REVIEW

of the scientific works, research, and teaching activities of

Chief Assistant Professor Ivan Stanimirov Stoyanov, PhD

submitted for participation in a competition for the academic position of "Associate Professor"

in the field of higher education

4. Natural Sciences, Mathematics and Informatics,

professional field

4.6. Informatics and Computer Science

for the needs of Varna Free University "Chernorizets Hrabar"

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This review has been prepared on the basis of: (1) documents submitted for the competition announced by VFU "Chernorizets Hrabar" (State Gazette, No. 69 of 31.07.2026 and on the VFU website), (2) Order of the Rector of VFU appointing the members of the Scientific Jury (No. 605 of 30.09.2026), and (3) the minutes of the first meeting of the Scientific Jury held on 07.10.2026.

1. General overview of the submitted materials and biographical information

Chief Assistant Professor Ivan Stanimirov Stoyanov, PhD, has an interdisciplinary educational background. He holds a Bachelor's degree in Finance from the University of National and World Economy, and in 2019 he obtained a Master's degree in Software Technologies with a specialization in Mobile Systems and Applications from the Faculty of Mathematics and Informatics at Plovdiv University "Paisii Hilendarski". His studies included courses in programming, databases, computer networks, artificial intelligence, intelligent agents, ontology engineering and intelligent software architectures.

In 2023, Ivan Stoyanov obtained the educational and scientific degree "Doctor" in the field of higher education 4. "Natural Sciences, Mathematics and Informatics", professional field 4.6. "Informatics and Computer Science", doctoral programme "Informatics" at Plovdiv University "Paisii Hilendarski". His dissertation is entitled "Research on the Creation of a Virtual Operator in an Infrastructure for Smart Agriculture". The dissertation research laid the foundation for his subsequent scientific work in the field of intelligent systems, agent-oriented architectures and applications of artificial intelligence.

Since 2021, the candidate has worked at the Institute of Information and Communication Technologies of the Bulgarian Academy of Sciences, and since July 2026 he has held the academic position of “Chief Assistant Professor” at Varna Free University “Chernorizets Hrabar”. He is a member of the Union of Automation and Informatics “John Atanasoff”.

The curriculum vitae lists 36 publications and participation in four research projects, including the National Research Programmes “Smart Crop Production” and “Smart Animal Husbandry”, a project on knowledge modelling in the field of Bulgarian folklore, and a project for the intelligent management of the Bulgarian plant gene bank.

For participation in the present competition, 12 scientific publications, one collective book and 4 projects have been submitted. The presented works demonstrate a consistent development of the candidate’s research in the areas of knowledge representation, intelligent and expert systems, agent-oriented architectures, smart agriculture, environmental monitoring and educational applications of artificial intelligence.

The candidate meets the minimum national requirements for occupying the academic position of “Associate Professor”. The submitted results by indicator groups are: Group A – 50 points with a minimum requirement of 50 points; Group C – 100 points with a minimum requirement of 100 points; Group D – 417 points with a minimum requirement of 200 points; Group E – 152 points with a minimum requirement of 50 points. Particularly significant is the extent to which the minimum indicators in Groups D and E are exceeded, demonstrating both active publication activity and scientific impact of the achieved results.

With regard to the additional requirements of VFU, it should be noted that Chief Assistant Professor Ivan Stoyanov, PhD, was appointed at the University in July 2026. During the short period following his appointment, no student research events were organized in the department, and therefore there was no objective opportunity to fulfil the requirement to supervise such activities. The candidate has publications indexed in Scopus and Web of Science and is registered in the NACID register for the academic position of “Chief Assistant Professor”.

2. General characteristics of the candidate’s scientific, applied research and teaching activities

The scientific activity of Chief Assistant Professor Ivan Stoyanov, PhD, is characterized by clearly defined continuity and a gradual expansion of the research scope. The starting point is the modelling of processes and knowledge in intelligent environments, particularly in the field of smart agriculture. In subsequent developments, this foundation is extended through expert systems, personalized intelligent assistants and agent-oriented systems. More recent research broadens the application scope to air-quality monitoring, integration of heterogeneous information sources and the combination of classical BDI agents with ReAct agents based on large language models.

Dr Stoyanov is also active in the field of artificial intelligence education. The candidate participates in the development and piloting of approaches for teaching logic programming and artificial intelligence through Prolog and STEM methodology. The submitted materials indicate the development and approval of curricula for specialized and innovative secondary schools, teacher qualification courses and experimental training conducted with students.

The available set of documents does not contain a detailed report on the candidate's specific teaching workload in higher education or on university courses taught by him. Due to the relatively short period since his appointment at VFU, this circumstance does not allow for an equally detailed assessment of his university teaching activity as can be made of his scientific activity. At the same time, the subject matter of his research and participation in educational initiatives indicate potential for active involvement in teaching artificial intelligence, intelligent systems, agent-oriented technologies, knowledge representation and software architectures.

3. Nature of the candidate's scientific achievements

The candidate's scientific achievements can be considered in several interrelated areas.

3.1. Event modelling and intelligent systems

One of the main research areas is related to the development of an event model for describing and interpreting processes in dynamic environments. In the early developments, this approach was applied in the ViSMod environment for modelling and simulating scenarios and processes in smart agriculture. Gradually, the model evolved towards the formalization of different event types, mechanisms for constructing complex events and their use in agent-oriented systems. Subsequently, the model was applied to air-quality monitoring, where individual measurements can be interpreted as atomic events and more complex indicators and analysis rules can be built on top of them. Research in this direction is further enriched by the development of ECOS (Event-driven Context-Oriented Server) as an interpreter of the event model, demonstrating a transition from theoretical formalization to the implementation of a functioning multi-agent architecture.

A positive aspect is that the candidate does not restrict the proposed models to a single subject area, but seeks their applicability across different classes of intelligent systems.

3.2. Knowledge-based systems

The second research area concerns the representation, storage and processing of knowledge. The developments employ classical approaches from symbolic artificial intelligence – semantic networks, frames, production rules, ontologies and logic programming.

Practical manifestations of this research area include expert systems for diagnosing poisoning in farm animals, as well as the use of ontologies in air-quality monitoring and in the digitization of cultural and historical heritage. An important feature is the effort to integrate different forms of knowledge representation within a common architecture in which the individual mechanisms perform mutually complementary functions.

3.3. Intelligent assistants and agent-oriented systems

This area can be regarded as central to the candidate's scientific development. The developed intelligent assistants are based on the concept of rational BDI agents capable of autonomous operation, reactive behaviour, goal-oriented planning and interaction with other agents and with the user. The developments have applications in smart agriculture, diagnosis of poisoning in animals, irrigation management, air-quality monitoring and cultural and historical heritage.

Of particular interest is the more recent development towards hybrid architectures combining classical BDI agents and ReAct agents based on large language models. This approach connects symbolic artificial intelligence with generative AI and corresponds to the contemporary trend towards the development of hybrid intelligent systems.

The publications related to AIRGuard and the regional air-quality monitoring platform demonstrate the practical applicability of these concepts. The research integrates agent-oriented architectures, ontologies, IoT data, REST services, machine learning and generative models.

3.4. Applications in environmental monitoring and smart agriculture

A strong aspect of the scientific output is the connection of the developed models with practically significant problems. Publications in the field of smart agriculture address the modelling of irrigation systems, integration between the virtual and physical worlds, and the use of personalized assistants.

In the field of environmental monitoring, multi-agent platforms are being developed to integrate measurements from different sources, analyse discrepancies, detect anomalies and support decision-making.

In the submitted publications from 2025 and 2026, this research has progressed towards architectures that combine BDI and ReAct agents, ontological models, external services, IoT sensors and machine-learning models.

The presence of publications in Q1 journals in this thematic area is an indicator of the quality and relevance of the conducted research.

3.5. Artificial intelligence in education

Another significant aspect is the transfer of accumulated scientific experience into educational practice. The developments related to the “Digital Bulgaria in Prolog” initiative address the introduction of logic programming and symbolic artificial intelligence in secondary education. Curricula, teaching materials and project-based STEM activities have been developed. Results from experimental teaching and assessment of acquired competencies are presented, demonstrating the transfer of scientific knowledge to the educational environment and deserving high evaluation.

3.6. Generative artificial intelligence

The candidate is a contributing author to the collective book “Artificial Intelligence in 24 … / Book Three”, published by the BAS Publishing House “Prof. Marin Drinov” in 2024. The chapter authored by Dr Ivan Stoyanov is devoted to generative artificial intelligence and includes mathematical foundations, a general overview of methods, prompt engineering, autoencoders, generative adversarial networks, autoregressive models and transformer models. This work complements the candidate’s main scientific line and demonstrates an expansion of his research interests towards one of the most dynamically developing areas of contemporary artificial intelligence.

4. Candidate’s contributions

On the basis of the submitted works, I recognize the following more significant contributions.

Scientific contributions:

• development and formalization of an event model for the representation and interpretation of processes in intelligent and agent-oriented systems;

• development of mechanisms for describing atomic, system-level and complex events and their use in the analysis of dynamic environments;

• development of architectures for integrating different knowledge-representation models – semantic networks, frames, production rules and ontologies;

• development of models for intelligent assistants and agent-oriented systems based on the BDI paradigm;

• integration of classical symbolic agents with ReAct agents based on large language models;

• development of approaches combining symbolic and generative artificial intelligence in hybrid agent architectures.

Scientific and applied contributions:

• development and piloting of an environment for modelling scenarios and processes in smart agriculture;

• development of expert systems and personalized assistants to support diagnostics in farm animals;

• development of agent-oriented solutions for the management and modelling of irrigation systems;

• development of architectures for integrated air-quality monitoring using ontologies, intelligent agents, external services and sensor data;

• development of multi-agent platforms for the aggregation, analysis and interpretation of heterogeneous environmental data;

• use of intelligent assistants in the digitization and representation of cultural and historical heritage.

Applied contributions:

• development and piloting of a methodology for introducing artificial intelligence and logic programming in secondary education;

• use of Prolog and STEM approaches for project-based learning;

• development of teaching materials and curricula for specialized and innovative schools and teacher qualification courses;

• systematization and presentation of contemporary methods of generative artificial intelligence in a collective monographic work.

I consider the most significant quality of these contributions to be their continuity. They do not represent isolated results, but rather a consistent development from knowledge and event modelling to intelligent agents, from there to real multi-agent systems, and finally to hybrid architectures with generative artificial intelligence.

5. Significance of the contributions to science and practice

The scientific output of Chief Assistant Professor Ivan Stoyanov, PhD, demonstrates a clearly pronounced applied orientation.

The obtained results have applications in socially significant areas – smart agriculture, water-resource management, air-quality monitoring, digitization of cultural heritage and artificial intelligence education.

The submitted works have been published in journals and proceedings indexed in Scopus and Web of Science. They include publications in Q1, Q2, Q3 and Q4 outlets. Particularly positive are the publications in Future Internet, presented as Q1, and the publication in Mathematical Biosciences and Engineering, presented as Q2.

The scientific impact is evidenced by the citation indicator, for which the candidate reports 152 points against a minimum national requirement of 50 points.

The candidate participates in research projects in the fields of smart crop production, smart animal husbandry, knowledge modelling and plant gene-bank management. His project activity corresponds to the main thematic line of the scientific publications and demonstrates genuine involvement in interdisciplinary research teams.

Another important positive feature is the topical relevance of the scientific issues addressed. Research on agent architectures, hybrid intelligent systems, BDI and ReAct agents, ontologies, IoT and generative AI is directly related to contemporary developments in artificial intelligence and software systems.

6. Remarks and recommendations

The submitted documents demonstrate active scientific work, and I have no fundamental critical remarks that would call into question the candidate’s scientific results or compliance with the minimum national requirements.

I would recommend that he continue his efforts to publish results in international journals in the leading quartile groups and gradually increase the share of publications in which he has a leading authorship role. I consider it promising for the candidate to continue research that connects classical symbolic models, agent-oriented systems and contemporary generative models, as precisely this combination may develop into a recognizable scientific niche of his own.

With regard to teaching activity, I recommend that the accumulated research experience be systematically transferred into university education through the development of original courses in the field of artificial intelligence and intelligent systems.

7. Personal impressions and assessment of the candidate

From the submitted documents, I can conclude that Chief Assistant Professor Ivan Stoyanov, PhD, is a motivated researcher with consistently developing scientific interests and a good ability to work in interdisciplinary teams. His scientific activity demonstrates an aspiration to combine theoretical modelling with practical implementation.

CONCLUSION

The thorough review of the materials, scientific works and reports submitted for the competition gives me grounds to assess positively the scientific and applied research activities of Chief Assistant Professor Ivan Stanimirov Stoyanov, PhD.

The candidate holds the educational and scientific degree “Doctor” in professional field 4.6. “Informatics and Computer Science” and has developed a consistent line of research in knowledge representation, intelligent assistants, agent-oriented systems and applications of artificial intelligence.

The works submitted for the competition demonstrate scientific and applied research results with practical implementation in smart agriculture, environmental monitoring, cultural heritage and education. Particularly relevant are the developments related to multi-agent systems and the integration of classical agent architectures with generative artificial intelligence.

The candidate’s scientometric indicators not only meet, but in Groups D and E significantly exceed, the minimum national requirements for occupying the academic position of “Associate Professor”.

The submitted publications in international peer-reviewed and indexed outlets, the presence of citations, participation in research projects and the relevance of the research topics give me grounds to consider that the candidate possesses the scientific potential required for the academic position.

On the basis of the above, I give a positive assessment of the candidacy and confidently propose that the esteemed Scientific Jury support the election of Chief Assistant Professor Ivan Stanimirov Stoyanov, PhD, to the academic position of “Associate Professor” in the field of higher education 4. “Natural Sciences, Mathematics and Informatics”, professional field 4.6. “Informatics and Computer Science”.

29.10.2026

Reviewer:

Prof. Teodora Bakardjieva, PhD