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EMPLOYING HIERARCHICAL TEMPORAL MEMORY MODEL FOR FINANCIAL TIME SERIES PREDICTION

Hierarchical Temporal Memory (HTM) is an artificial neural architecture proposed by Jeff Hawkins and Dileep George in 2004 that models some of the structural and algorithmic properties of biological neocortex. As recent advances in applying deep neural networks to some areas of applied artificial intelligence (image classification / scene parsing, natural language processing, actuator feedback in robotics) are hard to ignore, however, they are somewhat biased to classification and unsupervised learning domains, neglecting prediction-based challenges. HTM, on the contrary, is designed around the core assumption that prediction can be the universal operational foundation of AI in general, and makes many non-trivial problems that can be hard to solve by existing deep learning approaches comparatively easier.

We employ a HTM-based framework for predicting some financial time series. While our solution is still far from being universal, we have discovered some peculiarities of HTM model parametric configuration that are unique to this approach, such as:

– Data regularisation: normalisation and pre-classification are even more essential for normal network operations than with usual deep learning approaches. Pre-filtering anomalies and noise reduction are, however, seem to be less important.

– Amount of data required for successful model training is significantly less than with recurrent neural networks.

– Proper choice of time scale and aggregation is crucial for prediction accuracy.

– Predicting volatility is significantly easier than predicting movement direction.

– Long-term drift detection is also quite feasible.

Taking all this in mind, we consider the HTM approach to be very fruitful in time-series prediction tasks (even within difficult contexts of financial modelling), warranting further research.

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