

# Fuzzy C-Means Long Short-Term Memory

## with application in Exchange-Traded Funds

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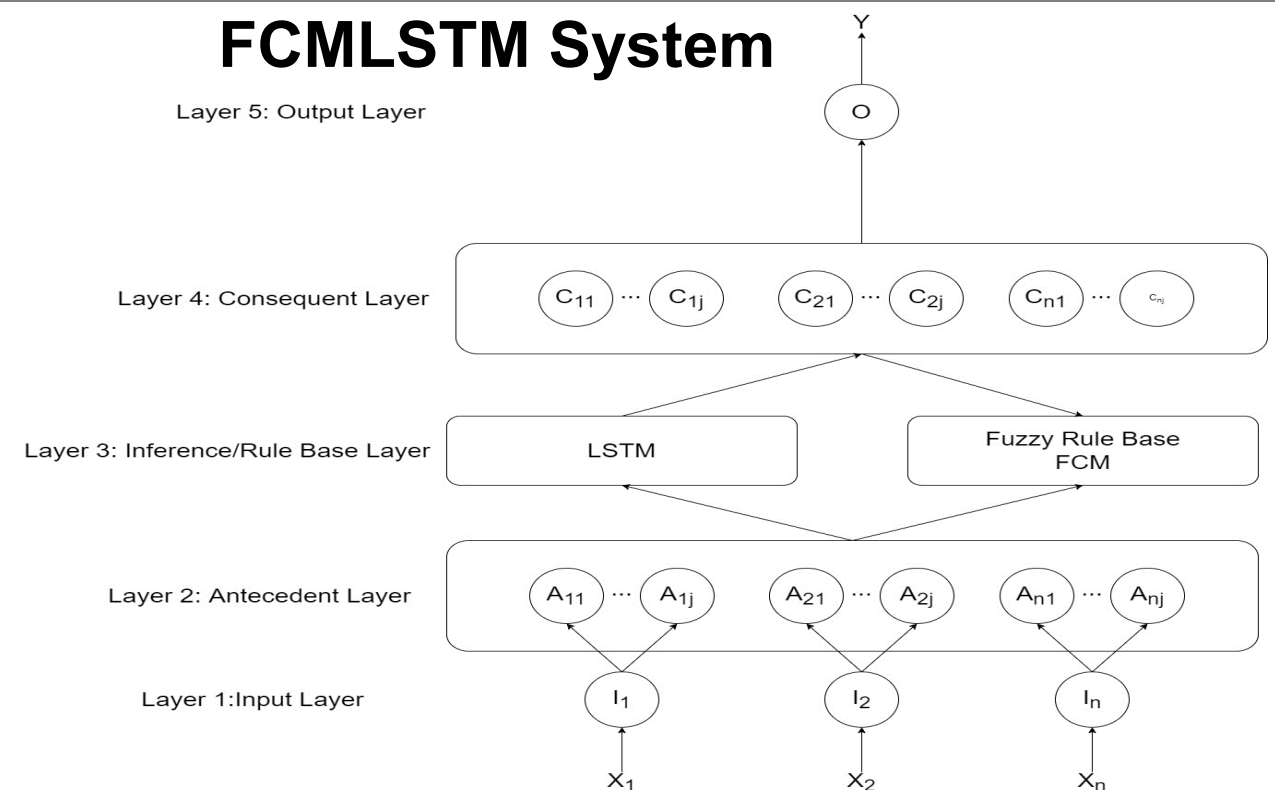
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### Project Objectives:

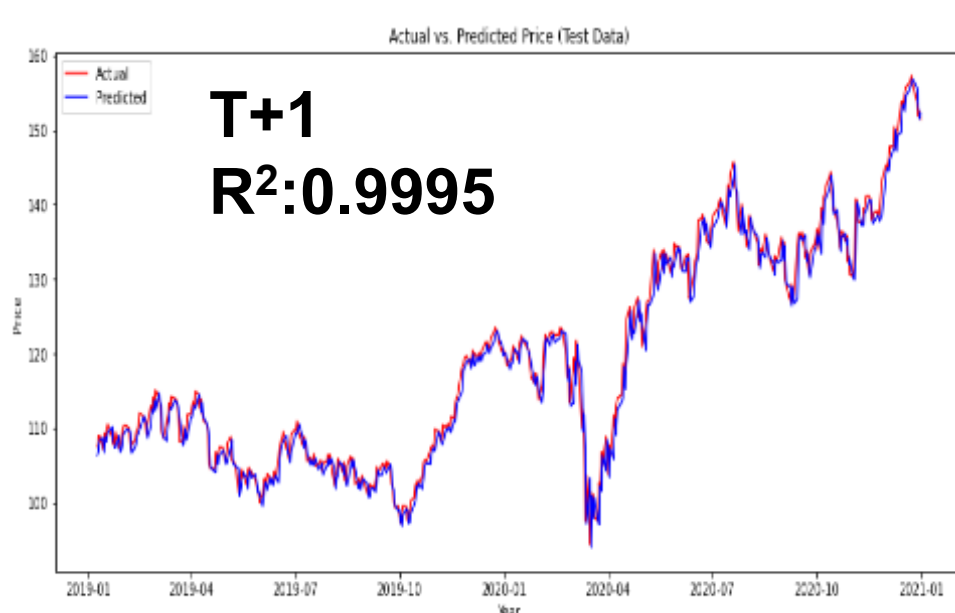
This project proposes a Fuzzy C-Means Long Short-Term Memory (FCMLSTM) system by incorporating the interpretability of fuzzy system and prediction performance of deep neural networks. The prediction by our system is utilised by a trend trading strategy to perform portfolio rebalancing containing exchange-traded funds (ETF).

### Design & Implementation:

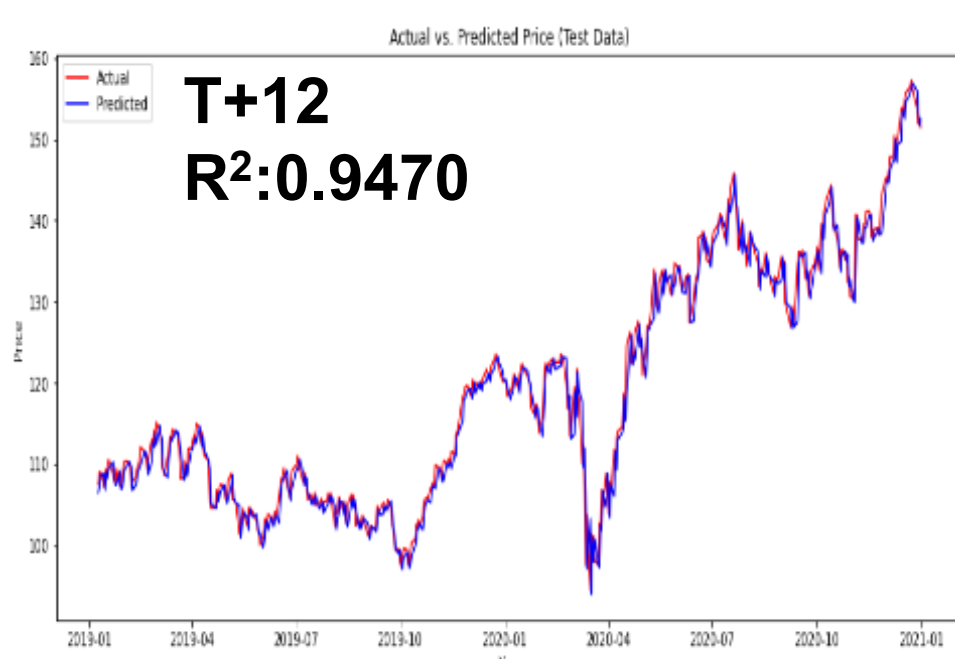
- 1) Fuzzy rule base generation by FCM
- 2) Fuzzification of crisp input to fuzzy input
- 3) Inference of fuzzy input to fuzzy output using FCM and LSTM
- 4) Defuzzification of fuzzy output to crisp output



### ETF Price Prediction:



High correlation,  
Predicts trend



Predicts up  
to T+12

### Portfolio Rebalancing:

#### Trading Strategy:

Predicted Moving Average Convergence

Divergence Histogram with Genetic Algorithms

(PMACDH-GA)

Rebalance portfolio based on PMACDH-GA

buy/sell signals

PMACDH-GA strategy outperforms against buy & hold and MACDH

Strategy	ROI	AROI
PMACDH-GA	<b>135.46%</b>	<b>11.3%</b>
Buy & Hold	130.92%	11.03%
MACDH	99.58%	9.02%