

REVIEW

by Boryana Tsvetanova Pelova, PhD – Assoc. Prof. at the Faculty of Economics and Business Administration, Sofia University “St. Kliment Ohridski”

on the thesis and papers, submitted for a PhD defense procedure

at the Faculty of Economics and Business Administration, Sofia University “St. Kliment Ohridski”

in the higher education field 3. Social, economic, and legal science

professional specialization 3.8. *Economics (Data Science)*.

Reasoning of the review: scientific jury member according to Statement № ПД 38-220/24.04.2025 г. of Sofia University Rector.

Author of the dissertation: Sergey Vichev

Under the scientific supervision of: Assoc. Prof. Angel Marchev, PhD

Title of the thesis: Application of ML tools in business /Multiagent automated systems, based on large language models for development of business solutions/

General characteristics and evaluation of the reviewed thesis

The dissertation has a total volume of 171 pages, including an introduction, three chapters and a conclusion. 118 literary sources are cited. The exhibition is characterized by a classical structure, appropriately balanced in terms of volume and content in each of the chapters.

The topic of the thesis belongs to a recent research strand, characterized by increasing attention. It focuses on the use of large language models in the process of knowledge from SQL databases. With the rapid progress in the development of pre-trained large language models over the past two years, a new scientific niche has been revealed, which explores the possibilities for their application in the automation of routine tasks, including the economy. The peer-reviewed work forms a contribution precisely in this innovative scientific field.

The author develops the architecture of an automated system for knowledge extraction on the basis of user-defined tasks serving as input of the system. Then, the author creates a prototype of the system in a well-established programming environment. The system thus created is applied to a popular case study in the field, and its effectiveness is evaluated.

I find the research as original, interesting and useful. The first chapter offers a systematic literature review, presenting introductory concepts as well as extensive overview on key theoretical developments in the field of large language models – what is their essence, main

classes of approaches for training these models, introduced in the context of their advantages and challenges. I find the presentation useful and informative.

In the second chapter, the architecture of the proposed system is introduced, which is applicable both in a single-agent framework and in a multi-agent one. The individual modules of the system are presented schematically and descriptively. It is evident that significant time and effort have been invested in this part of the thesis, which is evident for the reader and deserves its recognition.

In the third chapter, experiments were conducted to illustrate the capabilities of the proposed system, based on a set of popular OpenAI solutions. For this purpose, a classic task was used in order to evaluate the performance of the system in its single-agent and multi-agent format. In addition, a study was conducted focusing on the capabilities of an alternative language model, with the ultimate goal being to improve the obtained metrics instead of using models from the OpenAI family. The documented results demonstrate the benefits of such a type of system, as well as the outlined possibilities for its improvement in future research.

The main contributions of the research have been published in refereed and/or indexed journals, as well as presented at reputable international conferences.

Comments and recommendations

A number of comments and recommendations can be made on any scientific work, and the present one is not an exception. To an earlier version of the dissertation work presented in terms of the procedure for admission to public defense, I had the opportunity to offer my comments and notes, which are reflected in their essential part in its current version.

Conclusion

The currently reviewed dissertation forms an original contribution to an emerging and perspective scientific domain. It contains original author's results in the relevant subject field, published in refereed and indexed editions. Therefore, I propose to the esteemed scientific jury to honor with the PhD degree Sergey Vichev.

15-Jun-2025

Assoc. Prof. Boryana Pelova, PhD

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