Vorlesung Computational Intelligence:

Zusatzmaterial zum Selbststudium:
Künstliche Neuronal Netze in MATLAB

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jeden Donnerstag 14:00-15:30 Uhr, Nusselt-Hörsaal

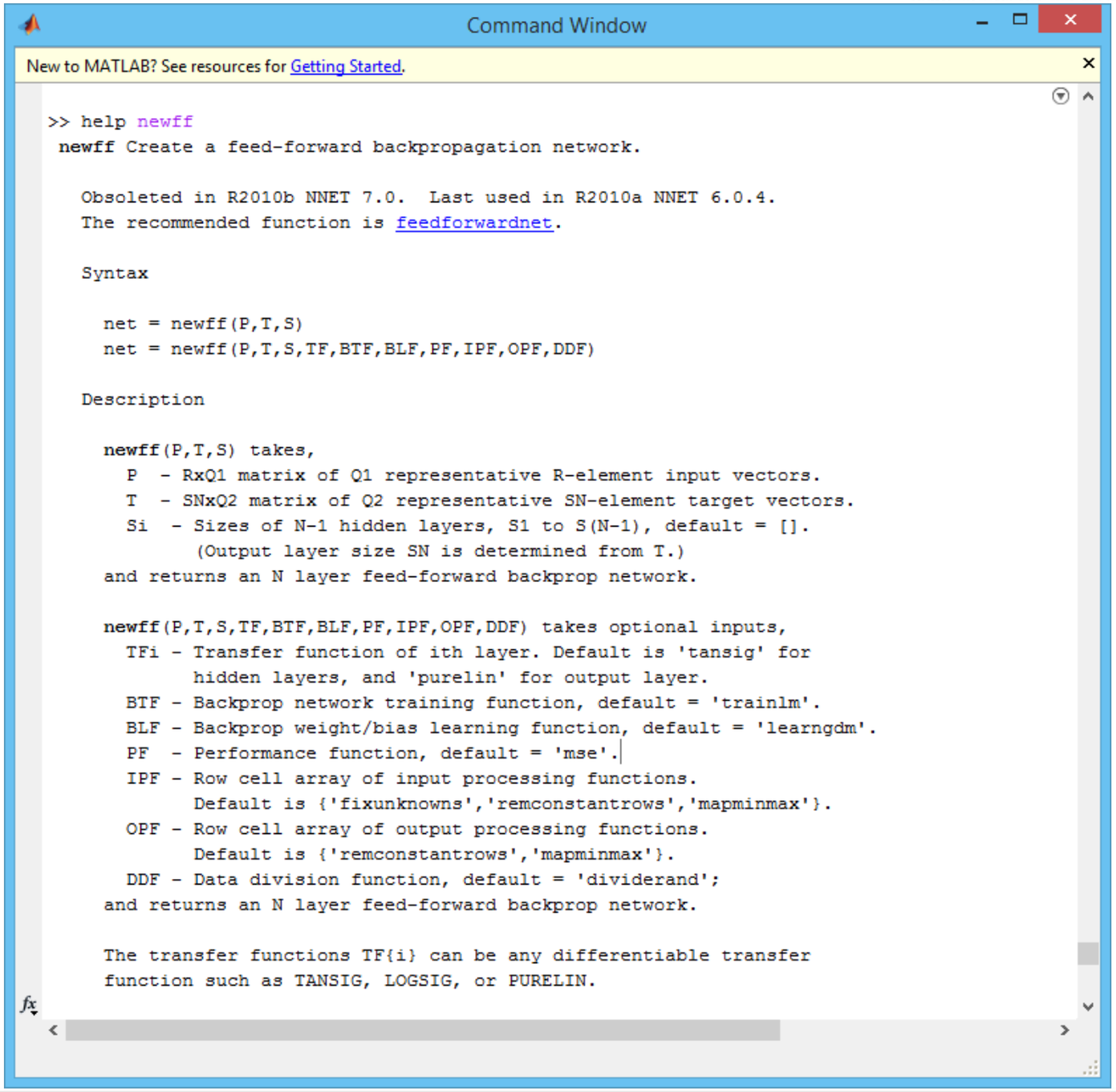
Beispiel MLP-Netze: MATLAB

MATLAB-Befehl für MLPs:

- `newff(.)`
- `feedforwardnet(.)`

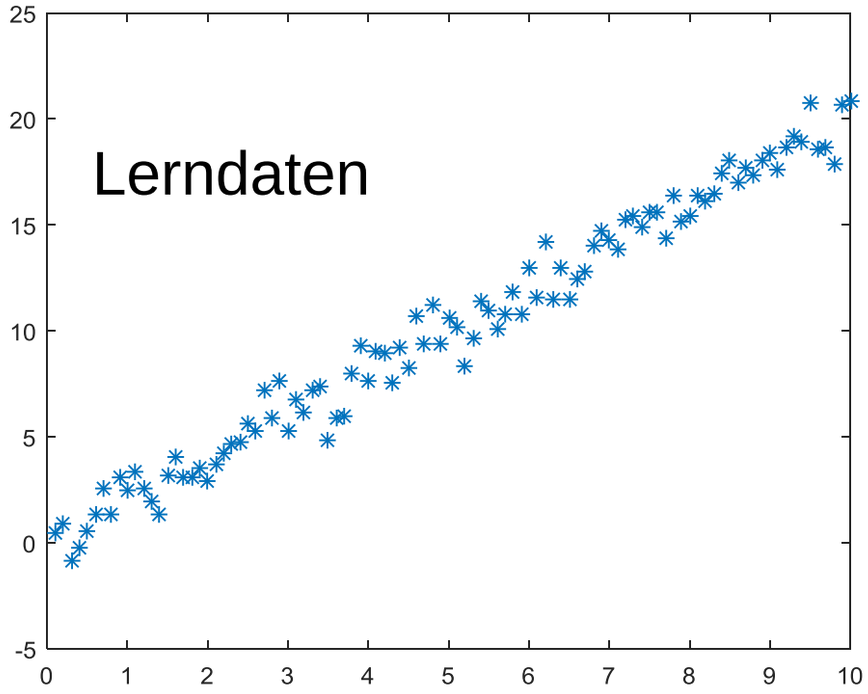
Beschreibung:

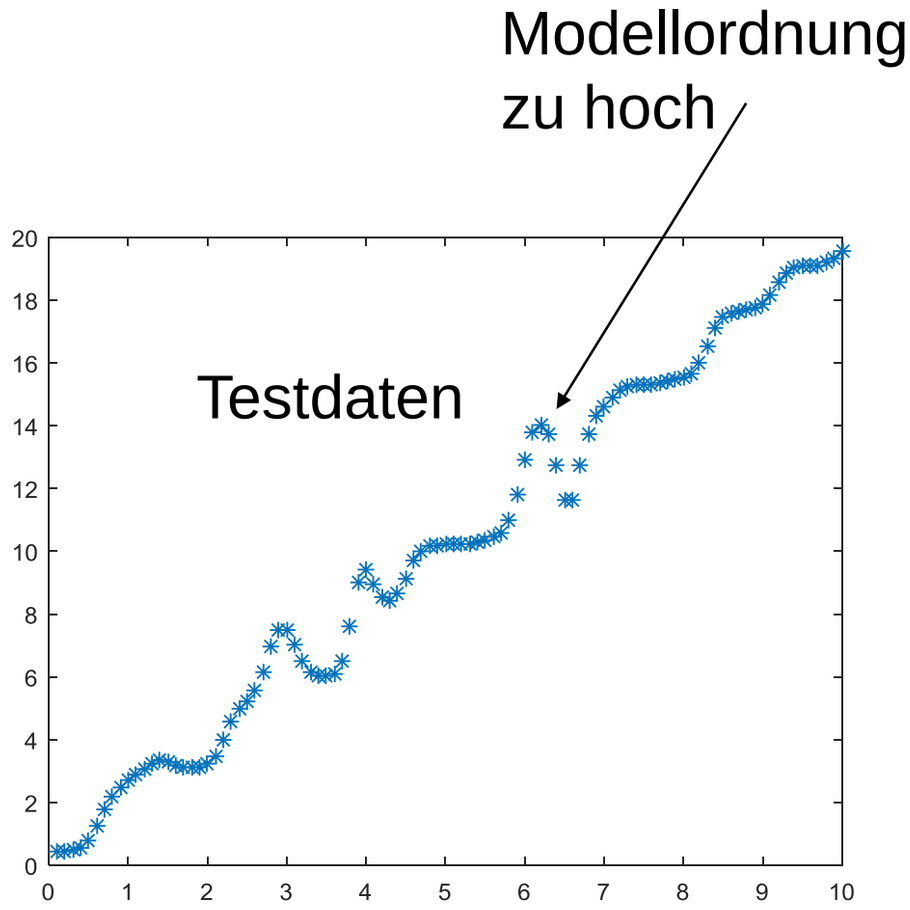
- `help nnet`
- `helf newff`



Beispiel MLP-Netze zur Regression

- `anz = 100; x = [0.1:0.1:10]; y = 2*x  + randn(1, length(x));`
- `figure; plot(x, y, '*');`
- `net = newff(x, y, 3);`
- `net = train(net, x, y);`
- `y_sim = net(x);`
- `figure; plot(x, y_sim, '*')`





Beispiel MLP-Netze zur Klassifikation

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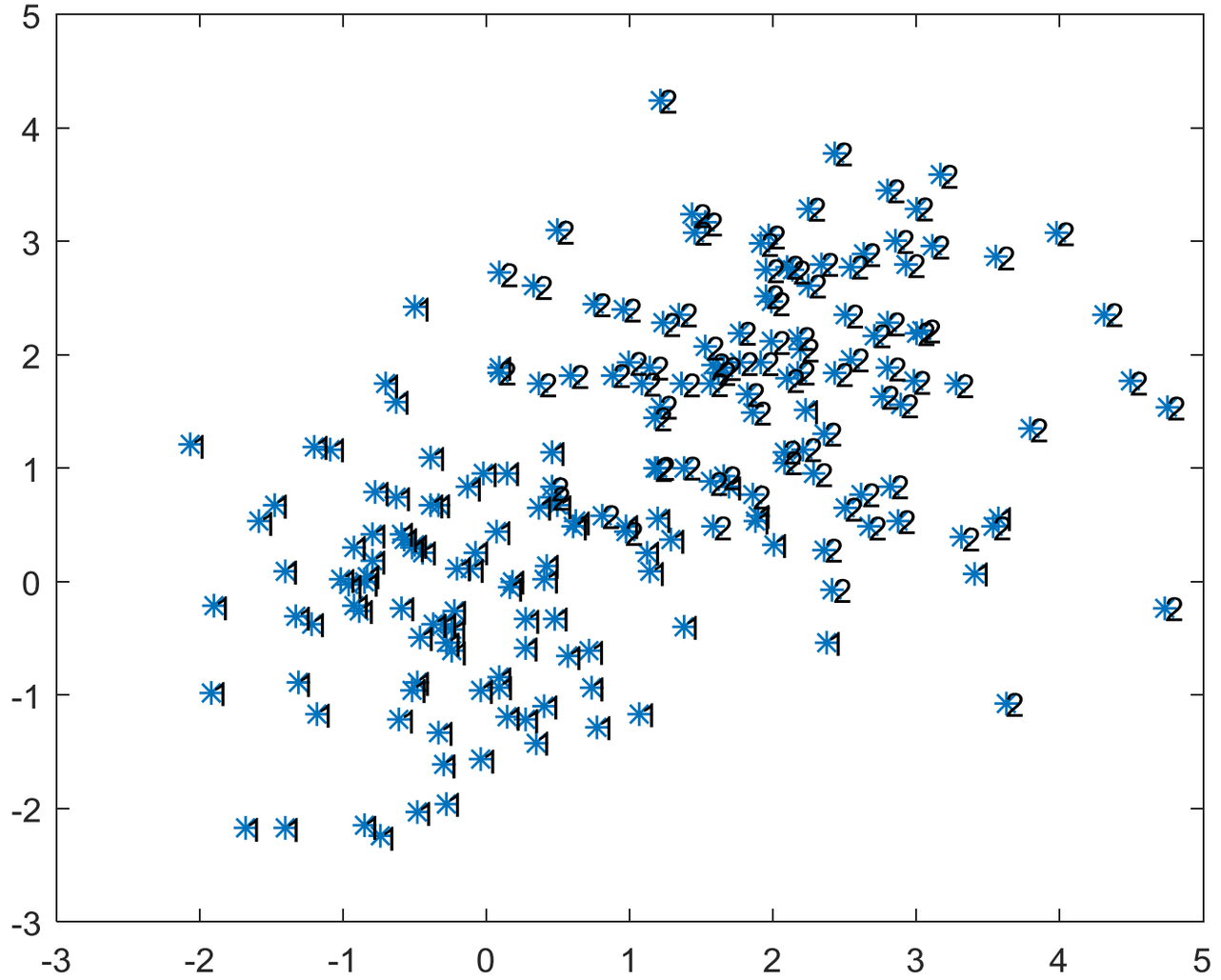
Lerndaten

- ```
  anz = 100;
  dat = [randn(anz,2);
  randn(anz,2) + 2];
  ```
- ```
  code = [ones(anz,1);
  2*ones(anz,1)];
  ```
- ```
  figure; plot(dat(:,1),
  dat(:,2),'*');
  ```
- ```
  for i=1:size(dat,1),
  text(dat(i,1), dat(i,2),
  sprintf('%i', code(i)));
  end;
  ```



Beispiel MLP-Netze zur Klassifikation

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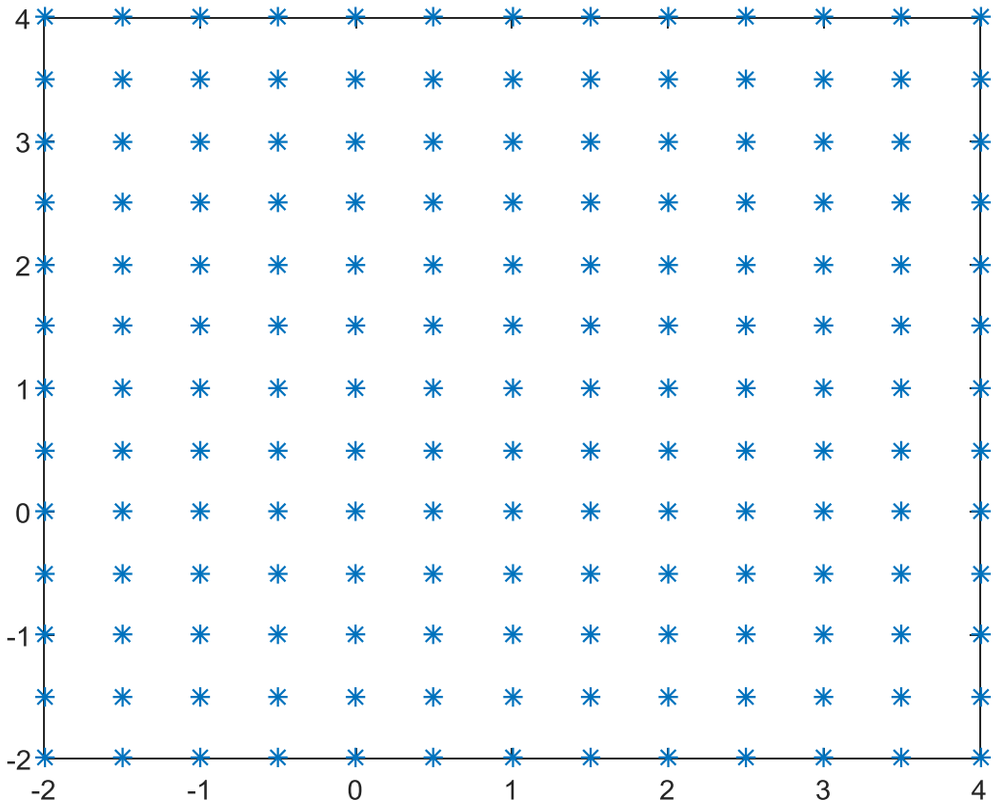
Testdaten

- `dat_test = []; for x=-2:0.5:4, for y = -2:0.5:4; dat_test = [dat_test; [x y]]; end; end;`
- `figure; plot(dat_test(:,1), dat_test(:,2), '*')`



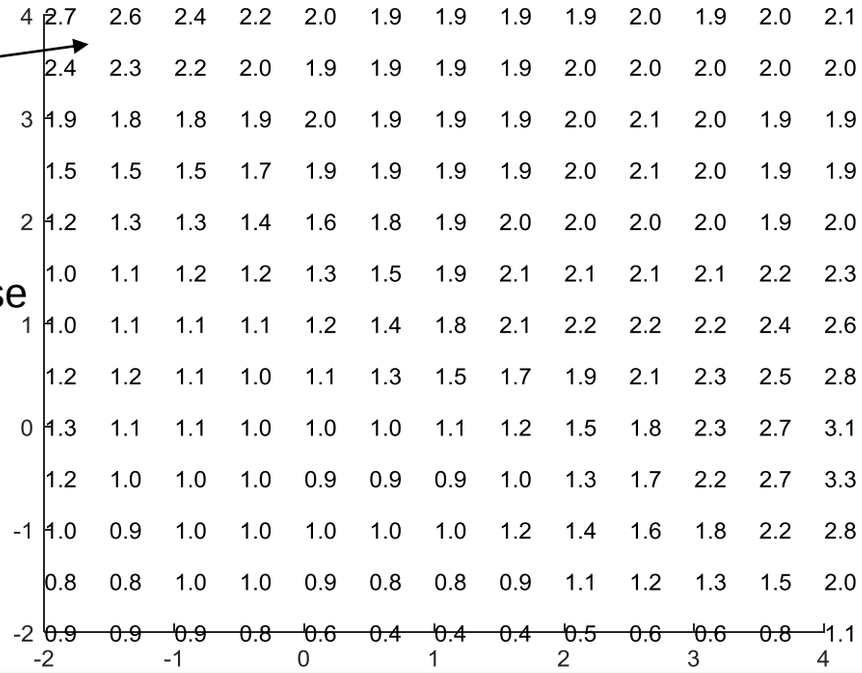
Beispiel MLP-Netze zur Klassifikation

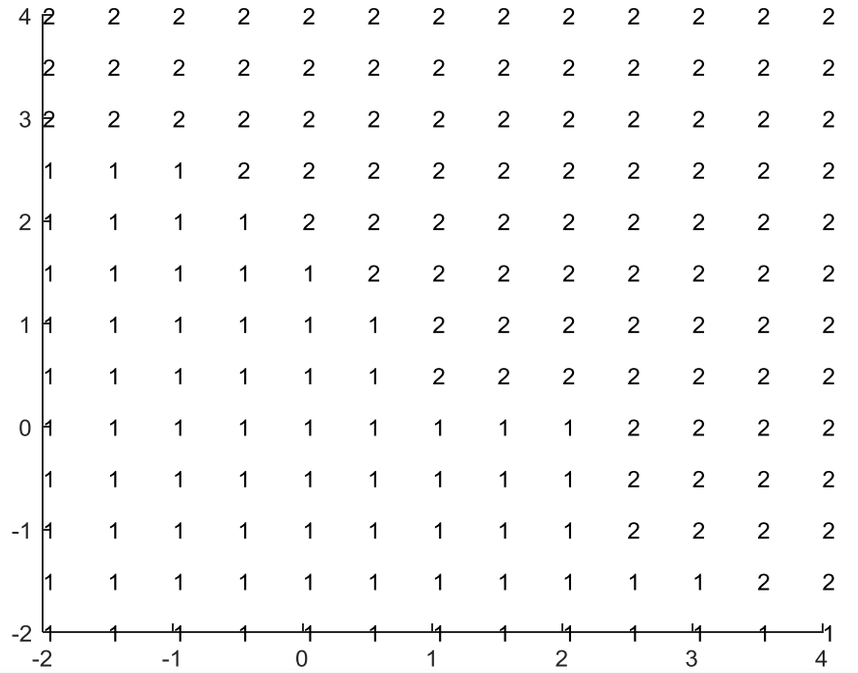
Trainieren und testen (1 Ausgangsneuron):

- `net = newff(dat',code',20);`
- `net = train(net, dat',code');`
- `outputs = net(dat_test');`
- `figure; set(gca,'xlim',[-2 4], 'ylim', [-2 4]);`
- `for i=1:size(dat_test,1), text(dat_test(i,1), dat_test(i,2), sprintf('%1.1f', outputs(i))); end;`

Bereich nicht in Lern-daten ab-gedeckt

→Prognose schlecht





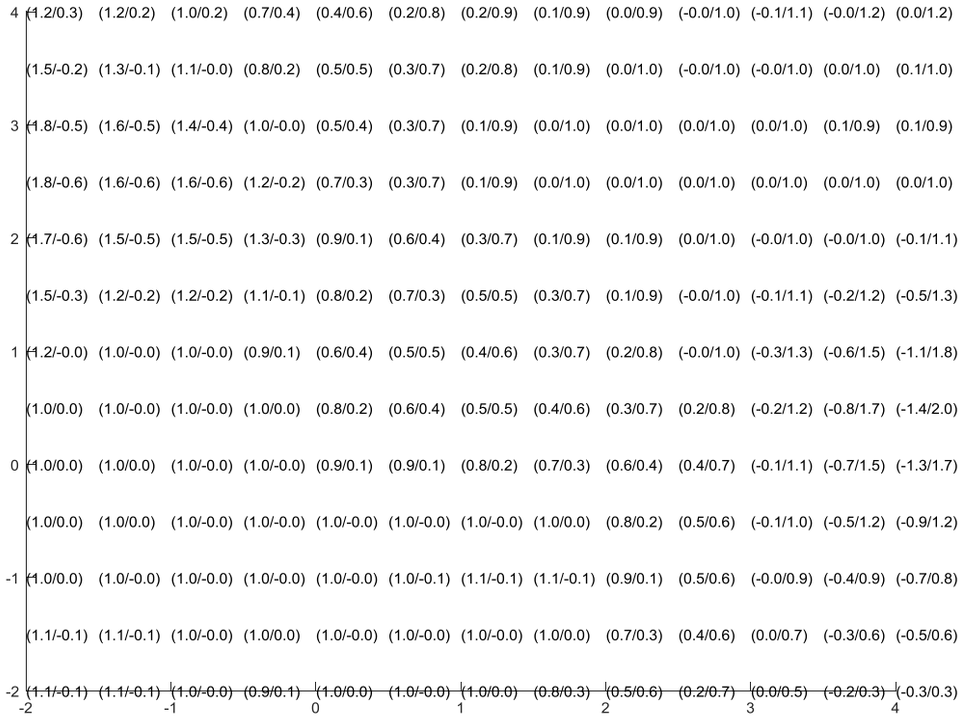
Beispiel MLP-Netze zur Klassifikation

Trainieren und testen (2 Ausgangsneuronen):

- `anz = 100; dat = [randn(anz,2); randn(anz,2) + 2];`
- `code = [ones(anz,1); 2*ones(anz,1)];`
- `code_n = [2-code, code-1];`
- `net1 = newff(dat',code_n',20);`
- `net1 = train(net1, dat',code_n');`
- `outputs1 = net1(dat_test');`

Beispiel MLP-Netze zur Klassifikation

- `figure; set(gca,'xlim',[-2 4], 'ylim', [-2 4]);`
- `for i=1:size(dat_test,1), text(dat_test(i,1), dat_test(i,2), sprintf('(%1.1f/%1.1f)', outputs1(1,i), outputs1(2,i))); end;`



- `[tmp, out] = max(outputs1,[],1)`
- `figure; set(gca,'xlim',[-2 4], 'ylim', [-2 4]);`
- `for i=1:size(dat_test,1), text(dat_test(i,1), dat_test(i,2), sprintf('%i', out (i))); end;`