

STATEMENT REPORT

under the procedure for defending a dissertation on the topic:
„Tools for improved user interaction in electronic commerce“
for the award of educational and scientific degree “Doctor”

by candidate: Stanislav Minchev Dakov,

In the Scientific field: **4. Natural Sciences, Mathematics and Informatics**

Professional direction: **4.6. “Informatics and Computer Sciences”**,

Doctoral program: **“Informatics”**,

University: University of Plovdiv "Paisii Hilendarski", Faculty of mathematics and informatics

The statement report has been prepared by **Prof. Daniela Ananieva Orozova, DCs - Trakia University** – Stara Zagora, as a member of the scientific jury for the defence of this PhD thesis according to Order RD 22-1033/ 19.05.2026 by the Rector of Plovdiv University "Paisii Hilendarski" (PU) on the basis of Art. 4, para. 2 of the Act on the Development of the Academic Staff in the Republic of Bulgaria.

In the evaluation of the dissertation, the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Regulation on the Implementation of ADASRB (RIDASRB, Council of Ministers Decree No. 26 of 13 February 2019), and the Regulations on the specific conditions of University of Plovdiv, Faculty of mathematics and informatics have been applied:

Pursuant to Art. 27, para. 1 of RIDASRB, “the dissertation must contain scientific or scientific-applied results that represent an original contribution to science. The dissertation must demonstrate that the candidate possesses in-depth theoretical knowledge in the respective specialty and the capacity for independent scientific research.”

According to Art. 27, para. 2 of RIDASRB, “the dissertation must be presented in a form and volume corresponding to the specific requirements of the primary unit. The dissertation must contain: a title page; an introduction; a presentation; a conclusion – summary of the obtained results with a declaration of originality; a bibliography.”

The minimum requirements by groups of indicators for acquiring the educational and scientific degree “Doctor” pursuant to RIDASRB have been met.

1. General characteristics of the dissertation and the materials presented

The author of the dissertation is Stanislav Minchev Dakov, a full-time doctoral student at the Department of Computer Technologies, Faculty of Mathematics and Informatics, Plovdiv University, under the scientific supervision of Associate Professor Veselin Kyurkchiev, PhD. The dissertation addresses the improvement of user interaction in online commercial platforms through the development and integration of innovative tools and technologies based on hybrid approaches for automated data extraction and processing from the Internet.

The relevance of the topic is indisputable. E-commerce is one of the most dynamically developing sectors of the digital economy. Enhancing the user experience through intelligent tools for automated data extraction, price tracking, and personalized notifications represents a concrete and significant scientific-applied problem with practical importance for businesses and consumers.

The dissertation comprises 179 pages and contains an introduction, three chapters, conclusion, contributions, a list of publications on the topic, noted citations, and a bibliography

of 206 titles. The main objective is formulated on page 8 of the dissertation: "researching possibilities and developing prototypes of software tools for improving user interaction in e-commerce." Three tasks related to this objective are set.

The first chapter presents a comprehensive analysis of existing tools and technologies, covering various categories — from user interfaces and chatbots to AR/VR technologies, personalization tools, and product listing audit tools. An analysis of security and trust issues is also provided. **The second chapter** presents the developed hybrid data extraction model integrating three approaches: deterministic symbolic (rule-based), deep learning (YOLOv8), and linguistic-semantic (ChatGPT). A formal theoretical framework and conceptual architecture were created, implemented using a Java-based system, the YOLOv8 model, and a multimodal language model. **The third chapter** describes the developed online platform with modules for product management, product lists, Bulgarian Posts parcel tracking, receipt management, and expense tracking. Additionally, a Telegram chat application and a Chrome browser plugin were developed.

2. Scientific and applied contributions of the candidate, contained in the submitted dissertation and the publications to it, included in the procedure

I accept the contributions described by the doctoral student on pages 153 and 154 of the dissertation as correctly formulated and consistent with the research work performed.

A conceptual-methodological framework for a hybrid model for automated extraction and structuring of data from Internet environments has been formalized. The novelty lies in the design of an adaptive cascading architecture in which the shortcomings of one component are compensated by the advantages of another, achieving a balance between speed, accuracy, and adaptability.

A hybrid model with three autonomously and synchronously operating components (Java rule-based system, YOLOv8, and ChatGPT) has been implemented. The system demonstrates high performance in tasks of recognition and data extraction with potential for transfer to other domains.

An online platform with an integrated hybrid model and a set of tools for enhanced user interaction has been developed using modern technologies, demonstrating the practical applicability of the ideas for monitoring product prices and characteristics.

A dedicated module for Internet data extraction with an *event-driven* architecture has been created, implementing effective web scraping, product data updates, and real-time user notifications via *Redis queues*.

A *Chrome* browser plugin with direct integration into the online platform has been developed, allowing users to add products for monitoring and save their current state via screenshots. A *Telegram* chat application has been built for managing platform functionalities, providing convenient mobile access through commands and buttons.

3. Approbation of the results

The listed contributions are supported by 6 scientific publications — two indexed in Scopus Q3 (TEM Journal, Engineering Proceedings), one in Web of Science (CBU Prague), and 3 in peer-reviewed journals. The publications reflect the sequential development of the research from 2021 to 2025. The publications are in English, with 5 publications being co-authored and 1 being independent.

The scientific works meet the minimum national requirements (under Art. 2b, para. 2 and 3 of the Act on the Development of the Academic Staff) and, respectively, the Regulations of the Plovdiv University for the application of the law for acquiring the educational and scientific degree of "Doctor" in the scientific field and professional direction of the procedure.

4. Abstract

The abstracts are prepared in Bulgarian and English and present the main results, contributions and conclusions of the dissertation. The content of the abstracts corresponds to the content of the dissertation.

5. Questions and recommendations for the doctoral student

I pose the following questions to the doctoral student:

- The dissertation describes three components of the hybrid model. What strategy does the system use to select which component to apply for a given data extraction task, and how is the effectiveness of this selection strategy measured?
- What is the system's success rate with websites that employ protections against automated data extraction (*captcha, rate limiting*)?
- The developed platform processes personal user data. What measures have been taken to ensure compliance with GDPR requirements, and how is the security of the stored data ensured?

6. Conclusion

The dissertation work of Stanislav Minchev Dakov contains scientific and applied scientific results that represent an original contribution to science, and meets the requirements of the Act on the Development of Academic Staff in the Republic of Bulgaria, the Regulations for its implementation and the Regulations of PU "Paisii Hilendarski". The submitted materials and dissertation results fully comply with the minimum national requirements set out in the Regulation on the Implementation of ADASRB

Due to the above, I confidently give my **positive assessment** of the research presented by the dissertation discussed above, the abstract, results, and contributions, and I strongly **recommend the scientific jury to award the educational and scientific degree "Doctor" to Stanislav Minchev Dakov in the Scientific field 4. Natural sciences, mathematics and informatics, Professional field 4.6. Informatics and computer science, Doctoral program "Informatics"**.

25.05.2026. г.

Signature:
(Prof. Daniela Orozova, DCs.)