The Use of Quantum Computing in Algorithmic Trading

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Abstract—Algorithmic trading, is an investment strategy that involves using automated trading systems to make investment decisions in financial markets. Quantum computing has the potential to enhance these strategies by processing market data and analyzing trends faster and more efficiently. This topic will explore the possibility of implementing an agent that makes investment decisions while playing the stock market using quantum computing. The agent will be tested on a quantum computer emulator or a real computer, and its effectiveness will be compared with selected algorithms that do not use quantum technologies.

Index Terms—Algorithmic trading, investing, trading systems, financial markets, Quantum computing, market predicting.

I. INTRODUCTION

THE project will result in a draft of a scientific article describing the research conducted and its conclusions.

II. RESULTS OF THE PROJECT

A. Scope of work performed and its characteristics

1) Collection of data sets: Historical stock market data was collected from the top 20 companies in the WIG20 and S&P indices, as well as historical stock market data of the indices themselves. The data was saved in csv form for easy processing.

2) Implementation of classical algorithms: With the help of available sources, implementations of algorithms based on the classical approach to computation were added. The selected algorithms were:

- PCA,
- SVM.

3) Implementation of quantum algorithms: With the help of available sources, implementations of algorithms based on the quantum computing approach were added. The selected algorithms were:

- QPCA,
- QSVM.

4) Conducting tests: On the basis of selected data sets (WIG20/S&P), the prediction quality of selected classical as well as quantum algorithms was checked.

5) Start of preliminary work on the article: A preliminary outline of the article was created, and the necessary bibliography was collected.

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P. Mironowicz, the project mentor, was with the Faculty of Electronics, Telecommunications and Informatics, Gdansk University of Technology, Gdansk, Poland.

B. Characteristics of teamwork

During the research work, the following tools were used to exchange ideas and created artifacts:

- discord to meet in a group as well as with a mentor,
- github to hold artifacts produced while working on the project,
- LATEX to write documents.

C. Achieved results

This semester's research project involved the implementation of selected algorithms for predicting continuous values from a data set. The selected algorithms were:

- PCA,
- SVM,
- QPCA,
- QSVM.

For each algorithm, wide-ranging tests were conducted on data covering stock market data from previous years. Based on the tests, it was possible to create graphs showing the performance of each algorithm, as well as collect statistical data on the quality of each algorithm's prediction.

D. Discrepancies and changes in project implementation

None.

E. Provisions

Performing more tests and completing the article.