

Fuzzy Deep Neural Network with application in portfolio management

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Motivation:

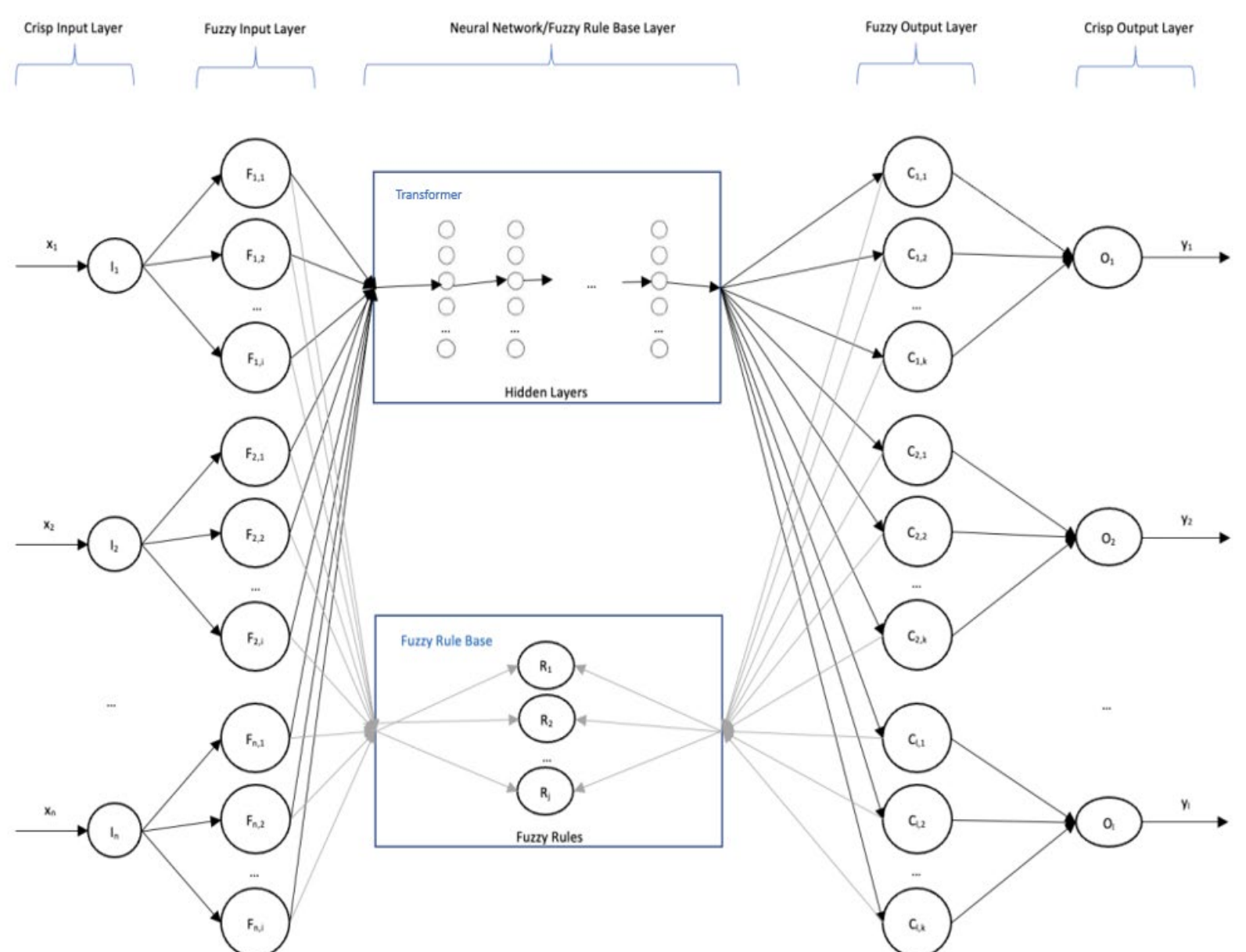
1. Due to the 'black-box' nature in deep learning models, it is discouraged to use in financial system.
2. Uses Fuzzy Deep Neural Network (FDNN) to combine both neural networks and fuzzy system to not only make accurate prediction while providing high interpretability and transparency of the predicting process.

Design & Implementation:

The crisp input is fuzzified and simultaneously fed into both the transformer and fuzzy system.

The transformer and fuzzy system are connected through a tagging mechanism.

The fired fuzzy rules
The crisp output is obtained after defuzzification.



Results & Applications:

FDNN is used to forecast the future stock prices from $t+1$ to $t+13$ timesteps. The optimal feature set was determined by MCES feature selection, and genetic algorithm was used to tune the parameters for the transformer.

Advantage Actor Critic (A2C) reinforcement learning algorithm is also used to rebalance the weight of the stock in the portfolio, comparing it with equal-weighted portfolio.

