STATEMENT REPORT

under the procedure for acquisition of the educational and scientific degree "Doctor"
by candidate **Pavel Aleksandrov Kyurkchiev,**
of the PhD Thesis entitled: "Methods and Architectural Approaches for Semantic Indexing and Simulation of Dynamic Processes in a Clod Environment",

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

Professional field: **4.6. Informatics and Computer Sciences**

Doctoral program "Informatics"

Department „Computer Technologies",

Faculty of Mathematics and Informatics (FMI), **Plovdiv University "Paisii Hilendarski " (PU)**

The statement report has been prepared by **prof. Georgi Teoharov Tuparov, PhD**, department of Informatics, New Bulgarian University, as a member of the scientific jury for the defense of this PhD thesis according to Order № РД-22-1415/17.07.2026 of the Rector of the Plovdiv University.

1. **General characteristics of the dissertation thesis and the presented materials**

The dissertation is written in Bulgarian and comprises a total of 140 pages. The main body consists of an introduction, five chapters containing 18 figures and 10 tables, a conclusion outlining directions for future research, a statement of the claimed scientific contributions, a list of the author's publications, a bibliography, and three appendixes comprising 2 tables. The bibliography includes 146 references, all of which are in English. The references are cited correctly throughout the dissertation. The literature reviewed is current and relevant, demonstrating that the doctoral candidate has a thorough understanding of the current state of the art in the research area addressed by the dissertation.

2. Short CV and personal impressions of the candidate

Pavel Kyurkchiev obtained his Bachelor's and Master's degrees from Plovdiv University "Paisii Hilendarski " in 2012 and 2013, respectively. Subsequently, he was enrolled as a PhD student on an individual study basis in the Department of Computer Technologies, in the PhD program in Informatics. He was recommended for the defense of his dissertation at a meeting of the Department of Computer Technologies held on July 7, 2026. Since 2018, he has been an Assistant Professor at Plovdiv University. According to the CV provided, he has extensive experience in the software industry.

I do not know the doctoral candidate, Pavel Pyurkchiev, personally and therefore have no direct personal impressions of him. My evaluation is based solely on the documents submitted for this dissertation evaluation and on his publication profiles in Scopus and Web of Science.

3. Content analysis of the scientific and applied achievements of the candidate, contained in the presented PhD thesis and the publications to it, included in the procedure

The doctoral candidate has classified and presented the claimed contributions into three categories:

Scientific and Applied Contributions:

- A new methodology and algorithm have been developed for the semantic linearization of cyclic graph structures specified using the System Dynamics formalism. The introduction of cyclicity markers (explicit loop tokenization) enables the preservation of causal topology in the form of a dense vector context suitable for NLP-based analysis.
- A hybrid, polyglot-based architectural model has been developed that integrates an event-driven microservices environment (RabbitMQ) with specialized vector search capabilities (Qdrant).

Applied Contribution:

- A software prototype, Alpha Cloud Data Hub, has been designed, implemented, and deployed to validate the effectiveness of the proposed theoretical methods.

Substantiating (Empirical) Scientific and Applied Contributions:

- The advantages of the semantic vector-based approach over traditional lexical algorithms for knowledge extraction from dynamic models have been empirically demonstrated.

Although I would classify the last claimed contribution as an applied contribution, I accept the claims as presented by the candidate and leave them for a detailed assessment by the reviewers.

4. Approbation of the results

The candidate has presented three publications related to the topic and content of the dissertation, two of which are single-authored and one co-authored with his academic supervisor and another researcher in the field. The latter publication is indexed in Scopus with an SJR ranking (Q1) and in Web of Science with an Impact Factor (Q2). At present, these publications have no indexed citations. The publications meet and significantly exceed the minimum national requirements (under Article 2b, Paragraphs 2 and 3 of the Law on the Development of the Academic Staff in the Republic of Bulgaria) and the relevant requirements of Paisii Hilendarski University of Plovdiv for the award of the educational and scientific degree of “Doctor” (PhD) in the relevant scientific field and professional field of the procedure.

5. Qualities of the abstract

The dissertation abstract comprises 32 pages. It has been prepared in accordance with the requirements of the Academic Staff Development Act of the Republic of Bulgaria, its Implementing Regulations, and the relevant Regulations of Plovdiv University "Paisii Hilendarski" governing the award of the educational and scientific degree of Doctor (PhD). In terms of its content, the abstract

provides an accurate and sufficiently comprehensive presentation of the dissertation, faithfully reflecting its content and the research results achieved.

6. Critical notes and recommendations

I have no comments or recommendations for the doctoral candidate other than to encourage him to continue his research in this highly interesting and promising field.

7. Conclusion

Having become acquainted with the PhD thesis presented in the procedure and the accompanying scientific papers and on the basis of the analysis of their importance and the scientific and applied contributions contained therein, **I confirm** that the presented PhD thesis and the scientific publications to it, as well as the quality and originality of the results and achievements presented in them, meet the requirements of the Act on Development of the Academic Staff in the Republic of Bulgaria, the Rules for its Implementation and the corresponding Rules at the Plovdiv University "Paisii Hilendarski" for acquisition by the candidate of educational and scientific degree "Doctor" (PhD) in the Scientific field 4. Natural Sciences, Mathematics and Informatics, Professional field 4.6. Informatics and Computer Sciences. In particular, the doctoral candidate meets the minimal national requirements in the professional field and no plagiarism has been detected in the scientific papers submitted for the competition.

In view of the above, I confidently give my **positive assessment** of the research presented in the above-reviewed dissertation, abstract, results achieved, and contributions, and **I recommend that the esteemed Scientific Jury award Pavel Aleksandrov Kyurkchiev the educational and scientific degree of "Doctor"** in Scientific Field 4. Natural Sciences, Mathematics and Informatics, Professional Field 4.6 Informatics and Computer Science, Doctoral Programme "Informatics".

Date: 03.09.2026 Signature:

Prof. Georgi Tuparov, PhD