Vector Field Neural Networks uses in Price Pattern Recognition and Trading Heuristic Assessment

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Initial Proposal

Background

This research aims to apply vector-field neural networks to eliminate the downsides of regression machine learning models when applied to chronological datasets. The largest drawback of regression analysis in price theory against chronologically sorted market data is the inability to vectorize incoming data without manually-preprocessed data points. Time vectors across a variety of categories labeled according to risk-assessing actions can better determine advanced heuristics used by top traders. This research has applications in both option theory and volatile markets, including cryptocurrency ICOs and blockchain trading.

Short-term Goals

The researcher hopes to develop an initial understanding of training neural networks and the implications of transitioning to vector inputs. The researcher will then explore the memory/time cost of vector-based data and proceed to develop a regression neural network based on pre-processed vector data points.

Long-term Goals:

The researcher will attempt to incorporate the vectorized data into model training. Additionally, the researcher will investigate potential optimizations both related to machine learning and financial concepts (signaling, etc.) for proper training of the neural network.

Tentative Timeline

- Weeks 1 & 2 (1/14-1/25): Theoretical: Begin research on neural networks and math behind model training. Practical: Set up python environment for use with scikit-learn MLP. Begin discovery of available resources (i.e. resources used in regression neural networks that will carry over to vector-field).
- Weeks 3 & 4 (1/28-2/8): Theoretical: Continue deeper discovery into neural network fundamentals, understand component pieces & view code samples for neural networks.

Practical: Generate/locate test (non-financial) chronological data set with predictable outcomes for initial testing. Begin applying neural networks with custom methods (create boilerplate for use).

- Weeks 5 & 6 (2/11-2/22): Theoretical: Begin discovery into vector-based inputs, with regression neural networks. (separate data point for each individual vector, with length of vector added as separate point). Practical: begin implementation of vector-input into working neural network with custom input functions.
- Weeks 7-10 (2/25-4/1): Theoretical: Begin and complete discovery of differences in vector-field neural network and regression neural network. Report background section should be mostly finished at this point. Practical: Generate new neural network for conversion to vector-field. Add & adapt methods to track data points. Determine time loss of execution (vectorization of chronological dataset pre-processing will increase time complexity of neural net).
- Weeks 10 & 11 (4/4-4/15): Explore and apply potential optimizations on a clone of vector-field neural network. Report experimental results between three models on non-financial train/test data. Begin cleaning financial data for use for each model application.
- Weeks 11 & 12 (4/18-4/29): (Tentative) Explore final ramifications of technology in crypto space. Begin thinking about potential scaling and application for investors and trading firms.
- Weeks 13 & 14 (5/1 – 5/12): Demo and report to Dr. Crandall & FRST, further analyses, blocked for overflow if necessary.

Tools, technologies, resources needed:

The researcher will be using the following resources:

- Model Development: Anaconda, mainly Python, scikit-learn MLP
- Data Processing: Spark with Apache Hive, dep. AWS Elastic MapReduce
- Scaling & Full Application: AWS Deep Learning for exploring scalability, GPU optimizations
- Kaggle for access to predictable datasets