Fuzzy-Rough Cognitive Networks: Building Blocks and their contribution to performance

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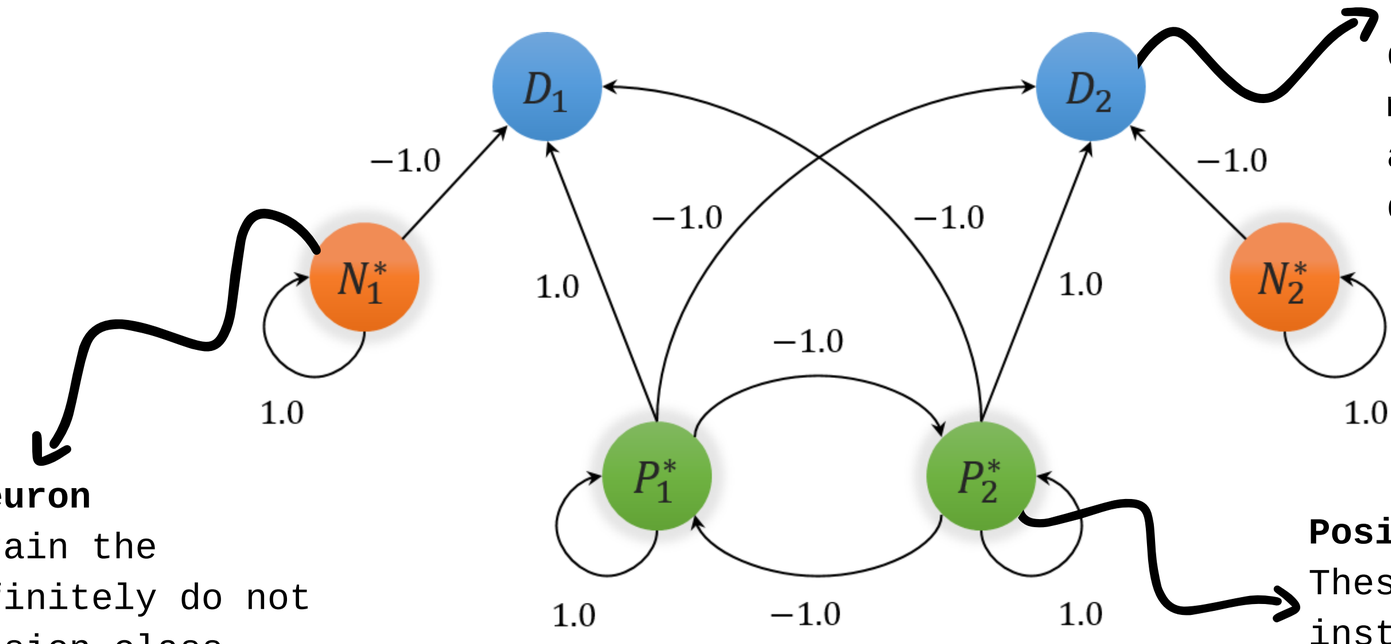
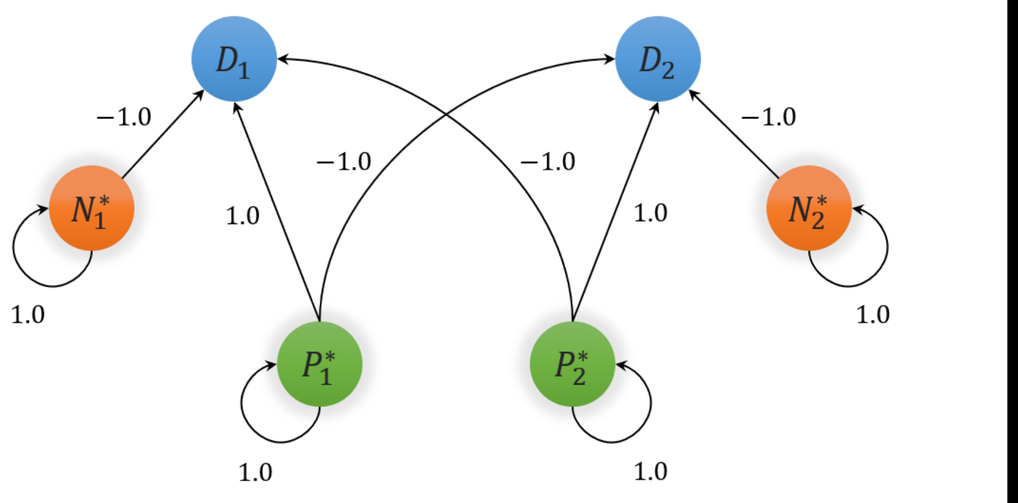


Decision neuron
These neurons denote the decision classes. There are as many decision neurons as there are decision classes in the dataset.

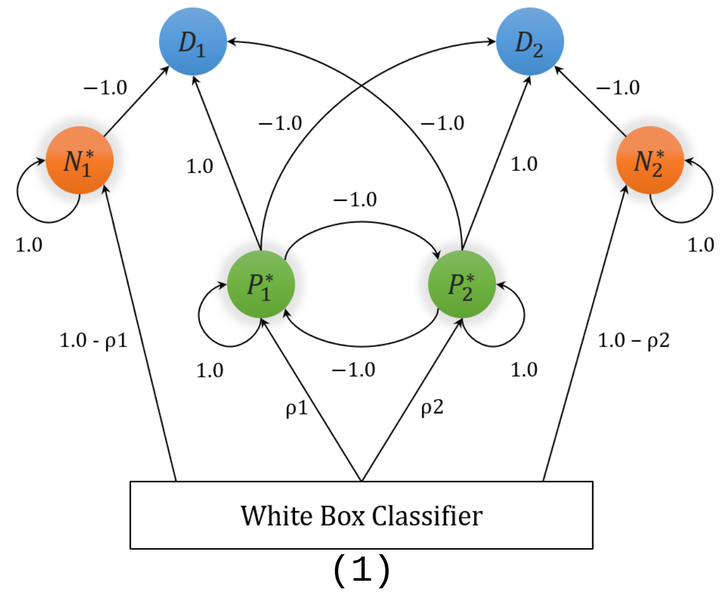
Negative region neuron
These neurons contain the instances that definitely do not belong to the decision class.

Positive region neuron
These neurons contain the instances that definitely do belong to the decision class.

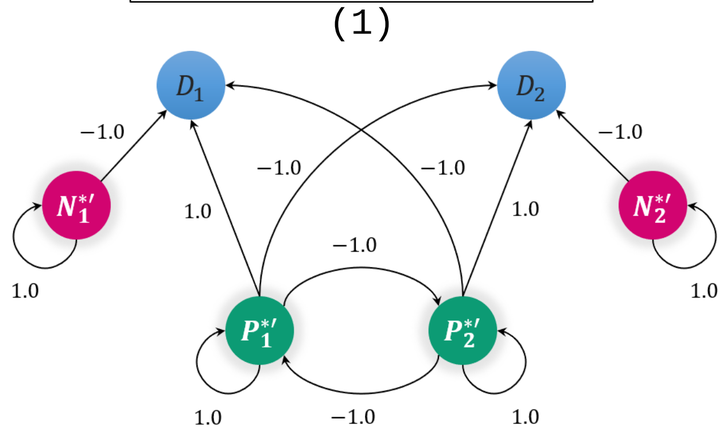
Approach #1



Approach #2



(1)



(2)

Through conducting experiments, we noticed that removing the connections between positive region neurons does not affect performance. This raises some interesting question. Firstly, can the model still be called recurrent? Secondly, can the underlying network still be called a Fuzzy Cognitive Map? And finally, why does suppressing these connections not affect performance? These questions require further research. We also noticed that adding extra connections does not increase performance. Moreover, optimising the current (fixed) values of the weights while preserving the sign does not affect performance either.

Conclusion

In this research, we investigated the contribution of the most important FRCN building blocks. Interesting research tracks in the future are (a) using different classifiers to compute the confidence degree and (b) investigating why removing the connection between positive regions does not affect performance.

Using a different classifier, we computed a confidence degree for each decision class. This degree allows us to label an object with more than one decision class at the same time, but to different degrees. There are two ways of integrating this confidence degree in the FRCN: (1) through an actual weight, which will be multiplied with the initial activation values of the input neurons and (2) directly into the initial activation value formulas. The results pointed out that for (1) there was no increase in performance and for (2) we only achieved a positive and significant result using a Bayesian Network. Our hypothesis is that Bayesian Networks are able to provide additional insights from data, which allows the FRCN to "correct" possible distortions.