CS 536: Machine Learning – Project Proposal

Topic: Time Series Prediction Problem - Detect future values of stock prices of a set of companies using RNN Intuition.

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Problem Statement:

Considering a Time Series Prediction Problem, where in, we take a set of companies, and we detect the future values of their stock prices in real time.
We do this using Recurrent Neural Network (RNN) Intuition.

Project Dataset:

https://drive.google.com/file/d/1zCVhNQoOH3_PGJPPVpOWxd0KPrRhqrix/view?usp=share_link
The dataset contains stock prices statistics of 500 S&P companies over a period of 2013-2018.

How We Implement:

- To incorporate the problem statement, we will be building a RNN, our first attempt.
- Then, we will observe the results to identify possible issues and ways to improve the RNN, so that eventually the RNN will be well improved by the end.
- We evaluate the RNN model (more generally a Regression model) and by the end, after having clearly identified the issues and improvement solutions, we will make several more robust and relevant RNNs.

The Idea Behind Recurrent Neural Networks:

- RNNs are like short-term memory in the human brain.
- In RNNs, we've got inputs, hidden layer and outputs as usual like ANNs, but now the neurons are also connected to themselves through time.
- The idea behind RNNs is that the neurons have some sort of short-term memory providing them with the possibility to remember, what was in this neuron just previously.
- Thus, the neurons can pass information on to themselves in the future and analyze things.

Examples and Applications of RNNs will be explained more in detail in the final report.

Project Specifications:

- Building a RNN
- Vanishing Gradient Problem
- Long Short-Term Memory (LSTM)
- Practical Intuition
- LSTM Variations

Expected Results:

- Predict the stock prices of the companies in real time using Recurrent Neural Network (RNN).
- Model and show the comparison between the predicted and the actual price of the stock over the years, and check if our model produced the accurate results as expected.

Literature – Research Papers:

[1] Andrej Karpathy, Justin Johnson, Li Fei-Fei (2015, November 17). Visualizing andunderstanding recurrent networks. arXiv.org. Retrieved March 6, 2023, from https://arxiv.org/abs/1506.02078

[2] Andrej Karpathy (2015, May 21). The unreasonable effectiveness of recurrent neuralnetworks. Retrieved March 6, 2023, from http://karpathy.github.io/2015/05/21/rnn-effectiveness/

[3] Klaus Greff, Rupesh K. Srivastava, Jan Koutn´ık, Bas R. Steunebrink, Jurgen Schmidhuber (2017, October 4). LSTM: A search space odyssey. arXiv.org. Retrieved March 6, 2023, from https://arxiv.org/abs/1503.04069

[4] Shi Yan (2016, March 13). Understanding LSTM and its diagrams. Retrieved March 6, 2023, from https://blog.mlreview.com/understanding-lstm-and-its-diagrams-37e2f46f1714

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[6] Sepp Hochreiter & Jurgen Schmidhuber (1997). Long Short-Term Memory. Retrieved March 6, 2023, from http://www.bioinf.jku.at/publications/older/2604.pdf