REVIEW

BY PROF. ASYA STOYANOVA-DOYCHEVA, PHD

Faculty of Mathematics and Informatics at the University of Plovdiv "Paisii Hilendarski"

of a dissertation for awarding the educational and scientific degree "doctor"

in field of higher education 4. Natural sciences, Mathematics, and Informatics,

professional field 4.6. Informatics and Computer Science

doctoral program Informatics

Author: Stanislav Minchev Dakov

Subject: „Tools for Improved User Interaction in Electronic Commerce "

Supervisor: Assoc. Prof. Veselin Nikolaev Kyurkchiev, Ph.D., Plovdiv University "Paisii Hilendarski"

1. General presentation of the submitted materials

By Order No. PD-22-1033 of May 19, 2026, issued by the Rector of Plovdiv University "Paisii Hilendarski" (PU), I have been appointed as a member of the academic jury for the defense of a dissertation on the topic "Tools for Improved User Interaction in E-commerce" for the award of the educational and scientific degree of "Doctor" in the field of higher education 4. "Natural Sciences, Mathematics, and Informatics," professional field 4.6. "Informatics and Computer Sciences," doctoral program "Informatics." The author of the dissertation is Stanislav Minchev Dakov, M.S. – a full-time doctoral student in the Department of Computer Technologies, supervised by Assoc. Prof. Veselin Nikolaev Kyurkchiev, Ph.D., of Plovdiv University "Paisii Hilendarski".

The set of materials submitted by Stanislav Dakov complies with Article 36(1) of the Regulations on the Development of Academic Staff at Plovdiv University and includes the following documents:

– a standard application to the Rector of Plovdiv University to initiate the procedure for the defense of a dissertation;

– a CV in European format;

– protocol from the preliminary discussion of the dissertation in the department and the academic advisor's opinion on the readiness to initiate the procedure;

– the dissertation;

– an abstract in Bulgarian and English;

– a list of scientific publications on the topic of the dissertation;

– copies of the scientific publications;

– a declaration of originality and authenticity of the attached documents;

– a statement of compliance with the minimum national requirements.

The set of materials presented to me by Stanislav Dakov on electronic media is in accordance with Article 36 (1) of the Law on the Development of the Academic Staff of the University of Plovdiv.

2. Brief biographical information about the doctoral student

The attached CV shows that the doctoral student earned a master's degree in Computer Science in 2013 from the Faculty of Mathematics and Computer Science at Plovdiv University "Paisii Hilendarski." Since 2020, he has been enrolled in a full-time doctoral program at the Department of Computer Technologies. His professional experience includes teaching at the Faculty of Mathematics and Informatics at Plovdiv University and working at various software companies, where he has held positions as a programmer and software support specialist. His research interests and professional activities are in the field of information technology and computer systems, software development using modern programming languages, and artificial intelligence (machine learning).

3. Relevance of the topic and appropriateness of the objectives and tasks set

This dissertation is dedicated to the development of an easy-to-use and user-friendly application in the field of e-commerce. The main objective of the dissertation is "To investigate possibilities and develop prototypes of software tools for improving user interaction in e-commerce." The primary task of the developed applications is to extract data from e-commerce websites in order to track various characteristics of the goods sold. This information is analyzed, summarized, and presented in a convenient format to interested parties. To achieve the goals and objectives of the dissertation, the doctoral candidate uses current and innovative techniques—a combination of web scraping, machine learning, and a Java application developed specifically for extracting data from e-commerce websites to provide it to users. I consider the topic to be relevant in the context of the ever-increasing number of e-commerce websites and platforms and the growing number of users who find it increasingly difficult to navigate prices, discounts, and products with different characteristics.

4. Understanding the problem

The introduction and literature review presented in Chapter 1 of the dissertation clearly demonstrate the doctoral candidate's familiarity with the subject area. The most popular and widely used e-commerce tools are examined—live chat software, chatbots and virtual assistants, AI-based personal shopping assistants, augmented reality (AR) and virtual reality (VR), forums and review

platforms, survey tools, customer data platforms and user analytics tools, heat mapping, personalization tools, tools for auditing product listings and price changes, and others.

Special attention is paid to user interaction with these tools, noting that security and trust are key prerequisites for their effectiveness.

The analytical review conducted in the dissertation's subject area demonstrates in-depth knowledge of the subject matter and current issues, as well as the potential for finding new solutions with scientific and applied value.

5. Research Methodology

The research methodology for conducting the study and achieving the intended results involves developing a theoretical framework for a hybrid model of web data mining that combines various information processing paradigms. Unlike existing approaches that treat these methods in isolation, the proposed solution demonstrates high reliability and flexibility when working with dynamic and heterogeneous web environments. As a second step in the research methodology, an online platform was developed that implements the proposed hybrid model for extracting data from websites. Experiments were conducted, based on which it was demonstrated that the proposed theoretical model works and is effective and practically applicable.

The methodological approach implemented fully meets the stated objective and tasks of the dissertation research.

6. Characteristics and Evaluation of the Dissertation

The dissertation is 179 pages long and consists of an Introduction, 3 chapters, a Conclusion and Findings, Prospects for Development, Main Contributions, Publications Related to the Dissertation, Notable Citations, a List of Figures, and a Bibliography. In accordance with the requirements, a Declaration of Originality and Authenticity of the Results is attached to the materials. The list of references includes 206 titles, including sources by Bulgarian and foreign authors and websites. The list of publications on the dissertation topic contains 6 titles. A list of seven citations of one of the publications related to the dissertation (publication number 1 in the list of publications) is included. The doctoral student has participated in three projects, two of which are part of Plovdiv University's Scientific and Research Department and one is part of the Ministry of Education and Science's "Young Scientists" program.

The Introduction discusses the relevance of the research topic and outlines the objectives and tasks of the dissertation.

Chapter 1 – "Key Tools and Technologies for Business-Consumer Interaction in E-commerce" – presents an analysis of the factors influencing business-consumer interaction in an e-commerce environment. It examines existing theoretical frameworks, technologies, and platforms aimed at improving the consumer experience. Key aspects related to security and the protection of consumer data are also analyzed, as well as the role of consumer awareness. Examples of successful

companies are presented, and conclusions are drawn regarding the effectiveness of various approaches to optimizing consumer interaction.

Chapter 2 – "Innovative Approaches to Data Extraction in E-commerce: A Hybrid Model" – describes a hybrid model developed for extracting data from the internet with the aim of improving user interaction in e-commerce. The model integrates three main approaches to data processing—rule-based mechanisms, deep learning, and large language models. The conceptual architecture, formal framework, and technical implementation of the system are presented. The hybrid model includes a rule-based module, an object recognition model, and integration with a multimodal language model, with the components capable of functioning both autonomously and in conjunction with one another. This achieves a balance between accuracy and efficiency in data extraction.

Chapter 3 – "Online Platform with Tools for Improved User Interaction" – presents a developed online system in which the proposed hybrid model is integrated. The chapter describes the platform's architecture, the technologies used, the main functional components, and the technical challenges overcome. The system provides tools for automatically extracting, analyzing, and summarizing publicly available product information, as well as for sending notifications to users. Two additional modules are also presented: a chat application for managing platform functionalities and a Chrome plugin for tracking changes in product information within web content.

The Conclusion provides an analysis of the achievement of the set goals and objectives, summarizes the results obtained and the scientific and applied contributions, and outlines directions for the future development of the research.

7. Contributions and significance of the study for science and practice

I accept and positively evaluate the contributions outlined in the dissertation and the abstract. These are primarily of a scientific and applied scientific nature and can be summarized as follows:

1. A formal conceptual and methodological framework for a hybrid model for the automated extraction and structuring of data from online environments is proposed.
2. Based on the developed theoretical hybrid model, a practical model for extracting data from the Internet has been developed. It has three main components—a Java-based system, the YOLOv8 model, and integration with ChatGPT—which can operate autonomously and synchronously.
3. The proposed hybrid method has been successfully integrated into an online platform containing a set of tools that contribute to improving user interaction.
4. A special module has been developed to extract information from the internet; it is integrated with the platform and significantly supports its operation. Its functionality includes processing tasks sent from the online platform and processing commands sent by users via the Telegram app.

5. A Chrome plugin has been developed, allowing users to easily and conveniently add products to the online system for tracking specific characteristics. The plugin's functionality includes the ability for users to take a screenshot of a web page at a given moment in time. This allows the customer to save the current state of the product data.

The contributions listed pertain to the development of new methods and the improvement of existing ones in the field of e-commerce, and in particular to data mining through the application of a hybrid method consisting of three main components: a Java-based system, the YOLOv8 model, and integration with ChatGPT—which can operate autonomously and synchronously. The results provide a clear example of the integration of methods from symbolic and subsymbolic artificial intelligence, reflecting current trends in this field.

8. Evaluation of the publications related to the dissertation

Six publications related to the dissertation topic are presented; they are co-authored, written in English, and published between 2021 and 2025. Two of the publications (publications numbered 1 and 5 on the list of publications) are indexed in Web of Science, with one having an impact factor and a Q3 (publication number 5 in the list of publications). Publications numbered 2 and 6 are indexed in the SCOPUS database and have an SJR. The remaining two publications in the list are from the international conference IMEA'23 and a collection of the Union of Scientists in Bulgaria. The publications reflect substantial parts and key results of the conducted research and meet the requirements for obtaining the educational and scientific degree of "Doctor." The publications related to the dissertation are fully sufficient to meet the minimum national requirements of the Regulations for the Implementation of the Law on the Development of Academic Staff; with a minimum requirement of 30 points under Group G indicators, the doctoral candidate has 90 points. A list of recorded citations has been additionally submitted with the dissertation, noting 7 citations of publication number 1. This ensures the necessary publicity for the doctoral candidate's research activity and the results of the dissertation research.

9. The doctoral student's active participation

I do not know the doctoral candidate personally and have no direct impression of his work. My review of the dissertation, the abstract, and the publications gives me reason to believe that the dissertation and its contributions are the doctoral candidate's own work, produced under the direct supervision of his academic advisor. I am not aware of any evidence of plagiarism..

10. Abstract

The abstracts, written in Bulgarian and English, are 32 pages long and comply with the formatting requirements. Their content corresponds to that of the dissertation and presents the main findings of the dissertation.

11. Critical comments and recommendations

I have no substantive criticisms of the dissertation or the results presented. All comments and recommendations made during the preliminary discussion of the dissertation have been incorporated into the dissertation. I have the following question for the doctoral candidate regarding the future development of the work:

Do you think it would be useful to use ontologies in the rule-based module? Including the semantic meaning of concepts such as “price,” “product,” “discount,” and others, as well as including rules that semantically interpret the data—for example, “if a value is a number followed by a currency symbol, then it is most likely a price”.

My recommendation to the doctoral student is to continue their research in accordance with the directions for future work outlined in the dissertation, as well as to prepare and publish independent works.

ЗАКЛЮЧЕНИЕ

I give a positive assessment of the scientific research conducted and the results presented in the dissertation. The dissertation contains original scientific and applied scientific results that meet the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria, the Regulations for the Implementation of the Law, and the relevant Regulations of Plovdiv University “Paisii Hilendarski.” The dissertation demonstrates that the doctoral candidate possesses in-depth theoretical knowledge and professional skills in the scientific field of “Computer Science,” demonstrating the qualities and abilities to conduct independent scientific research.

I strongly recommend that the distinguished Academic Jury award the academic degree of “Doctor” to Stanislav Minchev Dakov in the field of higher education: 4. “Natural Sciences, Mathematics, and Computer Science,” professional field 4.6. “Computer Science and Information Technology,” doctoral program “Computer Science”.

25.05. 2026 г.

Reviewer: …….

/rof. Asya Stoyanova-Doycheva/