

# **Lumped Deep Learning - City Development**

2024/1/16

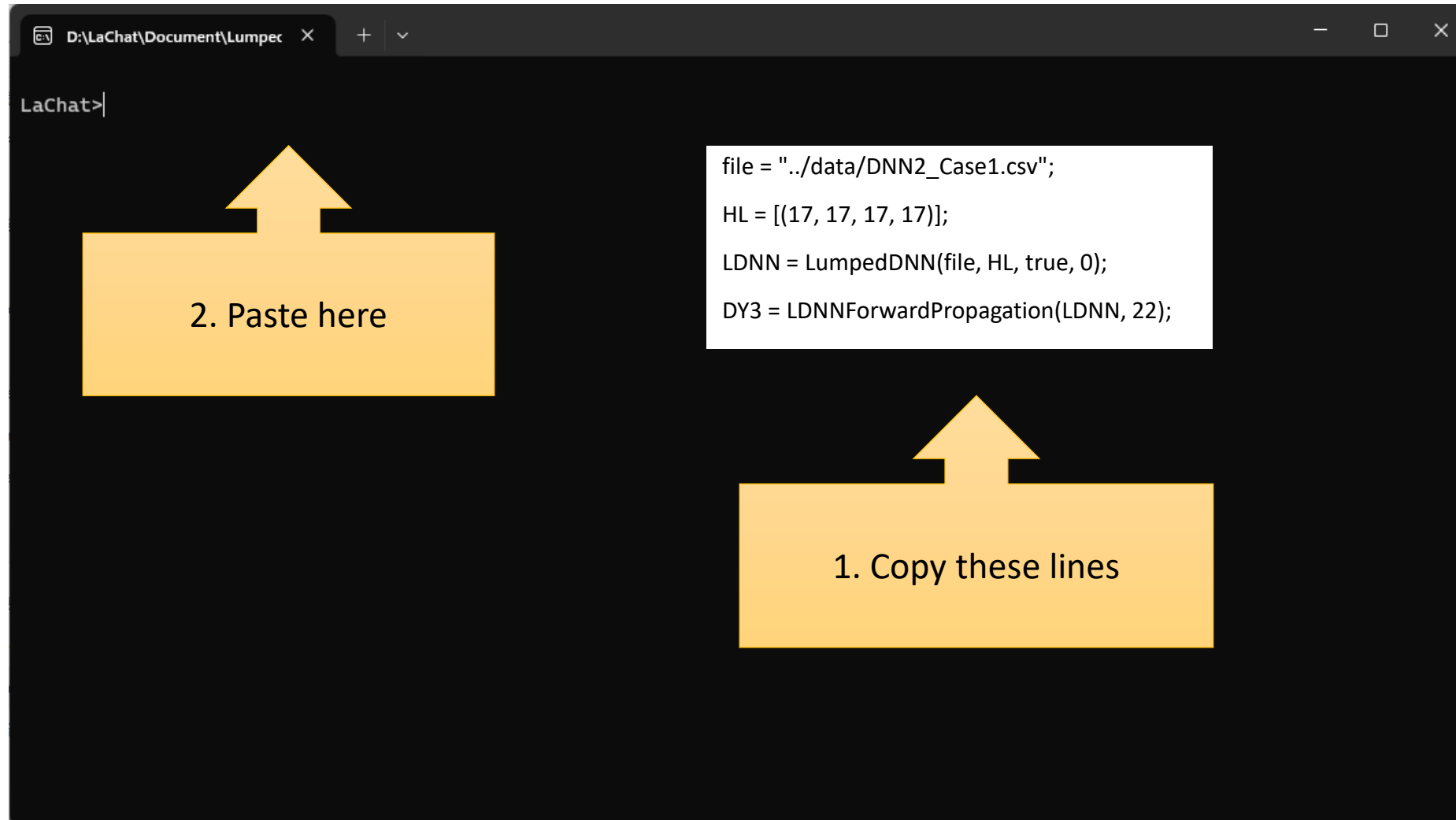
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# Case 1

# Execute Lachat.exe (Console application)



# Execute Lachat.exe (Verification)

LaChat>

2. Paste here

```
1 ///////////////////////////////////////////////////TRAINING//////////////////////////////////////
2 EtaStart = 0.002;
3 EtaEnd = 0.005;
4 Alpha = 0.1;
5 BetaStart = 0.002;
6 BetaEnd = 0.005;
7 InitWeight = 0.38;
8 file = "../data/DNN2_Case1T.csv";
9 HL = [(17, 17, 17, 17)];
10 LDNN = LumpedDNN(file, HL, false, InitWeight);
11 DY3 = LDNNLumpedLearning(LDNN, EtaStart, EtaEnd, Alpha, BetaStart, BetaEnd, 5, 0.01);
12
13 ///////////////////////////////////////////////////RESULT//////////////////////////////////////
14 file = "../data/DNN2_Case1.csv";
15 HL = [(17, 17, 17, 17)];
16 LDNN = LumpedDNN(file, HL, true, 0);
17 DY3 = LDNNForwardPropagation(LDNN, 22);
18
19
```

1. Copy the lines

# Execute Lachat.exe (Training)

The image shows a terminal window on the left and a Notepad++ editor on the right. The terminal window has a tab labeled 'D:\LaChat\Document\Lumpec' and a prompt 'LaChat>'. An orange arrow points from a yellow box labeled '2. Paste here' to the terminal prompt. The Notepad++ editor has a tab labeled 'D:\LaChat\bin\data\DNN2\_Case1.txt - Notepad++'. It contains a C++ code file named 'DNN2\_Case1.txt'. An orange arrow points from a yellow box labeled '1. Copy the lines' to the code in the editor. The code is as follows:

```
1  ///////////////////////////////////TRAINING////////////////////////////////////
2  EtaStart = 0.002;
3  EtaEnd = 0.005;
4  Alpha = 0.1;
5  BetaStart = 0.002;
6  BetaEnd = 0.005;
7  InitWeight = 0.38;
8  file = "../data/DNN2_Case1T.csv";
9  HL = [(17, 17, 17, 17)];
10 LDNN = LumpedDNN(file, HL, false, InitWeight);
11 DY3 = LDNNLumpedLearning(LDNN, EtaStart, EtaEnd, Alpha, BetaStart, BetaEnd, 5, 0.01);
12
13 ///////////////////////////////////RESULT////////////////////////////////////
14 file = "../data/DNN2_Case1R.csv";
15 HL = [(17, 17, 17, 17)];
16 LDNN = LumpedDNN(file, HL, false, InitWeight);
17 DY3 = LDNNLumpedLearning(LDNN, EtaStart, EtaEnd, Alpha, BetaStart, BetaEnd, 5, 0.01);
18
19
```

# Results (Verification)

```
D:\LaChat\Document\Lumpec X + -
0.088 0.406 0.115 0.249 0.355 -0.302 0.282 0.030 0.028 0.106 -0.064 -0.616 0.216 -0.293 -0.266 0.157 -0.346
-0.811 -0.009 -0.076 0.701 -1.690 0.724 0.623 -1.479 -1.120 0.268 -3.193 -0.248 -0.001 -0.457 0.657 -0.242 0.566
-1.055 -0.008 0.850 0.430 0.637 0.130 0.940 -1.543 -1.408 0.242 -0.816 0.436 1.459 0.292 0.818 -1.370 -0.978
0.172 -0.131 0.162 0.759 0.118 -0.029 0.280 -0.878 -0.051 -0.021 -2.284 -0.698 0.707 0.036 0.669 -0.729 -0.108
-1.829 -0.556 1.474 -0.299 2.189 0.070 0.410 -1.893 -1.804 0.205 1.320 -0.488 1.526 0.793 0.859 -0.045 -1.486
-0.149 0.081 -0.069 0.155 -0.973 -0.390 0.462 -0.672 -0.105 0.042 -0.081 -1.633 0.889 -0.178 0.027 2.499 -0.244
0.868 1.010 -1.824 -0.097 -3.544 0.822 0.254 0.067 0.780 0.096 -1.810 2.010 -1.980 -1.544 -1.243 -0.637 1.707
-0.287 0.224 0.067 0.490 -0.443 0.466 0.442 -0.706 -0.578 0.163 -1.809 0.827 0.223 -0.118 0.467 -1.733 0.102
-0.789 -0.189 0.239 0.016 -0.727 0.089 0.196 -0.836 -0.675 0.031 -0.498 -0.946 0.397 0.124 0.454 1.434 0.112
-0.422 0.011 0.999 0.728 1.721 -0.476 0.440 -0.475 -0.763 0.112 -0.752 -0.057 1.513 0.742 0.850 -1.820 -0.895
1.448 0.389 1.535 1.156 8.636 -3.809 1.716 -0.519 0.937 -0.193 3.214 -2.665 5.131 0.126 0.823 -1.969 -4.793
Cost = 0.018918 0.054215

DY3 =
-0.051 -0.067 -0.050 -0.066 -0.070 -0.065 -0.051 -0.072 -0.056 -0.063 -0.063 -0.055 -0.064 -0.053 -0.071 -0.055 -0.054 -0.055 -0.060 -0.074 -0.051
0.120
0.003 0.003 0.003 0.003 0.003 0.004 0.003 0.003 0.004 -0.001 -0.003 0.000 -0.003 -0.003 -0.000 -0.001 -0.002 -0.003 0.001 -0.000 0.015
0.009 -0.015 0.014 -0.006 -0.018 0.004 0.015 -0.016 0.010 -0.013 -0.011 0.012 0.001 0.011 -0.016 0.012 0.012 0.009 0.003 -0.020 0.019 0.105
-0.002 -0.003 -0.003 -0.002 -0.006 -0.002 -0.003 -0.006 -0.001 -0.008 -0.000 -0.001 -0.002 0.003 -0.005 0.001 -0.000 0.003 -0.004 -0.006 0.005 -0.0
17
0.001 -0.002 -0.002 0.000 -0.003 0.002 0.003 -0.003 -0.002 -0.001 0.001 0.003 0.003 0.001 -0.003 0.004 0.002 0.002 -0.001 -0.001 0.003 0.023
-0.001 -0.004 0.006 -0.003 -0.005 -0.003 0.006 -0.005 0.003 -0.002 -0.003 0.001 -0.002 0.003 -0.006 -0.000 0.002 0.003 -0.002 -0.007 0.006 0.097
-0.002 -0.002 0.002 0.002 0.000 0.002 0.003 -0.001 0.002 0.002 0.000 0.000 -0.001 0.002 -0.002 0.002 0.002 0.002 -0.000 -0.003 0.003 0.031
0.003 0.003 0.003 0.004 0.003 0.002 0.008 0.003 0.003 0.008 0.001 -0.000 0.001 -0.000 -0.004 0.004 0.001 0.001 -0.004 0.002 0.003 0.062
-0.001 0.001 -0.003 0.003 -0.002 -0.000 0.004 -0.003 -0.001 0.002 -0.001 -0.003 -0.002 -0.002 -0.004 0.001 -0.003 -0.001 -0.004 -0.003 0.002 0.019
0.003 0.003 0.004 0.003 0.004 0.002 0.006 0.003 0.003 0.006 0.001 -0.001 0.002 -0.001 -0.003 0.003 0.001 0.000 -0.003 0.003 0.001 0.050
0.003 0.001 -0.000 -0.000 -0.005 -0.002 -0.005 -0.005 -0.002 -0.006 -0.002 -0.002 -0.002 -0.003 -0.005 0.002 -0.003 -0.003 -0.004 -0.004 0.002 0.00
1
0.003 0.003 -0.002 0.003 -0.004 0.003 -0.002 -0.003 -0.002 -0.002 -0.001 0.002 0.003 -0.003 -0.003 0.002 -0.001 -0.002 -0.003 0.001 -0.001 0.012
-0.003 -0.004 -0.003 -0.002 -0.001 0.002 0.007 0.002 -0.002 0.007 0.001 0.003 0.002 0.002 0.003 0.003 0.004 0.003 0.002 0.002 0.003 0.067
0.001 0.002 -0.000 0.003 0.004 0.002 0.006 0.003 0.003 0.006 -0.000 -0.002 -0.001 -0.001 -0.003 0.002 0.001 0.002 -0.003 0.001 0.003 0.025
0.003 0.003 0.002 0.002 0.002 0.002 0.003 0.002 0.002 0.003 0.001 -0.001 -0.001 -0.000 -0.001 -0.000 -0.001 -0.000 -0.002 0.002 -0.002 0.011
0.003 0.004 -0.003 0.004 0.001 0.003 0.004 -0.003 0.003 0.004 0.000 -0.004 -0.001 -0.003 -0.004 0.000 -0.002 -0.001 -0.005 -0.001 0.003 0.013
0.001 -0.003 0.006 -0.000 -0.007 -0.002 -0.002 -0.007 0.004 -0.009 0.003 -0.000 -0.002 0.006 -0.008 -0.000 0.003 0.005 -0.000 -0.008 0.008 0.028
```

# Results (Training)

```
D:\LaChat\Document\Lumpec X + v
-0.023 0.033 0.164 -0.078 -0.258 0.568 -0.046 -0.178 -0.653 0.110 -0.867 -0.358 0.092 -0.135 -0.009 -0.283 -0.116
0.778 -1.017 0.135 0.450 0.030 0.327 0.062 0.060 0.329 0.262 0.594 0.219 0.044 0.294 0.085 -0.323 0.277
0.544 -0.441 -0.383 0.377 0.720 0.452 0.215 0.004 0.314 0.794 -0.612 0.735 0.533 0.551 -0.183 -0.262 0.004
-0.489 0.043 0.140 0.743 -0.126 -0.776 -0.128 -0.370 0.456 -0.339 0.071 -0.193 -0.317 -0.085 0.798 -0.021 -0.072
-0.554 -0.080 -0.345 -0.011 -0.382 -0.351 -0.520 -0.320 -0.447 0.030 -0.287 0.175 0.107 0.046 0.201 0.102 -0.063
0.343 -0.049 0.314 -0.745 -0.195 0.027 -0.256 0.455 0.104 0.314 0.333 -0.150 0.424 0.478 -0.020 -0.095 0.080
0.263 0.108 0.100 0.138 -0.073 0.694 -0.392 0.091 -0.005 0.074 0.183 0.742 -0.643 -0.095 0.220 -0.742 0.098
-0.178 0.122 -0.382 -0.430 -0.657 -0.333 -0.656 -0.038 0.557 -0.097 -0.066 -0.091 0.871 0.699 0.090 -0.225 0.150
-0.362 -0.067 0.289 -0.383 0.711 0.182 0.472 -0.196 0.684 0.296 -0.217 -0.096 0.045 -0.115 -0.360 -0.009 -0.074
0.070 -0.734 -0.621 -0.584 -0.569 0.106 -0.542 -0.326 0.367 -0.572 -0.561 -0.143 0.160 0.258 0.674 0.286 0.167
-0.184 0.337 -0.022 0.089 0.321 0.641 -0.224 0.060 -0.588 0.210 -0.048 -0.171 -0.019 -0.068 0.090 -0.432 0.017
0.124 0.103 0.392 0.189 0.192 -0.105 0.359 0.203 0.272 0.352 0.296 0.458 -0.519 0.120 0.383 0.510 0.193

LaChat>DY3 = LDNNLumpedLearning(LDNN, EtaStart, EtaEnd, Alpha, BetaStart, BetaEnd, 5, 0.01);
***** (RUN:0 Samples:20 Dimension:17) *****
20 1.654081 2.257362 0
20 1.645285 2.237900 1
20 1.636442 2.218496 2
20 1.627558 2.199159 3
20 1.618635 2.179897 4
20 1.609677 2.160717 5
20 1.600683 2.141607 6
20 1.591662 2.122601 7
20 1.582615 2.103694 8
20 1.573544 2.084890 9
20 1.564453 2.066193 10
20 1.555343 2.047608 11
20 1.546218 2.029139 12
20 1.537080 2.010788 13
20 1.527931 1.992559 14
20 1.518773 1.974456 15
20 1.509610 1.956480 16
20 1.500443 1.938635 17
20 1.491275 1.920923 18
```

Historical data and Weights  
result stored in  
d:/LDNN.txt

Run Verification  
pp.3

Open MS Excel and  
store the weights into  
../data/DNN2\_case1.csv

# Case 2



# Procedures

- Look into the sub-folder ../data
- Open DNN2\_case2.txt
- Copy the lines to the lachat.exe
- Observing the results
- The historical data is stored in d:/LDNN.txt

# **Your Own Application**

# Create File DNN1.csv using MS EXCEL

[	X0	]=	4	14											
4	7	2	-6	-9	10	4	10	-4	-6	-1	-5	-9	10	-1	
7	-10	-2	-9	-5	5	0	1	-6	-1	-9	-6	10	6	3	
-7	10	-8	-9	2	-5	-6	-8	6	-9	3	-1	-2	-2	5	
-10	-9	1	4	7	-4	5	3	-3	5	-9	4	-10	-5	-8	
[	YD	]=	5	14											
-9	-6	-8	-3	-1	5	-1	6	-8	-8	9	0	3	9	5	
8	8	-2	-6	5	-7	-7	4	-4	-9	-3	9	2	-6	-7	
1	2	-2	2	-5	4	9	6	2	-9	8	10	-10	8	9	
8	1	-7	-7	-8	8	0	5	6	0	1	7	-6	-10	7	
-8	8	4	0	-6	-10	-10	3	10	-7	-2	10	-2	6	-2	
7	2	-3	-3	4	-3	1	1	2	-10	4	-9	-3	-3	1	

# Create File DNN1.txt

```
EtaStart = 0.02;  
EtaEnd = 0.05;  
Alpha = 0.9;  
BetaStart = 0.02;  
BetaEnd = 0.05;  
InitWeight = 0.338;  
file = "../data/DNN1.csv";  
HL = [(4, 5, 5, 5)];  
LDNN = LumpedDNN(file, HL, false, InitWeight);  
DY3 = LDNNLumpedLearning(LDNN, EtaStart, EtaEnd, Alpha, BetaStart,  
BetaEnd, 100, 0.0001);
```

# Execute Lachat.exe (Training)

