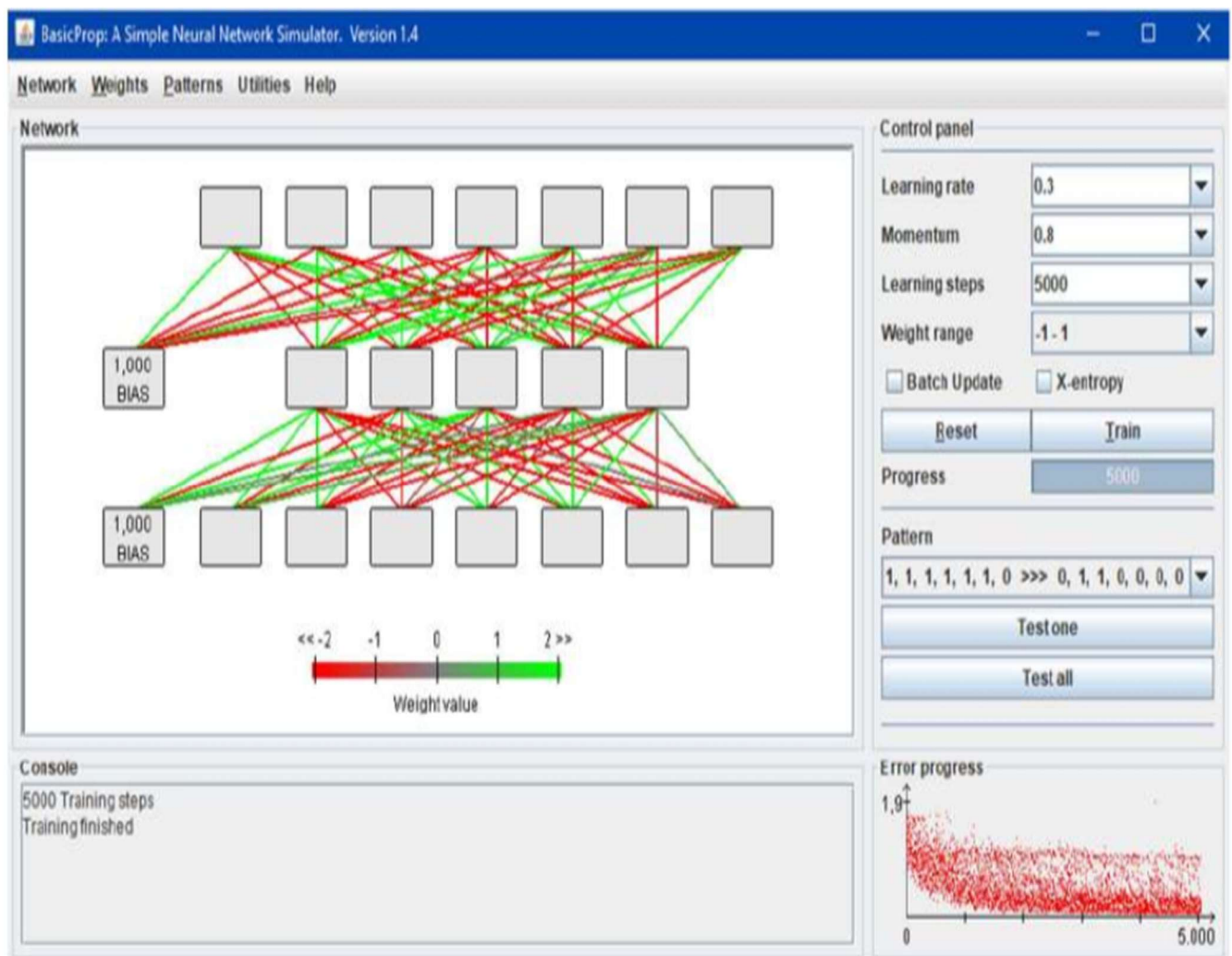
Total no. of layers = 3;

Input units = 7;

Layer 1 = 5;

Output units = 7.

- b. Train the network by loading in your pattern file. This can be done by going to the Patterns dropdown menu and choosing Load Patterns. Then choose the file that you created from part 1.**



[Weights]

Number of layers = 2

[Layer0]

Number to = 5

Number from = 8

3,241 5,188 3,745 -6,759 2,922 -1,564 -7,853 -4,2
 -2,393 -3,857 8,716 -4,378 4,021 6,52 -4,999 -0,074
 5,339 2,312 -2,272 -0,692 2,752 5,209 -8,919 -3,841
 0,465 -5,337 -2,787 -0,769 -3,449 3,001 9,891 -4,325
 0,974 0,821 -4,671 -7,768 -1,516 3,825 -0,784 0,728

[Layer1]

Number to = 7

Number from = 6

2,222 -3,479 -1,938 -7,76 6,184 6,142
 -2,212 3,525 1,901 7,689 -6,002 -6,281
 -2,209 3,555 1,883 7,677 -5,954 -6,341
 -4,88 -3,382 7,412 -2,57 -1,058 -2,482
 4,581 -5,411 -8,249 4,371 -7,843 4,023
 -0,863 11,769 -9,671 0,696 5,28 -2,351
 -7,871 7,505 -1,853 8,794 -5,364 5,611

c. Test the model by choosing individual patterns and Clicking the Test one button.

Pattern: " 1, 1, 1, 1, 1, 1, 0 >>> 0, 1, 1, 0, 0, 0, 0 "

Result: " 0,03, 0,97, 0,97, 0,14, 0, 0,06, 0,04 "

Pattern: " 1, 1, 1, 1, 1, 1, 0 >>> 0, 1, 1, 0, 0, 0, 0 "

Result: " 0,03, 0,97, 0,97, 0,14, 0, 0,06, 0,04 "

Pattern: " 1, 1, 1, 1, 1, 1, 0 >>> 0, 1, 1, 0, 0, 0, 0 "

Result: " 0,03, 0,97, 0,97, 0,14, 0, 0,06, 0,04 "

Test All: Average per pattern error: 0.04022113387017110