Using Meta-learning to recommend Multi-Layer Perceptron structure

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2018/12/3

01 Plan

Plan

Final purpose: Given a data set, we will recommend a suitable network structure for it.

Method: Considering that meta-learning has a good performance in algorithm recommendation, we intend to use meta-learning to recommend a suitable network structure for neural networks.

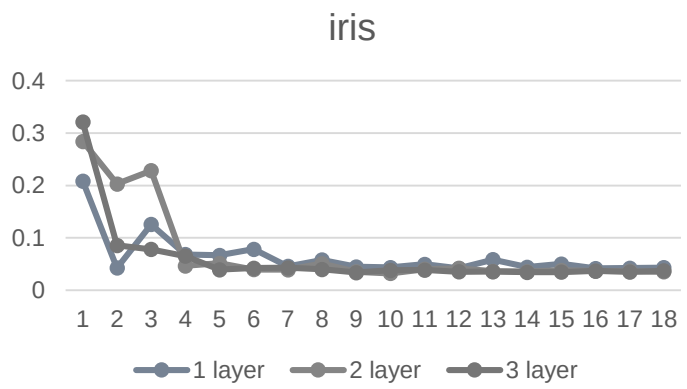
- Step 1: Influence of neural network structure complexity on model performance
- Step 2: The effect of the size of the metabase and feature selection on the performance of the recommended model
- Step 3: Observe the performance of the recommended network structure on the new data set

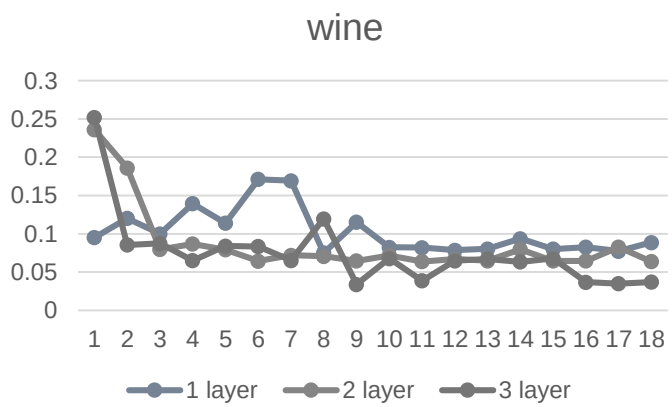
02 | Step 1

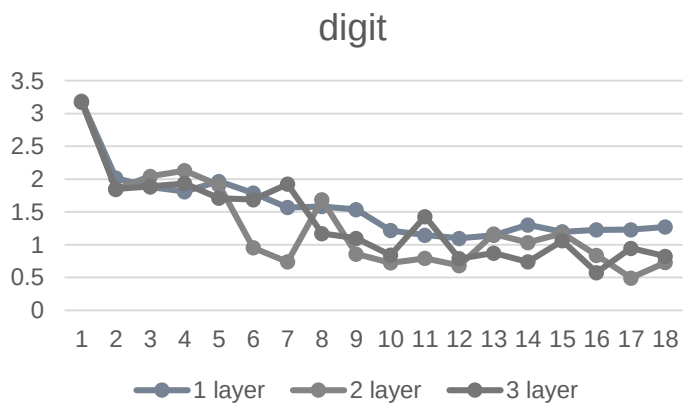
Influence of neural network structure complexity on model performance

Neural networks with overly simple structure

Dataset：



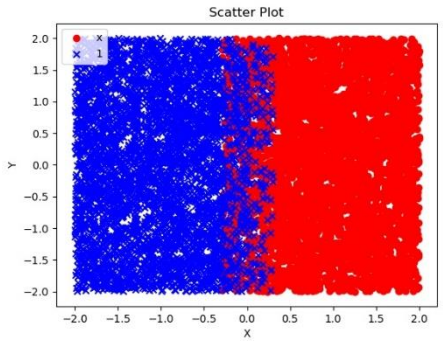




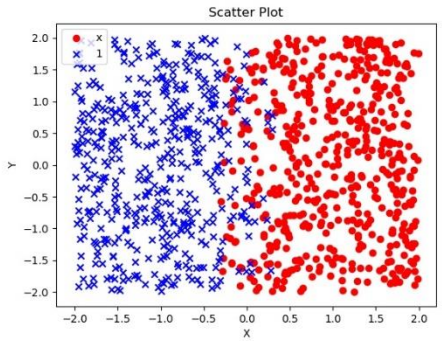
Step 1

Neural networks with overly complex structure

Dataset：



Training set



Testing set

Feature: { (x, y), -2<x<2 and -2<y<2}

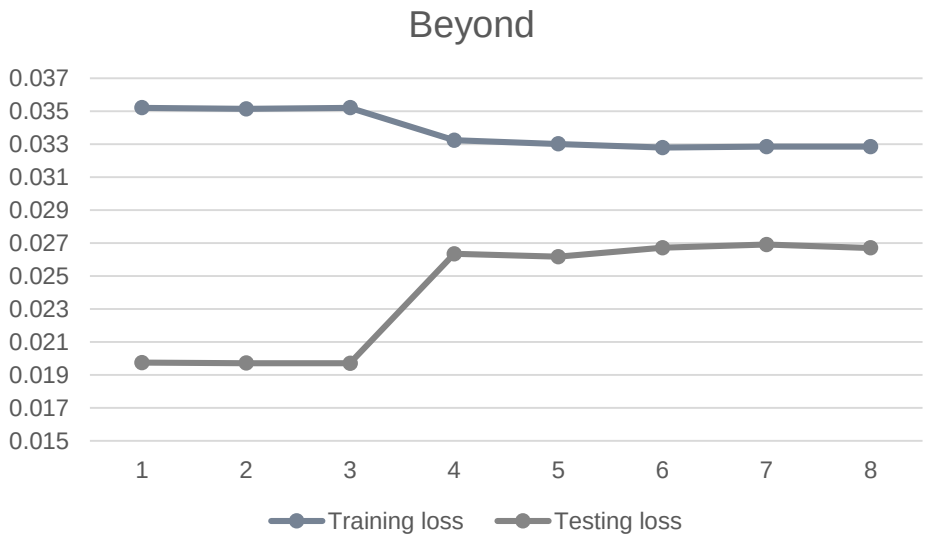
Label:

If x>0.2: label = 1　　If x<-0.2: label = 0　　else label = $\begin{cases} 0\ 50\%\ possible \\ 1\ 50\%\ possible \end{cases}$

Step 1

Neural networks with overly complex structure

Layer: 3
Active function: relu
Lr: 0.01



03 Step 2

- **The effect of the size of the metabase and feature selection on the performance of the recommended model**

Build database:
Use deep learning for feature selection and feature extraction
Build different matabase based on different feature selection methods

The number of the dataset in the metabase:

	50	100	150
Average loss of the testing dataset	-	-	-
Average Training accuracy of the testing dataset	-	-	-
Average Testing accuracy of the testing dataset	-	-	-

04 | Step 3

Observe the performance of the recommended network structure on the new data set

Because the number of layers in the neural network and the number of nodes in each layer are a continuous value. In order to simplify our experiment, we end up with an optimal recommendation in the alternative network structure.

Layer = {1, 2, 3}
Neuron = {10, 20, 30, 40, 50, 60, 70, 80}

Compare the network structure recommended by meta-learning with the prediction results of other network structures with different complexity. Use recommended accuracy to measure recommended performance.

Thanks