# Mathematical Problems in Engineering

# ANN architecture specifications for modelling of open-cell aluminum under compression

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## Supplementary Materials

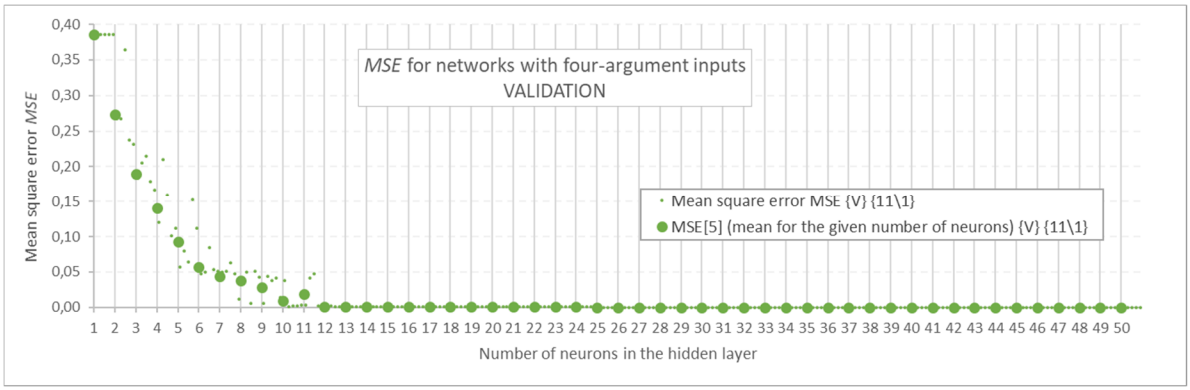



Figure A.1. Values of $MSE$, $MSE_{[5]}$ in dependence of the number of neurons in the hidden layer for networks for 11-samples input, sample no. 1 excluded.

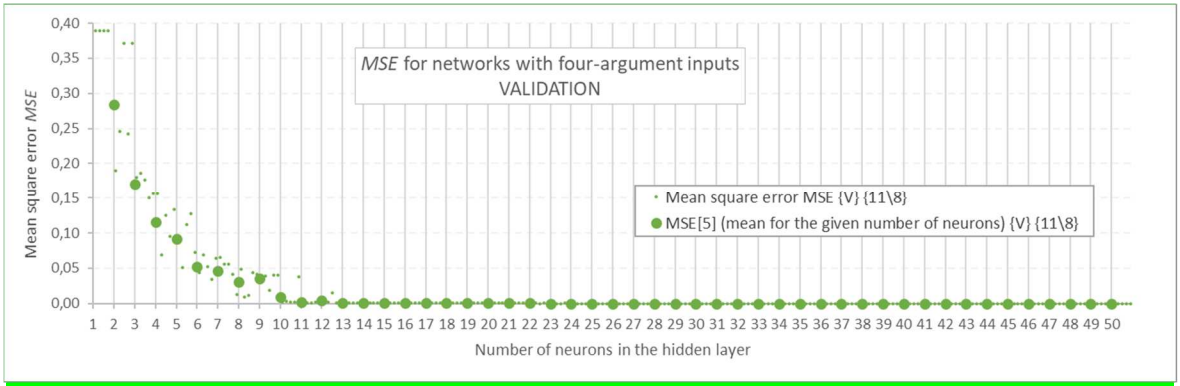



Figure A.2. Values of $MSE$, $MSE_{[5]}$ in dependence of the number of neurons in the hidden layer for networks for 11-samples input, sample no. 8 excluded.

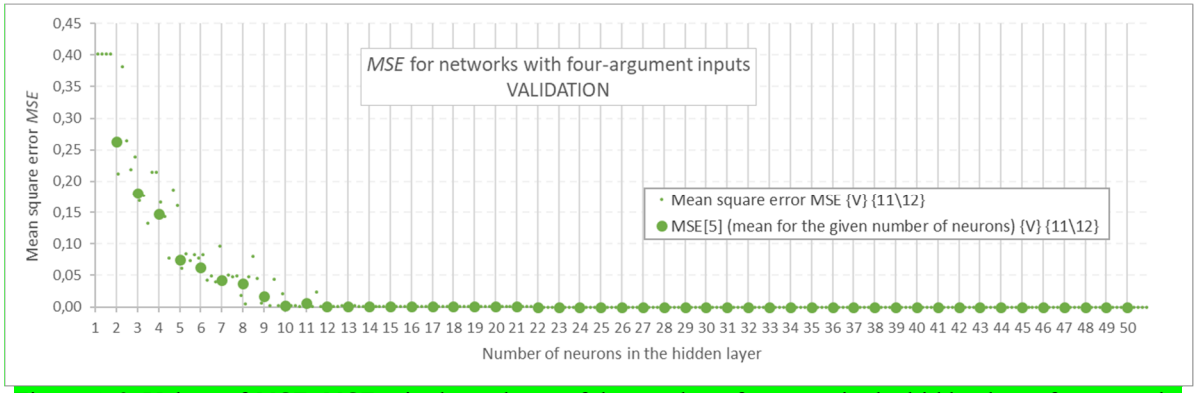



Figure A.3. Values of $MSE$, $MSE_{[5]}$ in dependence of the number of neurons in the hidden layer for networks for 11-samples input, sample no. 12 excluded.

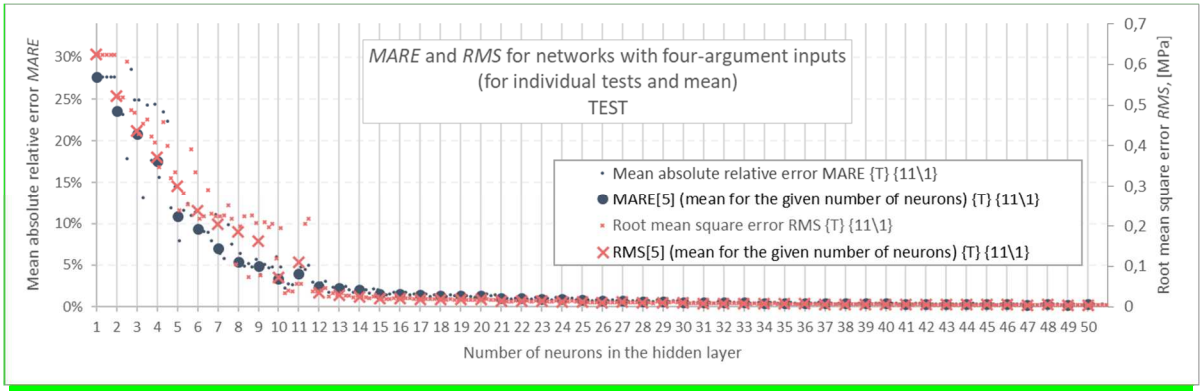



Figure A.4. Values of $MARE$, $MARE_{[5]}$, $RMS$ and $RMS_{[5]}$ for networks with 11-sample input in dependence of the number of neurons in the hidden layer; data for sample no. 1 excluded from inputs.

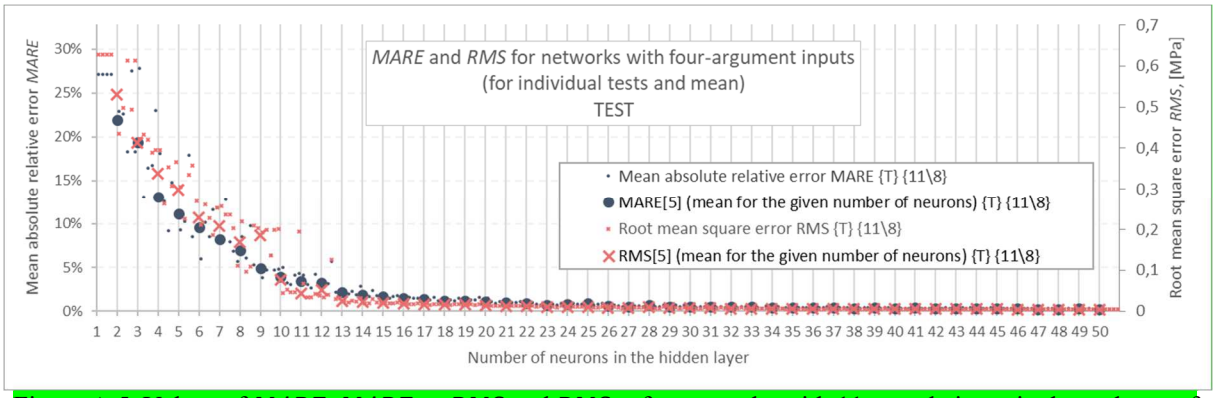



Figure A.5. Values of $MARE$, $MARE_{[5]}$, $RMS$ and $RMS_{[5]}$ for networks with 11-sample input in dependence of the number of neurons in the hidden layer; data for sample no. 8 excluded from inputs.

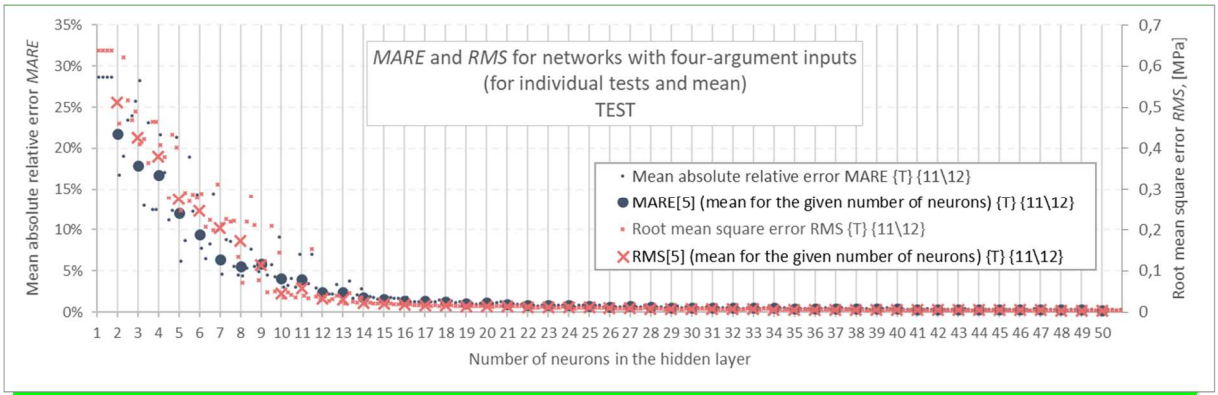



Figure A.6. Values of $MARE$, $MARE_{[5]}$, $RMS$ and $RMS_{[5]}$ for networks with 11-sample input in dependence of the number of neurons in the hidden layer; data for sample no. 12 excluded from inputs.

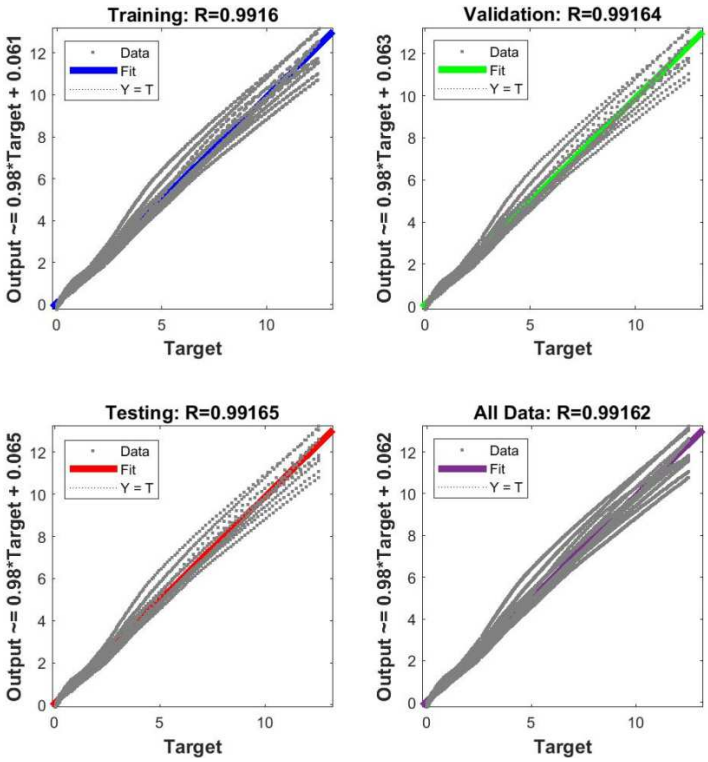



Figure A.7. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 12-specimens set, with 4 neurons in the hidden layer; $MARE \leq 10\%$ individually for the first time

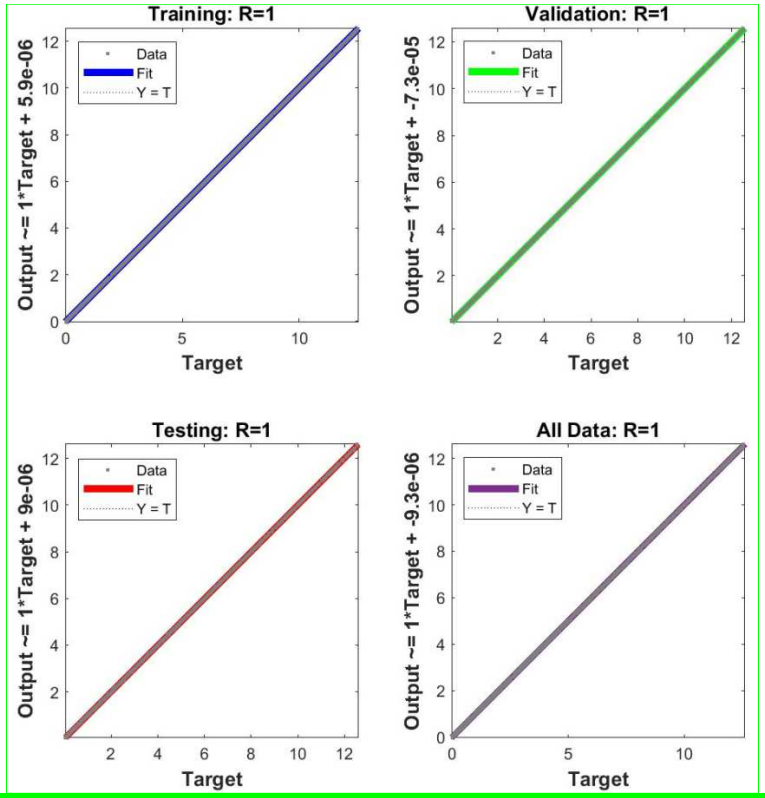



Figure A.8. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 12-specimens set, with 47 neurons in the hidden layer; best $MARE$.

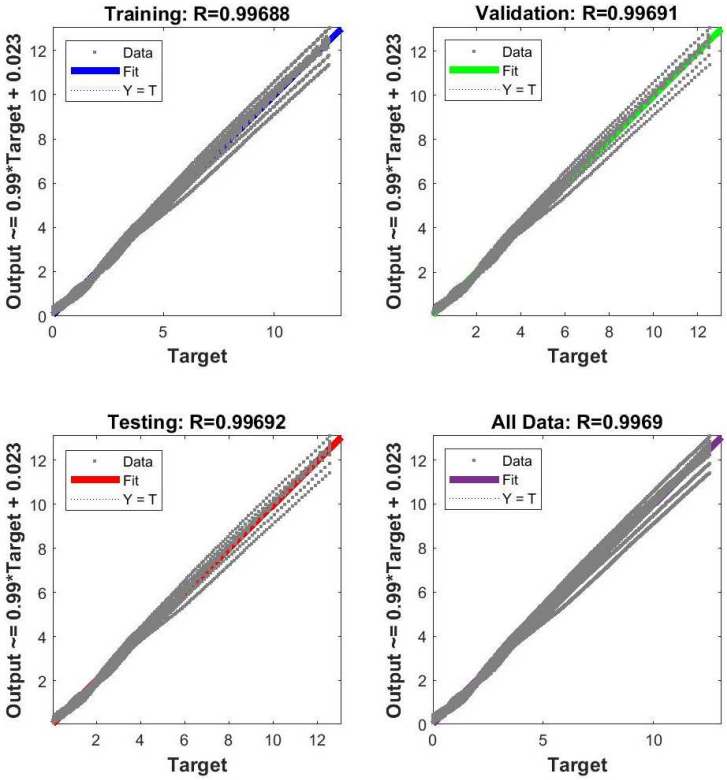



Figure A.9. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 11-specimens set (sample no. 1. excluded) with 5 neurons in the hidden layer; $MARE \leq 10\%$ individually for the first time.

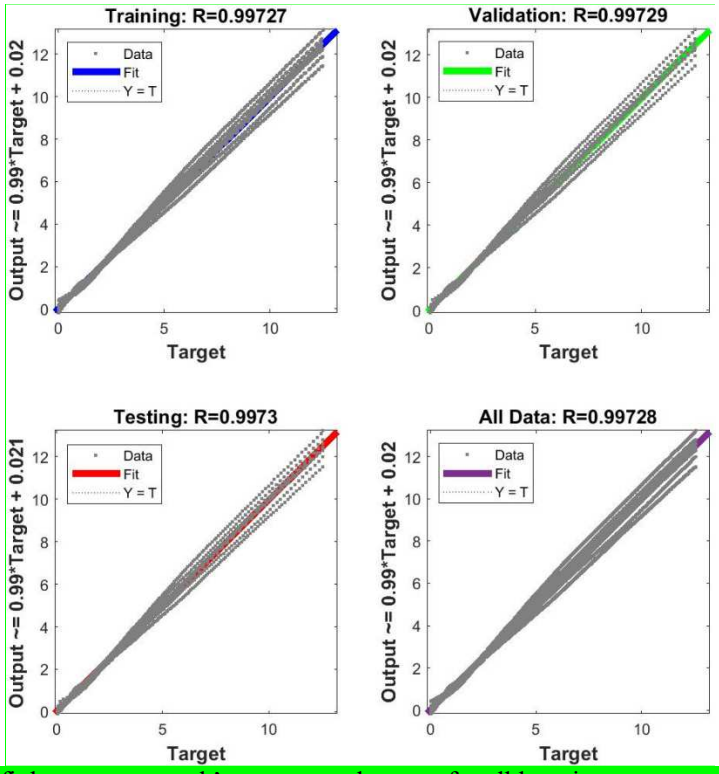



Figure A.10. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 11-specimens set (sample no. 1. excluded) with 8 neurons in the hidden layer; $MARE \leq 5\%$ individually for the first time.

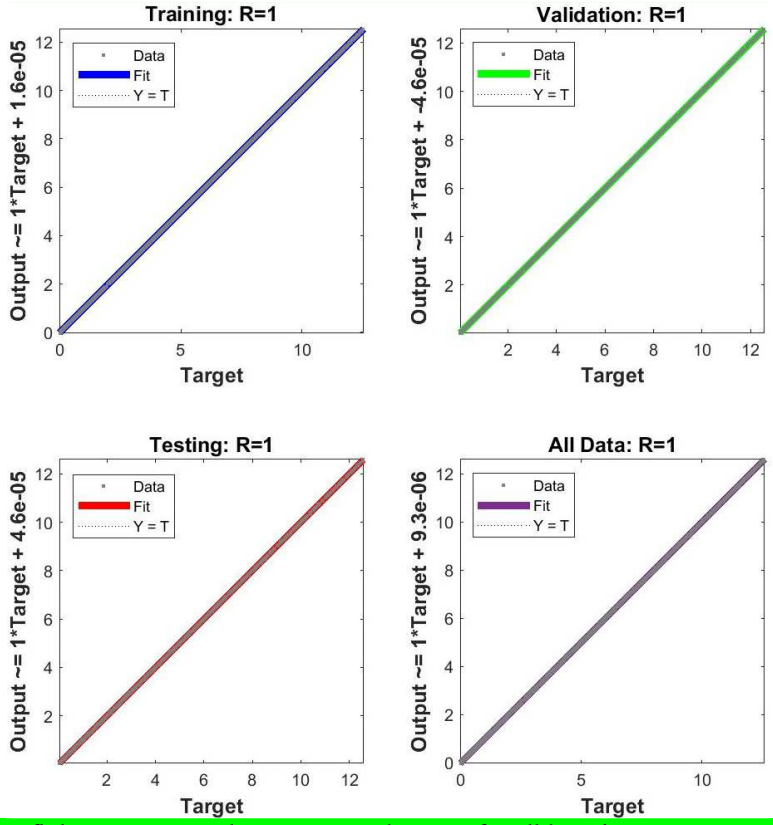



Figure A.11. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 11-specimens set (sample no. 1. excluded) with 47 neurons in the hidden layer; best $MARE$.

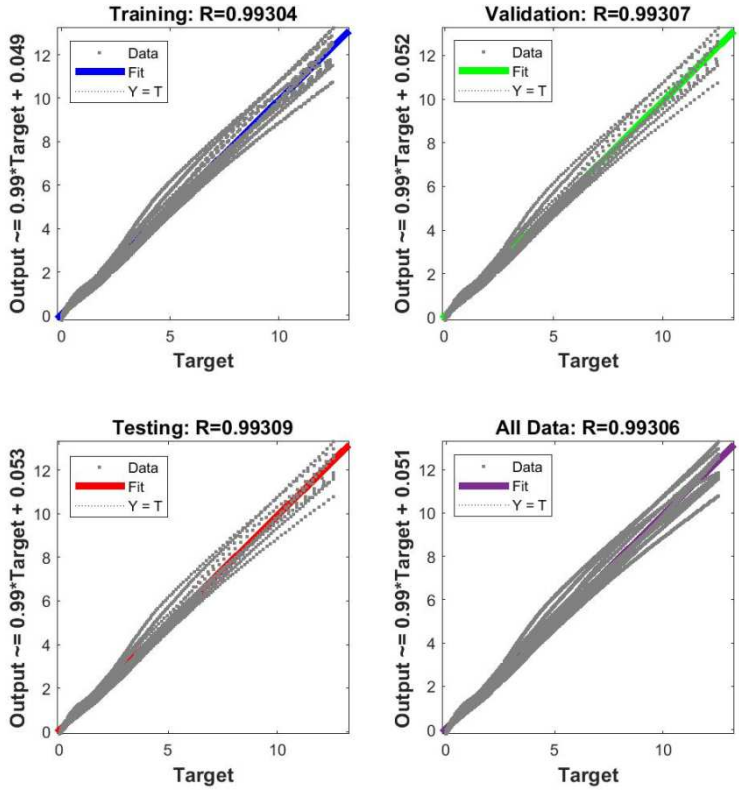



Figure A.12. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 11-specimens set (sample no. 8. excluded) with 4 neurons in the hidden layer; $MARE \leq 10\%$ individually for the first time.

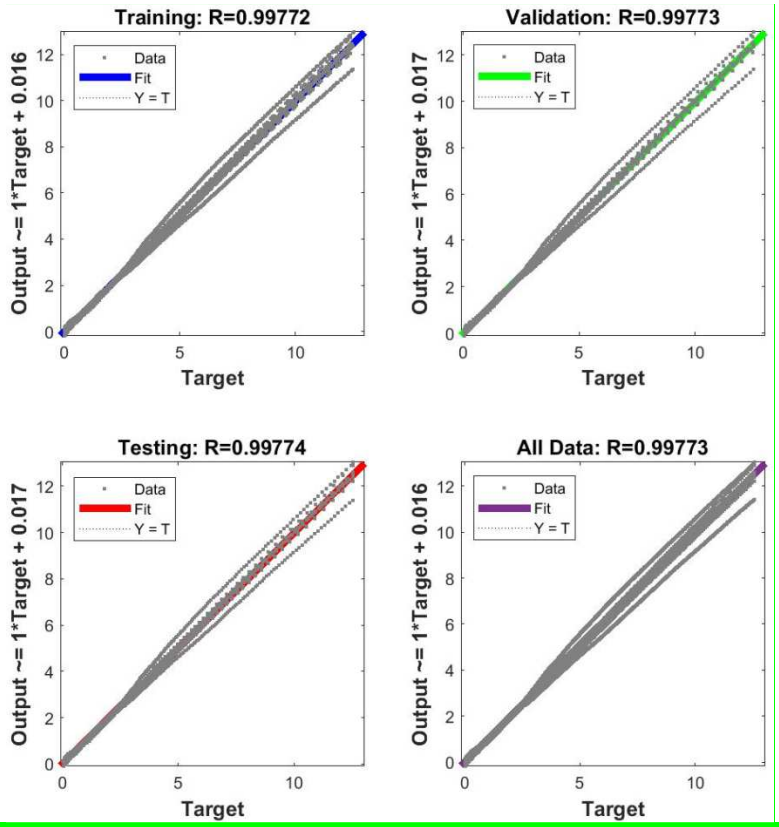



Figure A.13. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 11-specimens set (sample no. 8. excluded) with 8 neurons in the hidden layer: $MARE \leq 5\%$ individually for the first time.

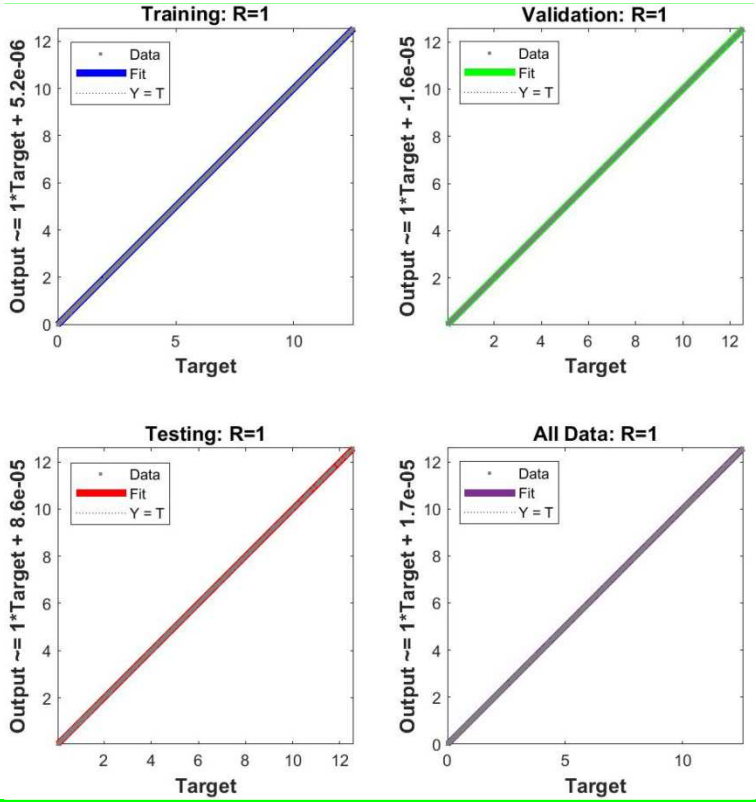



Figure A.14. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 11-specimens set (sample no. 8. excluded) with 48 neurons in the hidden layer; best $MARE$.

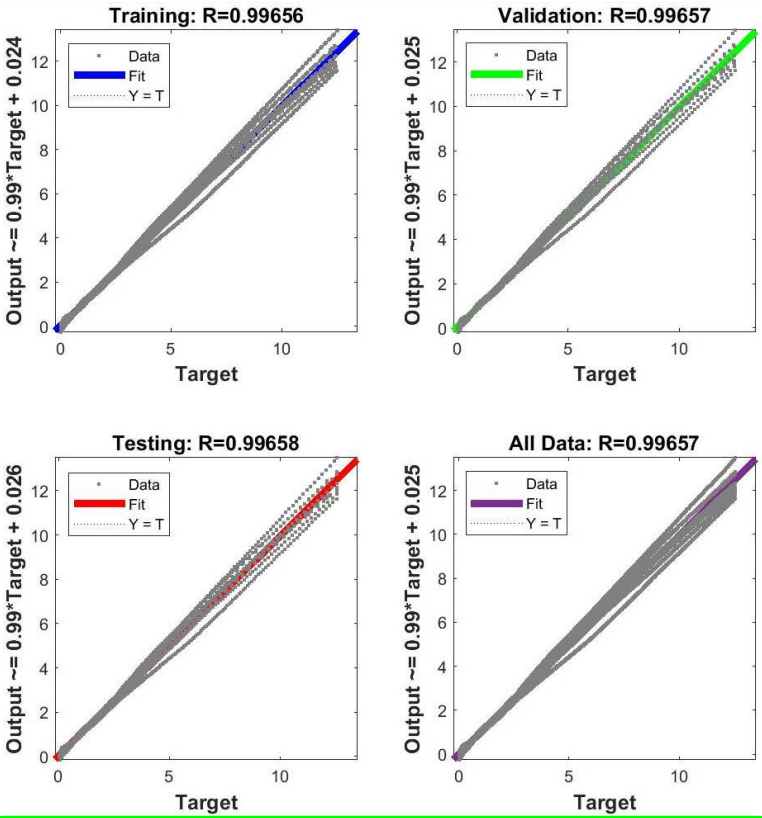



Figure A.15. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 11-specimens set (sample no. 12. excluded) with 5 neurons in the hidden layer; $MARE \leq 10\%$ individually for the first time.

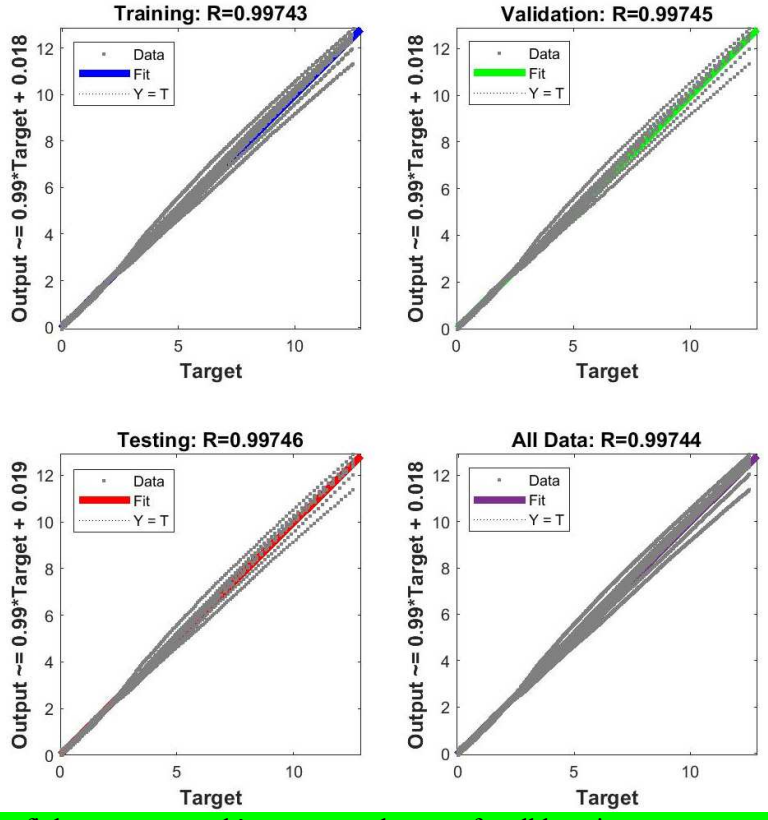



Figure A.16. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 11-specimens set (sample no. 12. excluded) with 7 neurons in the hidden layer; $MARE \leq 5\%$ individually for the first time.

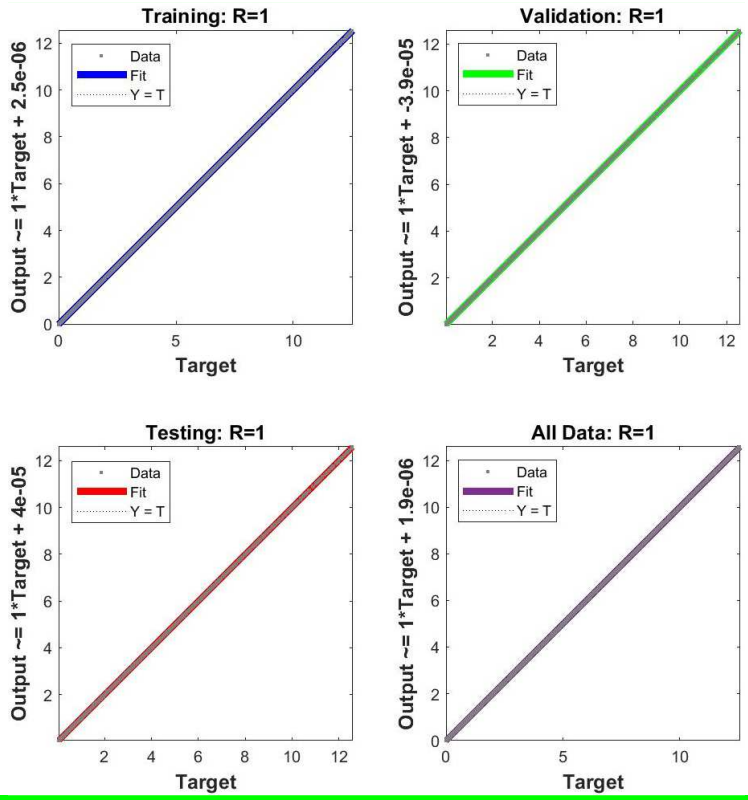



Figure A.17. A linear fit between network's outputs and targets for all learning stages separately and combined. For the network taught on 11-specimens set (sample no. 12. excluded) with 50 neurons in the hidden layer; best $MARE$.

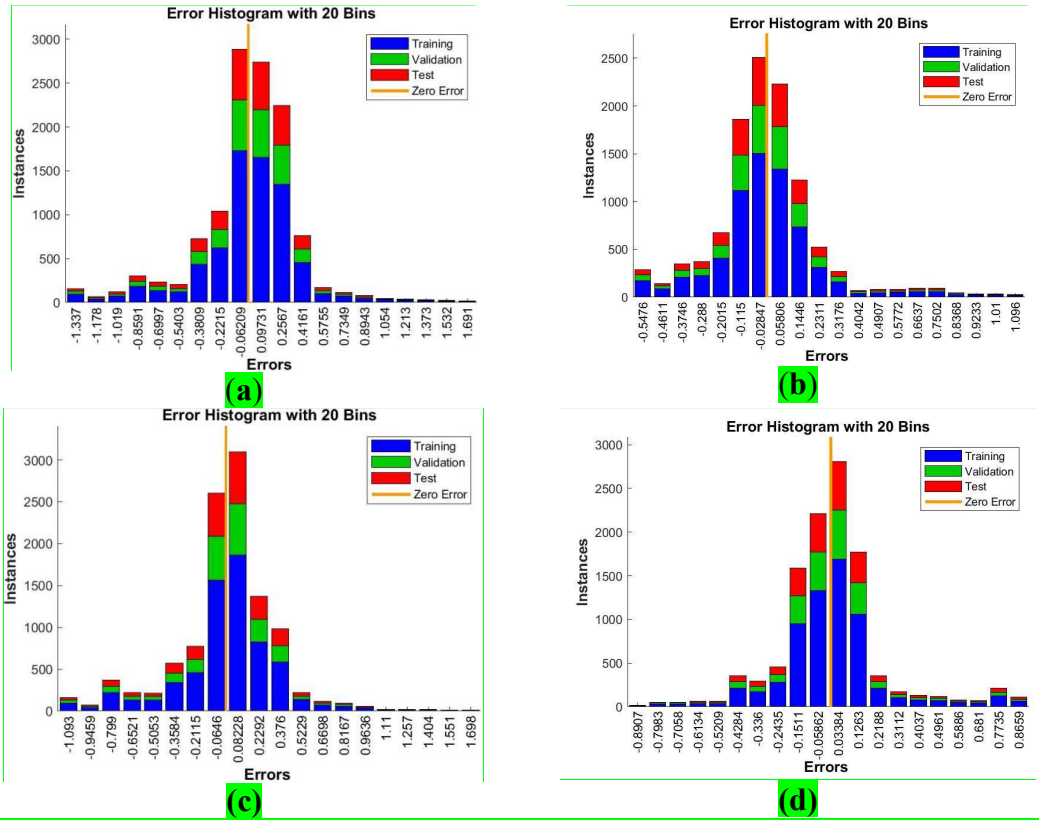



Figure A.18. Error histograms for networks for which $MARE \leq 10\%$ individually for the first time. (a) The 12-samples input, 4 neurons; (b) The 11-samples input (no. 1 excl.), 5 neurons; (c) The 11-samples input (no. 8 excl.), 4 neurons; (d) The 11-samples input (no. 12 excl.), 5 neurons.

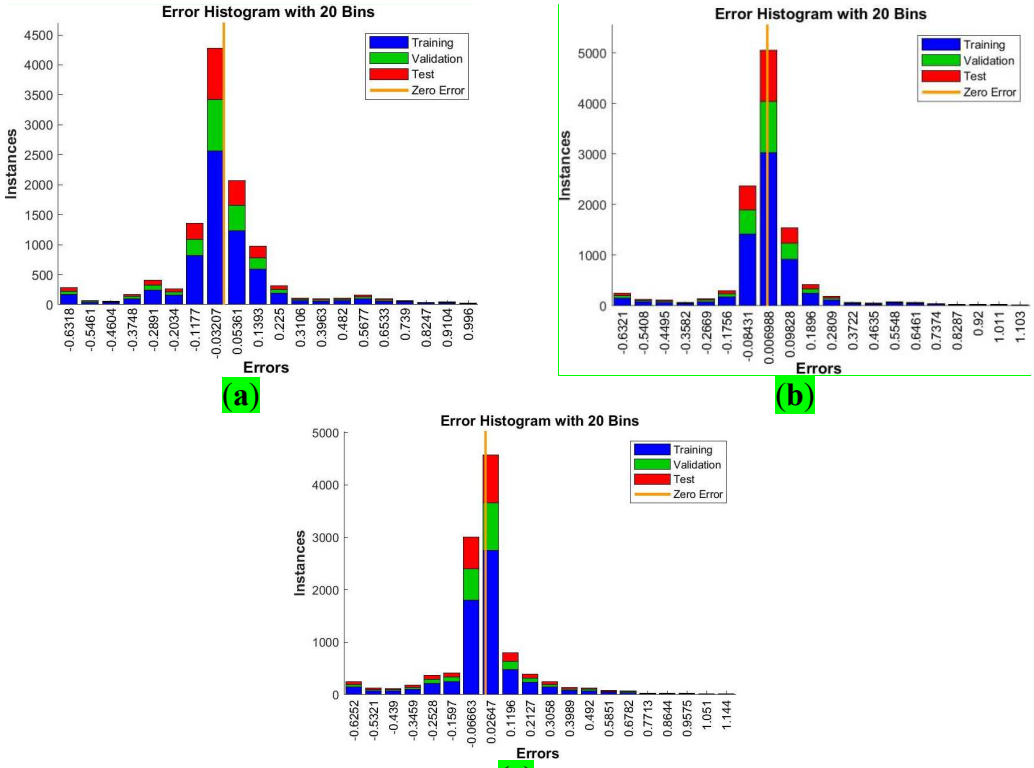



Figure A.19. Error histograms for networks for which $MARE \leq 5\%$ individually for the first time. (a) The 11-samples input (no. 1 excl.), 8 neurons; (b) The 11-samples input (no. 8 excl.), 8 neurons; (c) The 11-samples input (no. 12 excl.), 7 neurons.

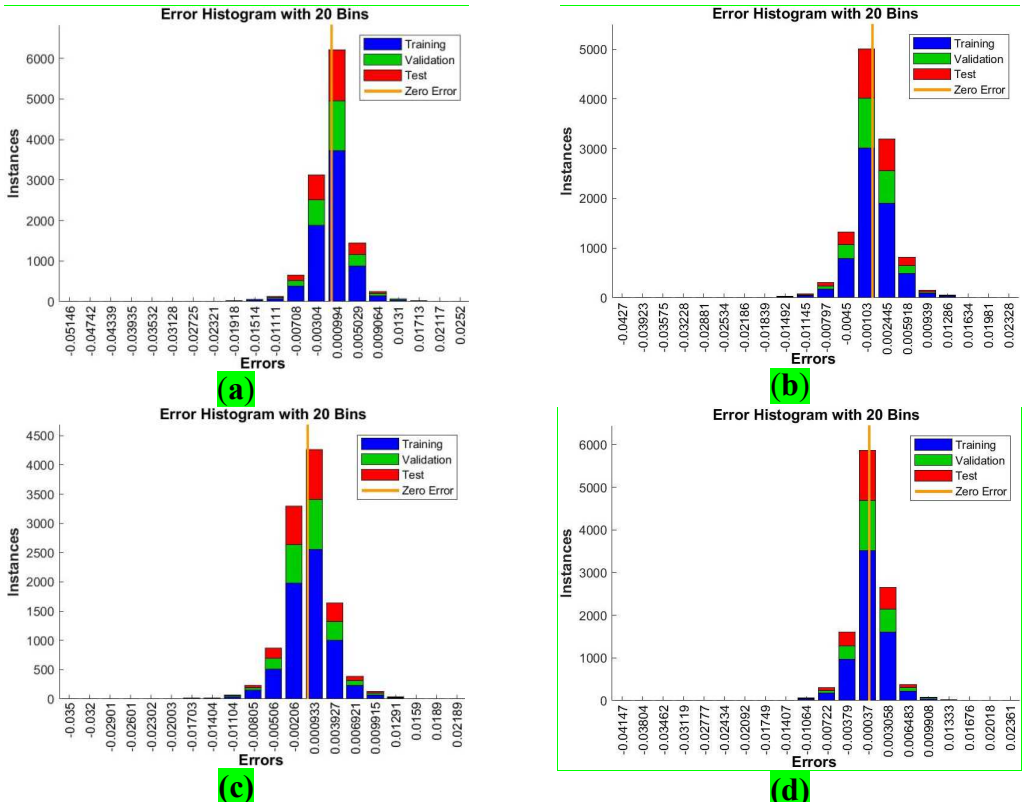



Figure A.20. Error histograms for networks for the best $MARE$. (a) The 12-samples input, 47 neurons; (b) The 11-samples input (no. 1 excl.), 47 neurons; (c) The 11-samples input (no. 8 excl.), 48 neurons; (d) The 11-samples input (no. 12 excl.), 50 neurons.

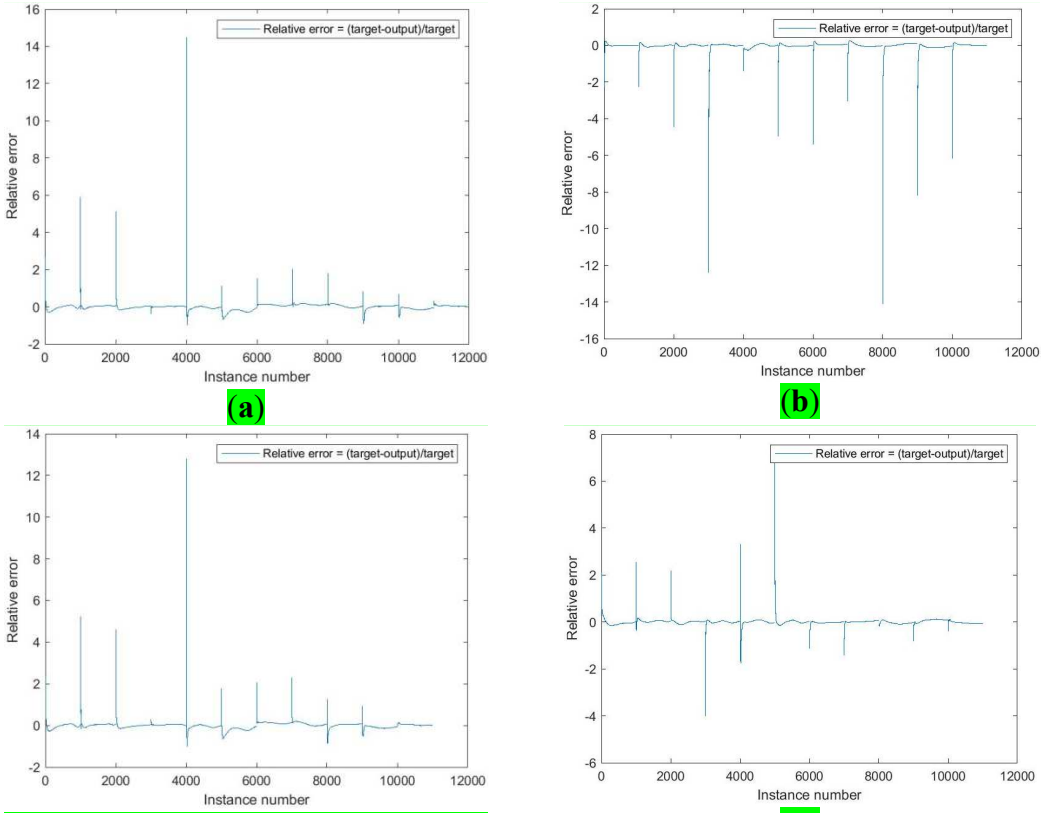



Figure A.21. Relative errors for networks for which $MARE \leq 10\%$ individually for the first time. (a) The 12-samples input, 4 neurons; (b) The 11-samples input (no. 1 excl.), 5 neurons; (c) The 11-samples input (no. 8 excl.), 4 neurons; (d) The 11-samples input (no. 12 excl.), 5 neurons.

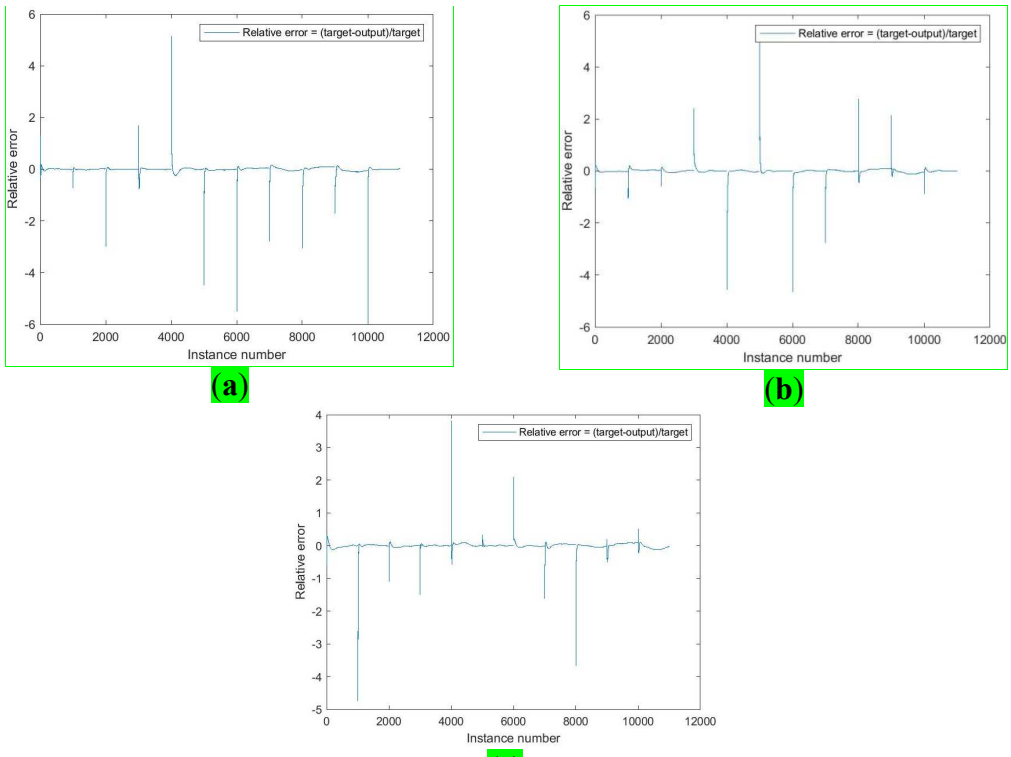



Figure A.22. Relative errors for networks for which $MARE \leq 5\%$ individually for the first time. (a) The 11-samples input (no. 1 excl.), 8 neurons; (b) The 11-samples input (no. 8 excl.), 8 neurons; (c) The 11-samples input (no. 12 excl.), 7 neurons.

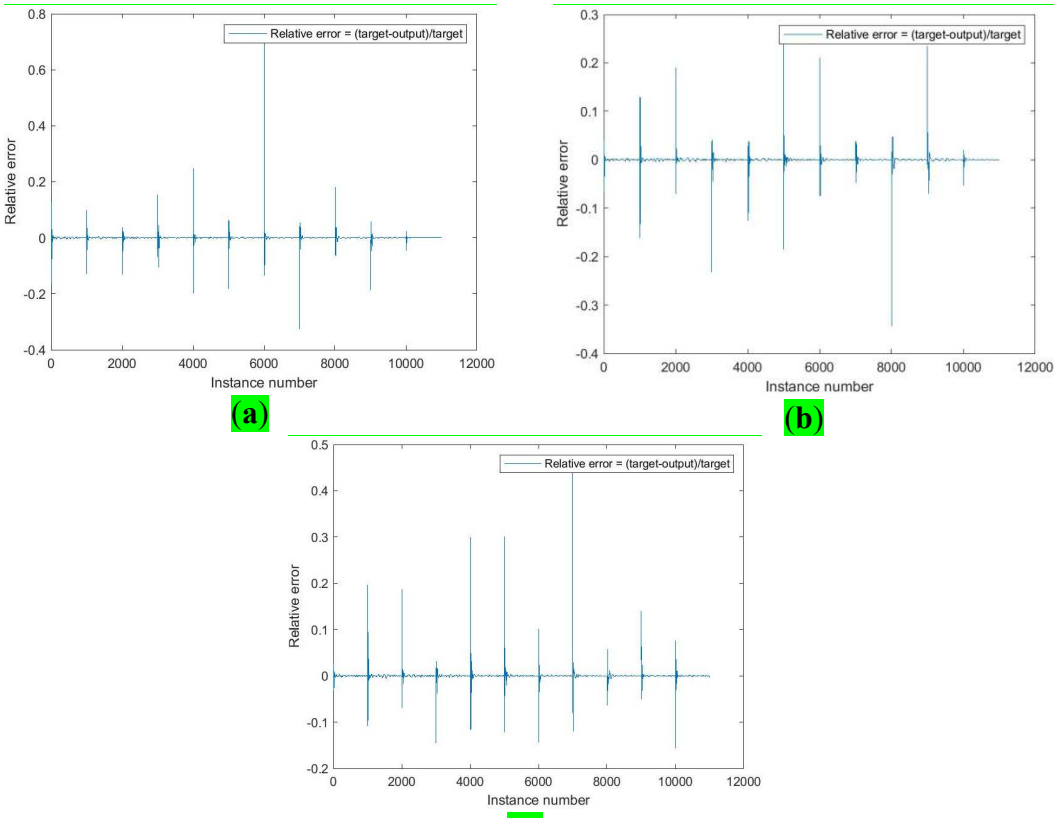



Figure A.23. Relative errors for networks for the best $MARE$. (a) The 11-samples input (no. 1 excl.), 47 neurons; (b) The 11-samples input (no. 8 excl.), 48 neurons; (c) The 11-samples input (no. 12 excl.), 50 neurons.

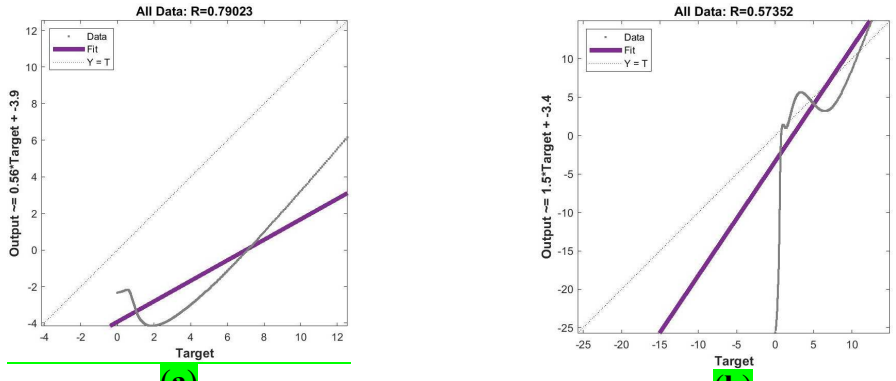
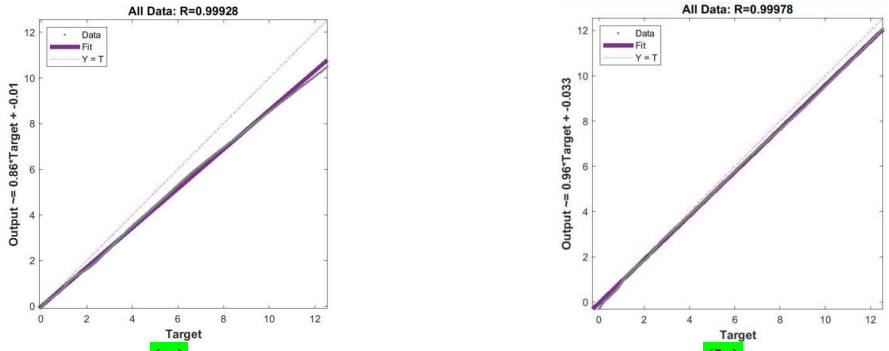
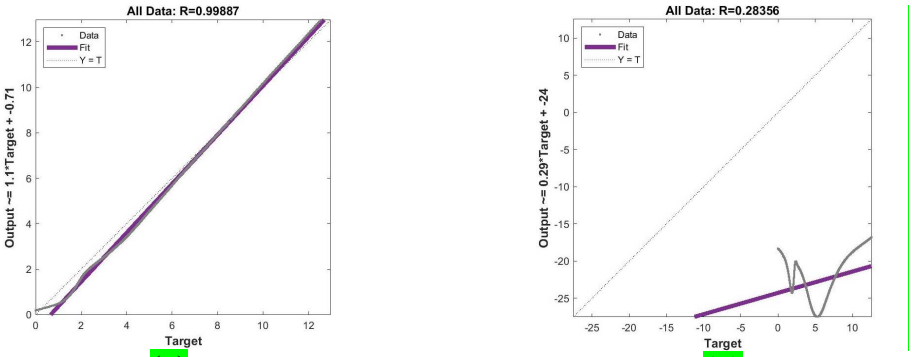



Figure A.24. Regression line from testing of the network taught on 11-specimens set (sample 1 excl.). (a) Structure with 5 neurons; (b) Structure with 47 neurons.



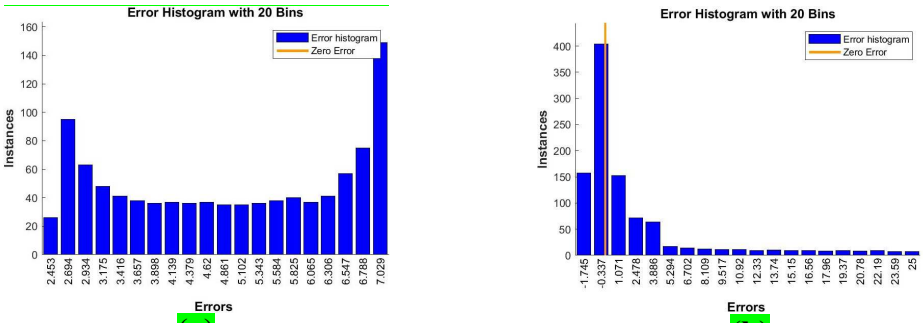

**(a)** **(b)**

Figure A.25. Regression line from testing of the network taught on 11-specimens set (sample 8 excl.). (a) Structure with 4 neurons; (b) Structure with 48 neurons.



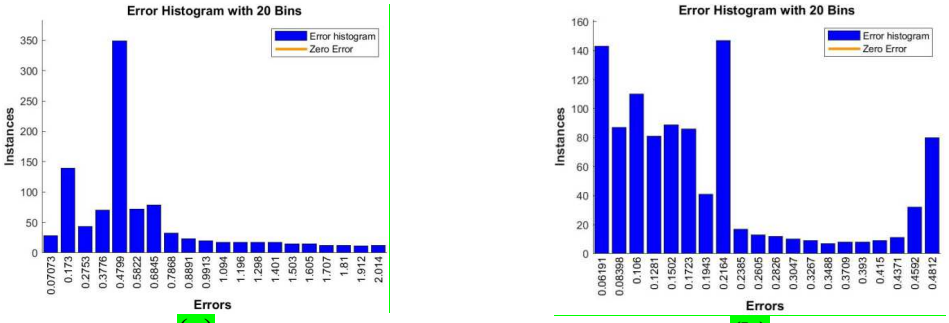

**(a)** **(b)**

Figure A.26. Regression line from testing of the network taught on 11-specimens set (sample 12 excl.). (a) Structure with 5 neurons; (b) Structure with 50 neurons.



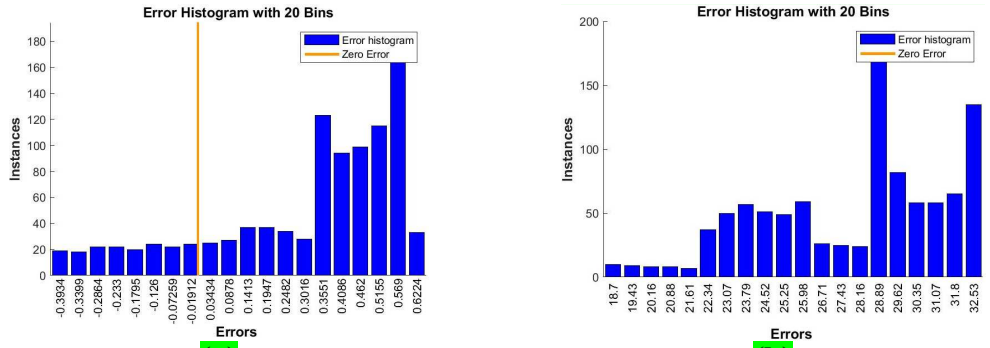

**(a)** **(b)**

Figure A.27. Error histogram from testing of the network taught on 11-specimens set (sample 1 excl.). (a) Structure with 5 neurons; (b) Structure with 47 neurons.



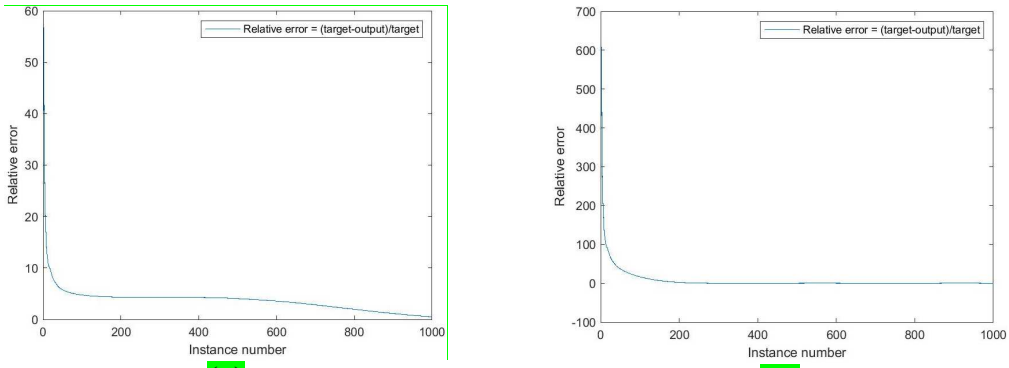

**(a)** **(b)**

Figure A.28. Error histogram from testing of the network taught on 11-specimens set (sample 8 excl.). (a) Structure with 4 neurons; (b) Structure with 48 neurons.



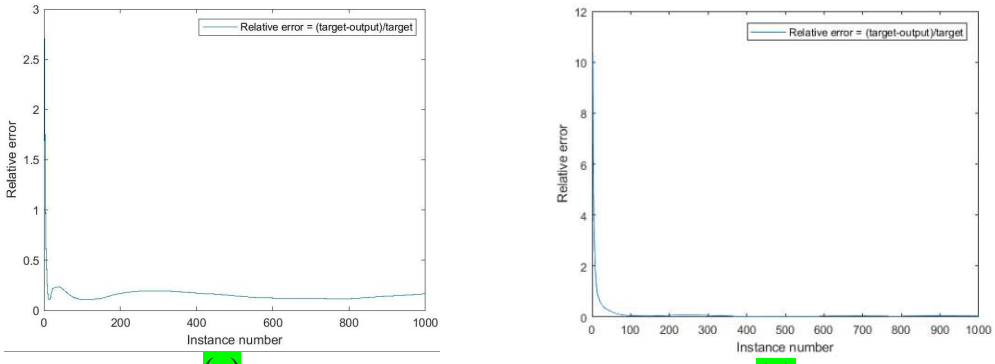

**(a)** **(b)**

Figure A.29. Error histogram from testing of the network taught on 11-specimens set (sample 12 excl.). (a) Structure with 5 neurons; (b) Structure with 50 neurons.



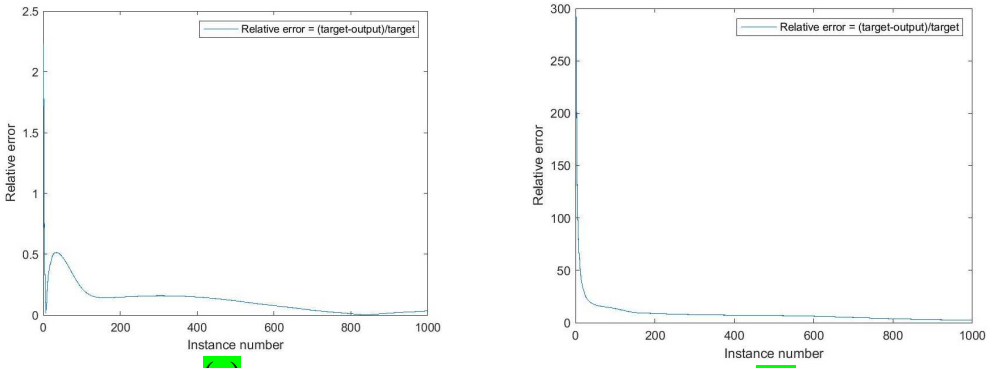

**(a)** **(b)**

Figure A.30. Relative errors from testing of the network taught on 11-specimens set (sample 1 excl.). (a) Structure with 5 neurons; (b) Structure with 47 neurons.




**(a)** **(b)**

Figure A.31. Relative errors from testing of the network taught on 11-specimens set (sample 8 excl.). (a) Structure with 4 neurons; (b) Structure with 48 neurons.




**(a)** **(b)**

Figure A.32. Relative errors from testing of the network taught on 11-specimens set (sample 12 excl.). (a) Structure with 5 neurons; (b) Structure with 50 neurons.

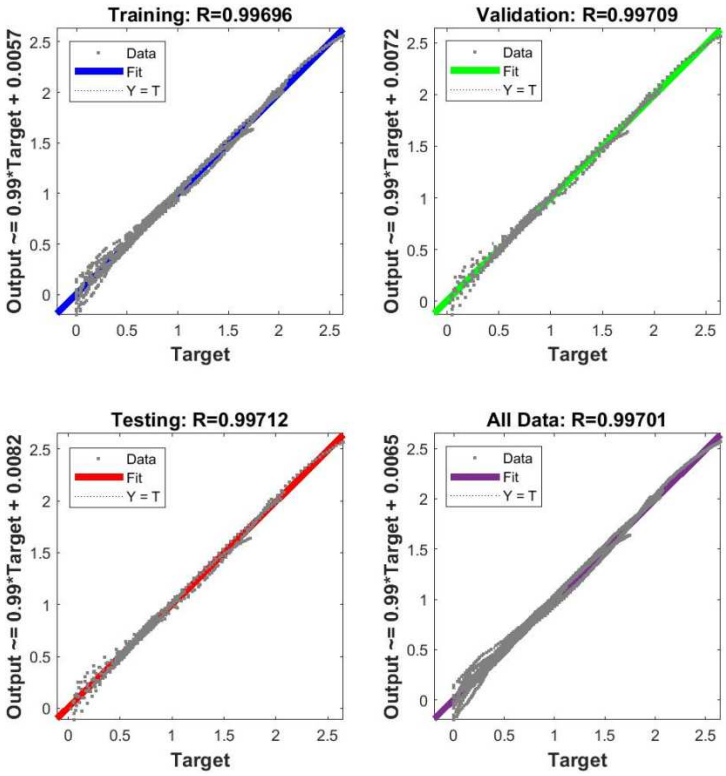



Figure A.33. A linear fit between network's outputs and targets for all learning stages separately and combined for the network taught on 11-specimens set (no. 8 excl.), with 4 neurons in the hidden layer. Case with 200 initial experimental data only.

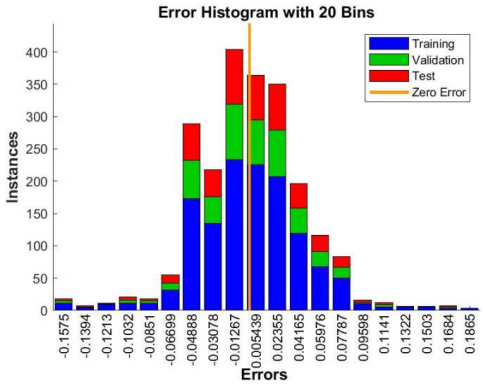



Figure A.34. Error histogram for the network taught on 11-specimens set (no. 8 excl.), with 4 neurons in the hidden layer. Case with 200 initial experimental data only.

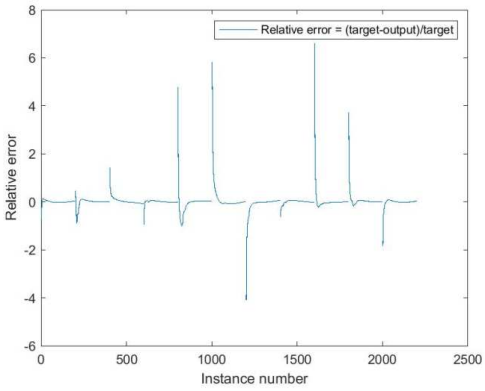



Figure A.35. Relative errors for the network taught on 11-specimens set (no. 8 excl.), with 4 neurons in the hidden layer. Case with 200 initial experimental data only.

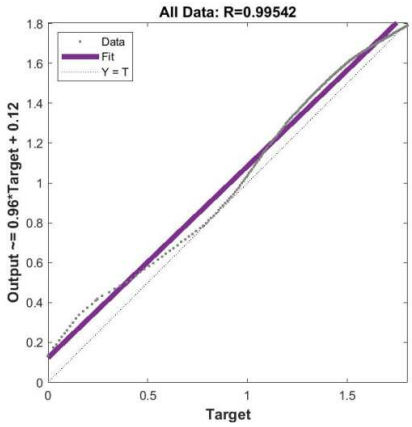



Figure A.36. Regression line from testing of the network taught on 11-specimens set with 4 neurons. Case with 200 initial experimental data only, sample 8.

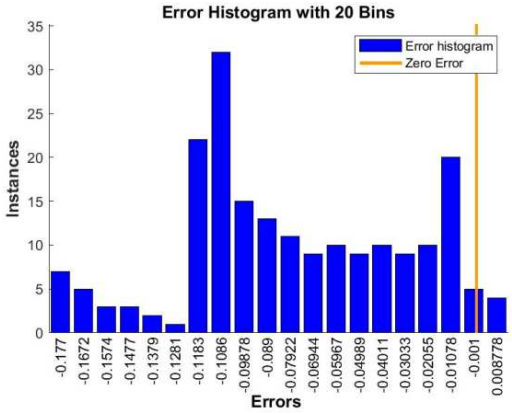



Figure A.37. Error histogram from testing of the network taught on 11-specimens set with 4 neurons. Case with 200 initial experimental data only, sample 8.

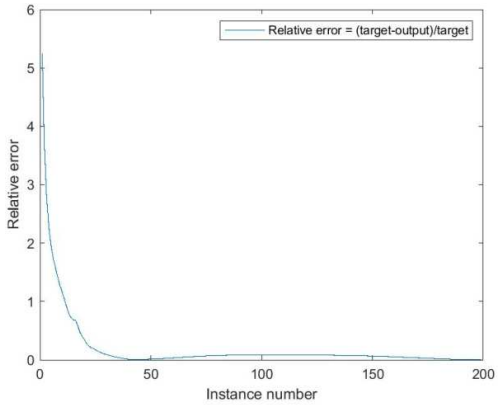



Figure A.38. Relative errors from testing of the network taught on 11-specimens set with 4 neurons. Case with 200 initial experimental data only, sample 8.