

# Paper Review

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Project Title: Predicting when to buy an option using neural networks

## Information of paper

list paper name, published venue, authors, and published year. Avoid picking unpublished work (e.g., those only available on arxiv.org).

### Paper Name

Machine Learning in Finance: The Case of Deep Learning for Option Pricing

### Published venue

Santa Clara University

### Published year

August 2, 2017

### Link

<https://pdfs.semanticscholar.org/fffa/2cec0b796707c975067654851e878a00a469.pdf>

## Relevance

Our project focuses on the selection of available options on the market. When selecting these available options, the key defining element of the quality of an option is how it is priced.

This paper uses machine learning to try and recreate some of the existing models using neural networks. The techniques used by the authors can be reproduced by our team when training a model to make picks that will use these models as data points.

This paper also offers a background on how neural nets may be used to mimic the trading made by professionals, so that a model could be created to make picks, as is our goal for this project.

## Summary

In part 1 an introduction into machine learning and what made it possible, such as new matrix calculation methods, hardware, and big data, is provided. Part 2 provides further detail on the function of neural nets and how the architecture used in the paper behaves. Part 3 focuses on the benefits of using neural nets in financial markets because they are inherently good at discovering nonlinear relationships, of which the market is full of. In part 4, the author explains the Black Scholes Model and explains how they will try to have their neural net reach equal or greater performance.

Part 5 goes into depth about the results of their predictor and how the training data was generated. Part 6 is a summary of the report and how the technology developed could be applied by an investment manager in the actual market.

## Pros and cons

One of the greatest aspects of this paper is the quality of how the author introduces each of the key concepts. Someone with no background on trading or machine learning could approach this paper and be able to learn from it given enough time.

Another positive aspect from this paper is the description of how the training data was generated. Finding available options data online has proven to be a challenge for our team so the techniques used by this author are certainly applicable.

One of the negative aspects of this paper is that the author did not justify why they decided to only use neural nets for the investigation. Some justification on why these are superior to all other ML models would have been useful.

Another negative aspects of this paper was that the performance of their model was limited from the outset. The author aimed to generate a neural net that can perform comparably to the Black Scholes pricing model and used this equation to generate data. It would have been valuable to learn how to create models that perform better than an equation that already exists.

## Comments

In the last sentence of the abstract the author mentions that the findings suggest that a model could be trained to mimic the performance of an actual trader however, the article does not go into further detail on how this may be achieved. Instead, they leave off on mimicking the pricing model of Black Scholes.

The author spent a great deal of time explaining how neural networks have increased in capacity and why this has happened. This is summarized well in the first sentence of the last paragraph in part 1. The author could have spent less time on this subject and more discussing the actual investigation and extrapolating on findings.

The insight that neural nets are good for finance because they uncover nonlinear relationships given in part 3 is valuable. However, the discussion at the beginning of part 3 about how ML has been commoditized in industry is not very relevant.

In the fourth paragraph of part 4 the author takes time to reiterate why this exploration is now possible due to developments in technology which is not necessary.

## Improvements

More commentary on how a model that performs better than the Black Scholes model could be generated would be great. The article does a great job establishing that machine learning can be applied to actual markets but does not actually provide specific examples of how what they have created is better than what already exists.

More time expanding on the various variables reported on could have been included. The author chose to focus on some parts of the explanation whereas some of the figure titles are given a bit out of context. For example, only one sentence is given to explain moneyness which relates to one of the key figures of the report.