NANYANG TECHNOLOGICAL UNIVERSITY SINGAPORE

School of Computer Science and Engineering
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Support Vector Fuzzy Parallel Embedded System (SVFPS)

Integrated with portfolio management strategy

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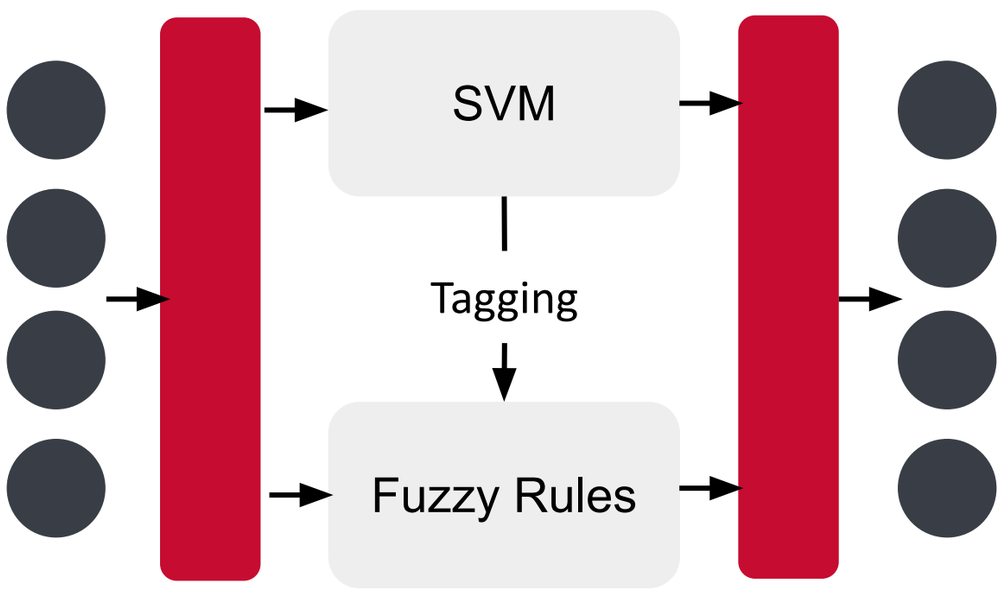
Abstract

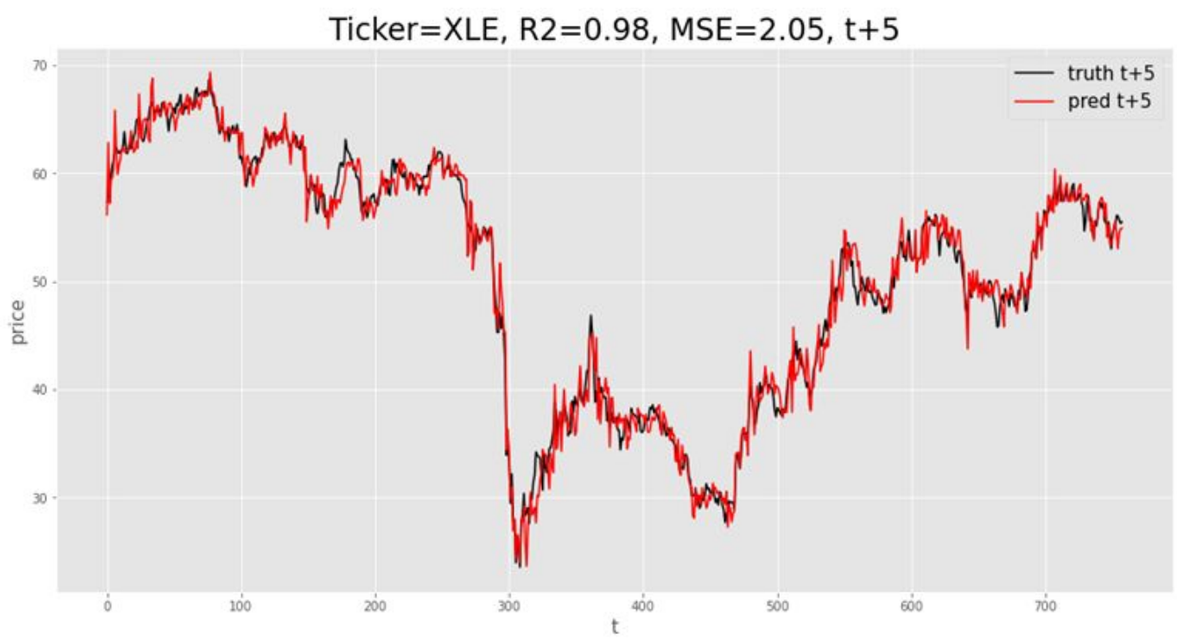
This project proposes a novel architecture called Support Vector Fuzzy Parallel Embedded System (SVFPS) by incorporating a fuzzy system embedded with Support Vector Machine (SVM). The architecture provides both high prediction accuracy from SVM implication and interpretability from fuzzy rule base.

Design and Architecture

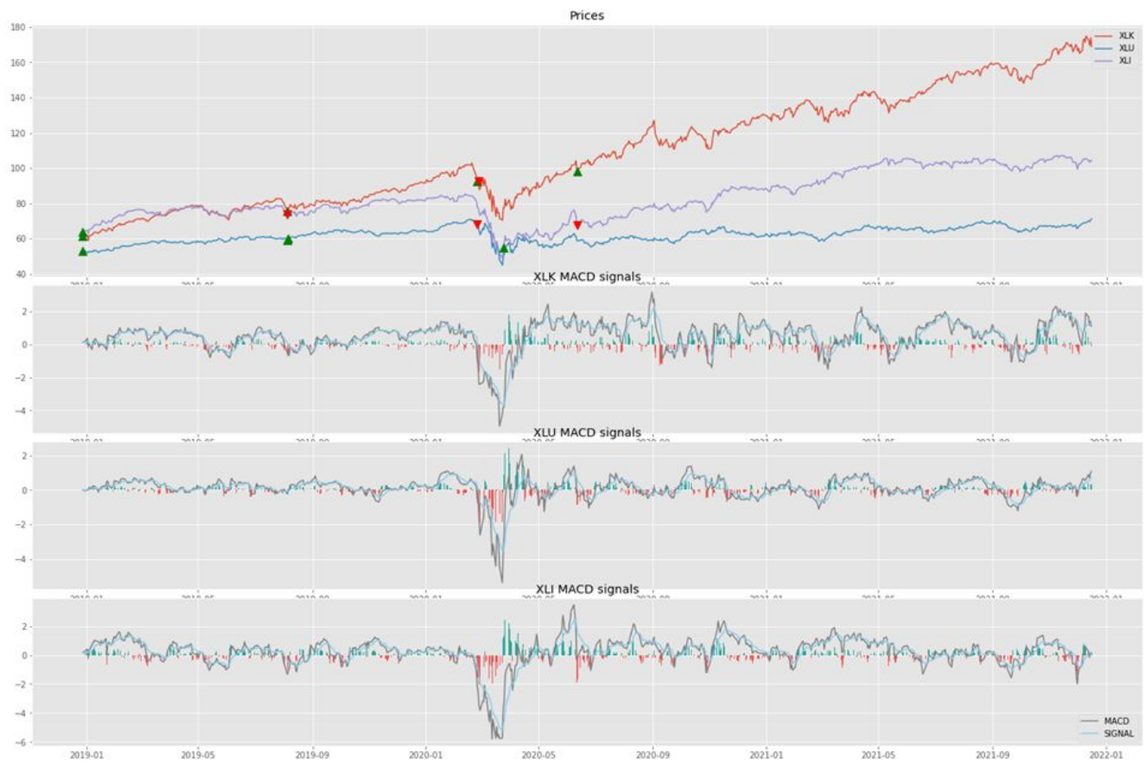


- **First layer**: Crisp inputs are fed where each node represents a feature.
- **Second layer**: Crisp values from the first layer are fuzzified.
- **Third layer**: Fuzzified values are split into the SVM and rule layer. Where SVM learns data patterns while the rule layer accord the explainability mechanism.
- **Fourth layer**: Fuzzy outputs from layer 3
- **Fifth layer**: Output crisp values after defuzzification

Results and Applications



SVFPS forecasting t+5 timestamps ahead for Exchange-Traded Fund, XLE



A proposed portfolio management system incorporated with SVFPS getting an annual return of 59.51% ROI, outperforming benchmarks.

Metric	Annual Return
Buy and hold	31.07%
Vanilla MACD	23.74%
Genetic Algorithm MACD	40.78%
GA-enhanced SVFPS fP	**59.51%**