

APPENDIX

-Feed forward BP Code:

```
p= [78 90 125 145 165;58 68 85 95 105];  
t= [20 15 0 8 12 ];  
net=newff(p,t,10);  
net=train(net,p,t);  
y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 12.2432 -0.0000 8.0000

Column 5

4.3561

```
net=init(net);  
net=train(net,p,t);  
y=sim(net,p)
```

y =

Columns 1 through 4

20.1472 13.9969 2.5267 6.1906

Column 5

11.4193

```
net=init(net);  
net=train(net,p,t);  
y=sim(net,p)
```

y =

Columns 1 through 4

-9.9305 -2.3354 6.8239 31.8807

Column 5

26.5537

```
net=init(net);  
net=train(net,p,t);  
y=sim(net,p)
```

y =

Columns 1 through 4

20.0977 19.3679 2.0003 8.0219

Column 5

12.3078

```
net=init(net);  
net=train(net,p,t);  
y=sim(net,p)
```

y =

Columns 1 through 4

19.9491 19.1099 31.6900 8.2355

Column 5

12.1377

```
net=init(net);  
net=train(net,p,t);  
y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 21.3304 -0.0000 1.8401

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

15.6851 15.0005 -0.0042 -0.4060

Column 5

12.0004

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.9367 15.8048 0.0987 4.3758

Column 5

10.4272

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

-0.6016 2.7202 0.3916 -2.7032

Column 5

2.8510

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

22.0895 15.0000 -0.0000 -7.4514

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

22.1247 13.3886 0.0402 8.0677

Column 5

11.9943

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.9176 14.7952 3.8813 8.0063

Column 5

2.4218

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.9807 14.9347 13.5195 7.9791

Column 5

4.8585

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

15.8975 15.0248 0.2064 8.2364

Column 5

11.6337

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

16.7397 4.0519 5.0227 13.2797

Column 5

11.3251

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

8.2671 15.0579 -0.0072 8.0005

Column 5

14.4409

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

24.8665 15.0000 0.0000 8.0000

Column 5

-3.4972

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

9.8931 15.0000 0.0001 4.8409

Column 5

12.0003

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 15.0000 0 3.9265

Column 5

11.1037

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 15.0000 0.2702 2.9531

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

-4.1300 -1.8797 -0.5435 -4.9398

Column 5

6.8432

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

23.0523 15.0000 0.0001 6.0974

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

-42.8320 -37.5713 -8.8596 3.2504

Column 5

18.4568

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0098 16.3260 0.3408 7.8615

Column 5

12.1425

```
>> net=init(net);
```

```
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

7.7693 14.8606 3.1284 8.1732

Column 5

13.2041

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

-5.3472 -5.9633 -5.2720 3.8619

Column 5

9.8221

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

18.2332 12.9439 -0.3152 -0.5029

Column 5

-2.0587

```
>> net=init(net);  
>> net=train(net,p,t);
```

```
>> y=sim(net,p)
```

```
y =
```

```
Columns 1 through 4
```

```
-15.4045 -14.9995 13.1104 32.2461
```

```
Column 5
```

```
40.0559
```

```
>> net=init(net);
```

```
>> net=train(net,p,t);
```

```
>> y=sim(net,p)
```

```
y =
```

```
Columns 1 through 4
```

```
19.3174 14.9997 0.0010 5.3306
```

```
Column 5
```

```
11.9996
```

```
>> net=init(net);
```

```
>> net=train(net,p,t);
```

```
>> y=sim(net,p)
```

```
y =
```

```
Columns 1 through 4
```

```
26.0721 15.0000 0.0000 8.9271
```

```
Column 5
```

```
12.0000
```

```
>> net=init(net);
```

```
>> net=train(net,p,t);
```

```
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0001 9.9988 -0.0001 17.4209

Column 5

11.9998

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

31.2428 36.9040 14.8967 -3.4189

Column 5

-9.4628

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.7811 14.9825 7.5633 11.5043

Column 5

13.3895

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.9142 29.8145 0.0039 3.0527

Column 5

12.0193

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

28.1699 22.6456 0.7806 9.5726

Column 5

15.4648

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 15.0000 0.0000 -9.4574

Column 5

-9.7048

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

22.8805 14.2458 -0.5640 6.1523

Column 5

20.9542

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

22.4365 19.4632 15.2057 4.9212

Column 5

3.7285

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.1800 15.1762 -3.7426 2.1263

Column 5

11.8350

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0197 13.6772 0.0036 13.6894

Column 5

12.0076

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0075 8.6359 -0.0045 12.4476

Column 5

12.0004

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

9.9527 11.2596 10.9117 3.8782

Column 5

7.4630

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

23.6048 11.9720 -1.2243 -9.5350

Column 5

-8.7334

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

12.4114 15.1216 -0.0532 5.1780

Column 5

-1.9740

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.3044 19.6558 2.1475 4.5110

Column 5

11.9940

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 15.0000 19.0997 14.0094

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

17.1059 19.3686 23.2147 15.9639

Column 5

8.1563

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

-32.3906 -26.4353 9.0700 19.1352

Column 5

23.1108

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

4.9208 -2.8425 12.0125 24.1168

Column 5

17.8792

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.9240 24.9794 8.9857 8.1362

Column 5

11.8514

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

15.6733 9.3115 4.0306 2.5271

Column 5

-2.5236

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

13.6198 15.0000 0 1.7908

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 15.0000 10.2301 8.0000

Column 5

15.6089

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

4.8344 7.1820 1.7742 -13.9697

Column 5

-7.1529

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

21.4994 6.4960 3.0062 -12.7152

Column 5

-15.2895

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

16.6236 15.0016 -0.0016 -1.4126

Column 5

11.9995

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

-6.6693 -7.5864 2.2222 -6.6374

Column 5

11.5491

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

11.8933 14.5999 -0.0620 8.4187

Column 5

11.9992

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

12.9754 4.7650 -0.1778 7.3259

Column 5

11.8259

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

14.1887 14.8103 -2.5618 8.0069

Column 5

9.5906

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.7191 16.0486 0.3251 11.1714

Column 5

12.0348

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.5865 15.0575 -0.0007 2.9250

Column 5

12.9099

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

-0.1107 12.1697 2.1504 3.7137

Column 5

-0.1469

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.9658 14.4723 -17.7745 7.7190

Column 5

13.2529

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 15.0000 13.3254 8.0000

Column 5

18.6297

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

10.8868 15.0000 16.5943 8.0000

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.6841 13.4902 0.0600 -0.4521

Column 5

11.5259

```
>> net=init(net);
```

```
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

8.4369 9.3420 1.2573 0.0473

Column 5

4.0956

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

22.9328 20.6654 -1.3935 -17.4991

Column 5

-23.5836

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.4556 14.2583 16.8252 8.0007

Column 5

3.9294

```
>> net=init(net);  
>> net=train(net,p,t);
```

```
>> y=sim(net,p)
```

```
y =
```

```
Columns 1 through 4
```

```
20.3253 15.0439 -0.0071 13.8276
```

```
Column 5
```

```
7.3661
```

```
>> net=init(net);
```

```
>> net=train(net,p,t);
```

```
>> y=sim(net,p)
```

```
y =
```

```
Columns 1 through 4
```

```
15.6240 15.0000 0.0000 8.0000
```

```
Column 5
```

```
8.0801
```

```
>> net=init(net);
```

```
>> net=train(net,p,t);
```

```
>> y=sim(net,p)
```

```
y =
```

```
Columns 1 through 4
```

```
24.4500 27.6466 16.9322 16.6838
```

```
Column 5
```

```
18.9570
```

```
>> net=init(net);
```

```
>> net=train(net,p,t);
```

```
>> y=sim(net,p)
```

y =

Columns 1 through 4

11.5122 14.3665 35.6721 27.2896

Column 5

6.8871

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.9991 11.8135 15.2778 8.0070

Column 5

12.0169

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

15.0559 15.0022 0.0100 1.6152

Column 5

12.0037

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

15.9772 14.8422 4.4050 8.1203

Column 5

7.9591

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0924 15.1495 0.2351 7.5233

Column 5

6.4326

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

17.1330 15.0013 -0.0008 4.4409

Column 5

12.0007

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

-0.1500 15.0963 22.8452 8.2109

Column 5

12.2480

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.9730 15.1044 3.3325 13.4306

Column 5

11.2704

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

24.8843 15.0000 -2.9597 8.0000

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

16.8302 26.7308 36.1165 14.4140

Column 5

5.4102

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.1627 12.3619 1.2297 7.0339

Column 5

23.7217

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

11.8902 9.0802 -27.5240 -46.8970

Column 5

-52.7804

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 13.3034 0.0000 6.7444

Column 5

12.0000

```
>> net=train(net,p,t);  
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0237 14.9258 3.7115 8.9555

Column 5

12.0010

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 15.0000 -0.0001 10.3089

Column 5

16.5500

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

15.0949 15.0003 -0.0002 0.9964

Column 5

12.0002

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

8.1215 19.4871 6.3767 9.3565

Column 5

9.9488

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

39.5986 32.2616 0.0000 8.0000

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

17.8309 13.9366 2.1822 8.1107

Column 5

3.1106

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 14.9999 11.8161 13.3481

Column 5

11.9999

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0183 19.3853 0.4702 7.4708

Column 5

11.6431

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.0000 18.0629 -0.0000 8.0000

Column 5

8.4516

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

12.5494 14.9970 3.7558 7.8779

Column 5

11.8952

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

25.4479 38.9644 37.3721 36.0634

Column 5

31.8701

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.9997 21.5785 -0.0001 14.8832

Column 5

12.0000

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.7145 14.8270 0.5517 3.3008

Column 5

3.4997

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

18.9579 15.2897 0.0497 6.3608

Column 5

12.0099

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

18.8774 21.8166 0.3331 7.6696

Column 5

13.5294

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

20.7858 15.0000 15.9406 8.0000

Column 5

12.0000

```
>> net=train(net,p,t);  
>> net=init(net);  
>> net=train(net,p,t);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

18.6627 23.6106 28.2676 37.1033

Column 5

19.9658

```
>> net=init(net);  
>> net=train(net,p,t);  
>> y=sim(net,p)
```

y =

Columns 1 through 4

19.5579 15.0692 0.0270 8.0734

Column 5

11.7944