

# OPINION

**by Assoc. Prof. Silvia Nikolaeva Gaftandzhieva, PhD**  
**University of Plovdiv Paisii Hilendarski**

of the materials submitted to the competition  
for the academic position **“Professor”**  
**of the University of Plovdiv Paisii Hilendarski**

Field of higher education: 4. Natural sciences, Mathematics, and Informatics,

Professional field: 4.6 Informatics and Computer Science (Artificial Intelligence)

In the competition for “Professor”, announced in the State Gazette, № 98 of 19.11.2024 and on the website of the University of Plovdiv Paisii Hilendarski for the needs of the Department of Computer Informatics of the Faculty of Mathematics and Informatics, Associated Professor Stanka Ivanova Hadzhikoleva, PhD, from the Department of Computer Informatics, Faculty of Mathematics and Informatics at the University of Plovdiv “Paisii Hilendarski”, participates as a candidate.

## **1. General presentation of the procedure and the candidate**

By order No. PD22-443 of 18.02.2025 of the Rector of the University of Plovdiv Paisii Hilendarski, I have been appointed as a member of the scientific jury of a competition for the academic position of “Professor” at PU in the field of higher education 4. “Natural Sciences, Mathematics and Informatics”, professional field 4.6. “Informatics and Computer Sciences” (Artificial Intelligence), announced for the Department of "Computer Informatics" at the Faculty of Mathematics and Informatics needs.

Only one candidate has submitted documents for participation in the announced competition: Assoc. Prof. Dr. Stanka Ivanova Hadzhikoleva from the Department of Computer Informatics, Faculty of Mathematics and Informatics, University of Plovdiv Paisii Hilendarski.

The set of materials submitted by Assoc. Prof. Dr. Stanka Hadzhikoleva, on paper and electronic format, is under the Regulations for the Development of the Academic Staff of the University of Plovdiv.

The candidate Assoc. Prof. Dr. Stanka Hadzhikoleva has submitted 31 scientific papers, which have not been submitted for defending the educational and scientific degree “Doctor” and holding the academic position of “Associate Professor”. 15 of these papers are in journals, 13 in proceedings of international conferences, 2 in proceedings of national conferences, and 1 is a textbook. Documents (in the form of references and official notes) for participation in 1 international, 8 national and 8

university research projects have also been submitted. In addition, a certificate of membership in 3 professional organisations has been submitted.

Assoc. Prof. Stanka Hadzhikoleva has presented a habilitation report, a complete list of scientific works (including a list of publications with students) and a list of works for participation in the competition (including a list of publications in journals and proceedings of international conferences), a list of noted citations, report for compliance with the minimum national requirements and additional requirements of the Regulations on the Implementation of the Development of Academic Staff in the Republic of Bulgaria Act, according to Art. 76. (1) of the Requirements for the implementation of the Law on the Development of the Academic Staff of the University of Plovdiv, annotations of the materials for participation in the competition in Bulgarian and English and self-assessment of the contributions, documents and references for proving work experience, for academic work and scientific research activity, copies of the scientific works, a declaration of authenticity of the presented materials.

Assoc. Prof. Stanka Hadzhikoleva has presented all documents and reports required for holding the academic position of “Professor”, which satisfy the Requirements for the Implementation on the Development of the Academic Staff Act of the University of Plovdiv. I accept all submitted materials for review.

In 2000, Assoc. Dr. Stanka Ivanova Hadzhikoleva graduated as a master at the Faculty of Mathematics and Informatics, University of Plovdiv Paisii Hilendarski, in the study programmes "Mathematics and Informatics" and “Mathematics”, specialisation “Informatics”. In June 2013, she acquired 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 Sciences”. Assoc. Prof. Hadzhikoleva began her work experience in 2001 as a teacher of informatics, information technologies and computer accounting at the Private Vocational High School “Business and Banking” - Plovdiv. From 2001 to 2002, she worked as a system software support specialist at the Saedinenie Corporation AD. Assoc. Hadzhikoleva was the Manager of the Consortium “Academy of High Technologies” (2002) and Managing Partner of FrakTime OOD (2005-2011). In 2002, Stanka Hadzhikoleva started to work as an Assistant Professor at the University of Plovdiv Paisii Hilendarski. She worked as a Chief Assistant Professor from 2011 to 2016, and from 2016 to the present, she holds the academic position of “Associate Professor” in the professional field 4.6. “Informatics and Computer Science” (Informatics).

I have known Stanka Hadzhikoleva for more than 15 years. I can confidently say that she is an established and respected teacher and researcher, distinguished by her professionalism, dedication and responsibility.

## **2. General characteristics of the candidate's activities**

### *Evaluation of the candidate's teaching and learning activities and preparation*

Assoc. Prof. Hadzhikoleva has developed and lectures on the mandatory subjects “Databases”, “Introduction to Cloud Technologies”, “Software Technologies 2”, and “Mobile Applications”, as well as exercises on “Modeling and Management of Business Processes”. Assoc. Prof. Hadzhikoleva has proposed curricula, developed teaching materials and conducted training on 6 elective subjects – “Intelligent Data Analysis with Orange”, “Graph Databases with Neo4j”, “Introduction to Big Data and Cloud Computing”, “Modeling of Business Processes”, “Scientific Papers Writing and Presentation”, “Writing and Presentation of Diploma and Scientific Papers” during the period 2016 – 2024.

Assoc. Prof. Hadzhikoleva has also lectured at Thracian University - St. Zagora, Technical University - Plovdiv Branch, Burgas Free University, Higher School of Agribusiness and Regional Development – Plovdiv, and Academy of Music, Dance and Fine Arts “Prof. Asen Diamandiev” - Plovdiv.

To maintain a high quality of education, Assoc. Prof. Hadzhikoleva develops and maintains a wide range of electronic courses, located in <https://edu.studentschool.eu/>, in the disciplines “Software Technologies 2”, “Introduction to Cloud Technologies”, “Mobile Applications”, “Databases”, “Intelligent Data Analysis with Orange”, “Graph Databases with Neo4J”, “Modelling of Educational Courses in Moodle”, “Writing and Presentation of Diploma and Scientific Papers”, “Discrete Structures”, “Modeling and Management of Business Processes”, “Organization and Functioning of Data Centers”. Assoc. Prof. Hadzhikoleva is the co-author of two textbooks: Fundamentals of Programming with Java (2016) and Introduction to Databases (2023), the latter of which is submitted for participation in this competition.

Assoc. Prof. Hadzhikoleva conducts weekly consultations and supports student academic development. Proof of this is the diploma theses defended under her supervision (12 successfully defended bachelor's theses for 2016-2024), dissertations (two defended doctoral theses in 2024), and 15 publications with students. Assoc. Prof. Hadzhikoleva is the scientific supervisor of 7 doctoral students (2 defended, 3 in the process of training, 2 dismissed), a mentor of a young scientist under the “Young Scientists and Postdoctoral Fellows – 2” program and has been an academic mentor to over 40 students who underwent practical training in business organisations within the framework of the projects “Student Internships”, “Student Internships - Phase 1” and “Student Internships - Phase 2”. Assoc. Prof. Hadzhikoleva organises student scientific seminars (21 held in 2017-2024 with 44 reports presented by students, doctoral candidates and young scientists) and information meetings to familiarise students with the conditions for admission, training and acquisition of the educational and scientific degree “Doctor”.

Assoc. Prof. Hadzhikoleva demonstrates dedication and professionalism in her work, successfully combining teaching, research and organisational activities. Her commitment to the development of innovative curricula, as well as her active teaching activities, are proof of her high professionalism.

*Evaluation of the candidate's scientific and applied scientific activities*

In recent years, Assoc. Prof. Dr. Stanka Ivanova Hadzhikoleva has focused her scientific and applied research activities on research for the application of Artificial Intelligence in various fields. As a result of this work, she has proposed models and designed and developed software tools with applications in education (innovative technologies for training, development and assessment of high-order thinking skills, quality assurance of training), energy, textile production, bioinformatics, etc.

Assoc. Prof. Hadzhikoleva has presented a habilitation report for 14 publications and an application for fulfilling criterion C4 of the minimum national requirements of Regulations on the Implementation of the Development of Academic Staff in the Republic of Bulgaria Act. Of these, 11 are referenced and indexed in the world-renowned databases of scientific information SCOPUS and/or Web of Science. The habilitation report presents the main contributions of Assoc. Prof. Hadzhikoleva, related to proposing a model and prototype of a cloud application for automated test creation and management using generative artificial intelligence, methodologies for developing educational games using ChatGPT and training with AI, stimulating the development of high-order thinking skills, a conceptual framework of an e-learning software system based on pedagogical patterns, approaches and models for the development and assessment of high-order thinking skills, models for ensuring the quality of training. After checking in Scopus, I found that articles [15-17] also have  $SJR2023 = 0.152$ , which gives me reason to award them 30 points instead of 18 points. The presented publications meet the requirements of indicators from Group C of the minimum national requirements from the Regulations on the Implementation of the Development of Academic Staff in the Republic of Bulgaria Act– 315 points with a minimum requirement of 100 points.

The publications presented outside the habilitation report include 11 scientific publications in journals ([1], [4-6], [9], [11-13], [18], [25], [27]) and 5 publications in conference proceedings ([10], [14], [19], [23], [26]). Of the publications included in the group of indicators D, 6 articles have an impact factor and, respectively, with quartiles Q1 ([1], [11-13]) and Q2 ([6] and [18]), and 4 of the articles have SJR. After checking in Scopus, I found that articles [25] and [26] also have ( $SJR2021 = 0.139$  and  $SJR2021 = 0.249$ , respectively), which gives me reason to award them 30 points instead of 18 points. Thus, according to Group of indicators D, Assoc. Prof. Stanka Hadzhikoleva has 636 points with a minimum requirement of 200 points.

Assoc. Prof. Stanka Hadzhikoleva participated in the competition with 76 citations of 25 of her publications in articles by other authors, published in journals, indexed in Web of Science or Scopus. According to Indicator Group E, the candidate has 608 points.

According to Indicator Group F, Assoc. Prof. Hadzhikoleva has provided evidence for 190 points with a minimum requirement of 100 points.

Assoc. Prof. Dr. Stanka Hadzhikoleva achieved a total of 1799 points (with a requirement of 550 points), which exceeds 3 times the minimum national requirements for occupying the academic position of “Professor” in professional field 4.6. “Informatics and Computer Science”. The submitted scientific papers, evidence for scientific work and materials for participation in the competition also meet the additional requirements for occupying the academic position of “Professor” at the Faculty of Mathematics and Informatics of the University of Plovdiv.

The papers submitted for participation in the competition contain original scientific, scientific-applied and applied results in 3 thematic areas: training and artificial intelligence, artificial intelligence models, and neural networks. Assoc. Prof. Hadzhikoleva ‘s main scientific results in the first area are the proposed conceptual models of an instance of a pedagogical pattern, a formal model of the assessment process, which can be personalised according to the needs of teachers, an approach and model for automated complex assessment of high-order thinking skills, a model for hierarchical multi-component assessment based on Bloom's taxonomy. As scientific-applied and applied results in this area, the following can be mentioned: the proposed methodologies (development of educational games with ChatGPT, training with artificial intelligence, training for the formation of scientific competencies), models (cloud application for automated creation and management of tests using generative artificial intelligence, centralised and decentralised quality assurance system in higher education, software ecosystem for ensuring the quality of education), conceptual framework of an e-learning software system based on pedagogical patterns, teaching method through modelling of pedagogical patterns in an e-learning environment, prototype of a cloud application for automated creation and management of tests using generative artificial intelligence, developed educational games with generative artificial intelligence, conducted empirical experiment within the framework of a real learning process. The second direction of the author's contributions is in the creation of models for the interpolation of missing parts of surfaces with neural networks, multifactorial prediction of electricity consumption, electricity losses in the Bulgarian electricity system, deviations in the quality of worsted yarns in the production process, research of life expectancy, etc. Models of a system for predicting electricity consumption and fulfilling customer orders in the textile industry have been proposed, software prototypes have been developed, and an experiment has been conducted. The main contributions in the third direction are related to determining upper limits for the number of hidden layers and the number of neurons in them for approximating artificial neural net-

works, a proposed algorithm for improving the accuracy of extrapolation with neural networks, defined conditions for solving multiple tasks by one neuron and a comparative analysis of approximations using polynomials and neural networks.

All this gives me reason to appreciate Assoc. Prof. Dr. Stanka Hadzhikoleva is a successful and competent researcher and accomplished scientist with recognised scientific contributions in Artificial Intelligence.

### 3. Critical comments and recommendations

I have no critical remarks or recommendations regarding the submitted materials. I recommend that the candidate continue to publish in prestigious journals with an impact factor.

### CONCLUSION

The documents and materials presented by Assoc. Prof. Stanka Ivanova Hadzhikoleva, PhD **meets all the requirements** of the Act on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations on the Implementation of the Development of Academic Staff in the Republic of Bulgaria Act and the relevant Regulations of the University of Plovdiv Paisii Hilendarski.

The candidate has presented significant scientific works published after the materials for defending the educational and scientific degree “Doctor” and occupying the academic position “Associate Professor”. The candidate's works contain original scientific and applied contributions that have received international recognition, as a representative part of them have been published in journals and proceedings by international academic publishing houses. The theoretical developments have practical applicability, as some are directly oriented towards academic work. The scientific and teaching qualifications of Assoc. Prof. Stanka Ivanova Hadzhikoleva, PhD are **undoubted**.

The achievements of Assoc. Prof. Stanka Ivanova Hadzhikoleva's results in the educational and scientific research activities **fully comply** with the minimum national and additional requirements of the Faculty of Mathematics and Informatics, adopted in connection with the Regulations of the University of Plovdiv for applying the Act on the Development of the Academic Staff in the Republic of Bulgaria.

After reading the materials and scientific works presented in the competition, analysing their significance and the contributions contained in them, I give my **positive assessment** and confidently recommend to the esteemed Scientific Jury to prepare a proposal to the Faculty Council of the Faculty of Mathematics and Informatics for the election of Assoc. Prof. Stanka Ivanova Hadzhikoleva, PhD, to the academic position of “Professor” at the University of Plovdiv Paisii Hilendarski in the field of higher education 4. “Natural Sciences, Mathematics, and Informatics”, professional field 4.6 “Informatics and Computer Science”, scientific specialty: “Artificial Intelligence”.

08.04.2025

**Reviewer:** .....  
*Assoc. Prof. Silvia Gaftandzhieva, PhD*