

Assignment 2

Neural Networks and ANFIS Models

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For the Neuronal Network we used a standard Multi-Layer-Perception model. We tried different layer/neuron options and received the best accuracy with 3 hidden layers and 1000 neurons each. Our accuracy is around 0.874. The accuracy is still pretty good but could be improved. For example we only used a brute-force-method (we just did some trial runs and checked for the best accuracy scores) for determining the layer and neuron size. We could have used a cross-validation method to optimize the model layout (the amount of hidden layers and neurons) in order to improve our model accuracy. Additionally, we could have tried different neural network architectures to try to gain even better results, since the Multi-Layer-Perception model is not state of the art.

For the Adaptive Neuro-Fuzzy Interference System (ANFIS) we used the provided MATLAB code and changed it according to the wine data set. The code creates a Takagi-Sugeno Fuzzy System Model and maps it onto a neural network structure with 5 layers in total. In our model we create 5 clusters with FCM. By using the one-vs-all approach we mitigate the natural rounding error. We achieve an accuracy around 0.94. Therefore, the ANFIS-Model is already in a really good setup and probably changes only reduce the accuracy. Nevertheless, we can try improving our model by for example changing the number of clusters or changing the clustering method we use to an GK or Grid Clustering.

Method	Fuzzy-Model	Neural Network	ANFIS
Accuracy	0,93	0,874	0,943

In our small trial run (mean of 5 iterations) the neuronal network is performing the worst and the ANFIS performs the best. This could be due to the chosen simple neural network model. We can also see that the Fuzzy-Model and ANFIS-model have small differences. This could be because the ANFIS-method is also based on a Fuzzy-Model. The higher accuracy of the ANFIS could be explained by the combination of the neural network with the Fuzzy-Model. Additionally, the used wine-data set is a relatively simple data-set and therefore we get a high accuracy scores for all of our methods without the need to improve the methods a lot.