REVIEW

by Prof. Dr. Vladimir Vassilev Monov
Institute of Information and Communication Technologies
Bulgarian Academy of Sciences
of scientific works and documents submitted for participation in a competition
to occupy the academic position "professor"
at the Institute of Information and Communication Technologies
Bulgarian Academy of Sciences

by: field of higher education: *4. "Natural sciences, mathematics and informatics"*
professional direction: 4.6. *"Informatics and Computer Science"*
specialty: *"Informatics"*

In the competition for "professor", announced in the State Gazette, no. 103 of 12.12.2023 for the needs of the "Modeling and Optimization" Deartment of the Institute of Information and Communication Technologies (IICT), the only candidate participating is Assoc. Prof. Dr. Tatyana Vladimirovna Atanasova from IICT-BAS.

1. General presentation of the received materials

By order No. 41 of 09.02.2024 of the Director of IICT, I have been appointed as a member of the scientific jury for the announced competition. With the decision of the scientific jury from a meeting held on February 15, 2024, my participation in the work of the jury was determined by the preparation of a review of the presented materials. As a member of the scientific jury, I received in electronic form the following documents and works of the candidate, on the basis of which the present review was prepared:

1. Curriculum vitae in European format with attached lists of publications, citations and participation in projects;
2. Copy of diploma for educational and scientific degree "doctor";
3. Reference for teaching activity;
4. Certificate of work experience in the specialty;
5. List of scientific publications for participation in the competition, which do not repeat those presented for the acquisition of the educational and scientific degree "doctor" and for the academic position "associate professor";
6. List of citations;
7. Summaries of the scientific publications for participation in the competition in Bulgarian and English;

8. Copies of the scientific publications for participation in the competition;
9. Reference of fulfillment of the minimum requirements of IICT;
10. Reference to the original scientific and scientific applied contributions;
11. Declaration that no plagiarism in scientific works has been proven according to the legally established procedure.

The submitted documents and scientific works of the candidate fully comply with the requirements for admission to participation in the competition for the academic position of "professor", defined by Art. 29 of ZRASRB and Art. 10 para. (1) of the Regulations on the specific conditions for acquisition of scientific degrees and for holding academic positions in the Institute of Information and Communication Technologies.

2. Brief biographical data of the applicant

Assoc. Prof. Dr. Tatiana Atanasova was a full-time PhD student in the Central Laboratory of Control Systems of the BAS in the period 1988-1993. Subsequently, she successively held the positions of research assistant III and II degree at the Institute of Control and System Research of the BAS and research associate I degree at the Institute of Information Technologies, BAS. She obtained the educational and scientific degree "doctor" in the specialty "Application of the principles and methods of cybernetics in various fields of science" in 2003. From 2003 to 2022 she held the position of associate professor II degree at the Institute of Information technologies and the Institute of Information and Communication Technologies of the BAS. From 2022 to the present, Assoc. Prof. Dr. Tatiana Atanasova is the head of the "Modeling and Optimization" Department at the Institute of Information and Communication Technologies of the Bulgarian Academy of Sciences. It can be seen from the Reference of work experience that she has a total work experience of 39 years and 2 months, of which 20 years and 9 months as an associate professor. Assoc. Prof. Dr. Tatyana Atanasova is the author of 162 scientific publications with over 360 citations, participates in 5 international scientific projects, 3 of which she is the head of, as well as in 3 national scientific programs. Assoc. Prof. Atanasova teaches courses at the Higher School of Telecommunications and Posts and Southwest University "Neofit Rilski". She is the supervisor of 4 successfully defended doctoral students at IICT. Assoc. Prof. Atanasova's scientific organizational activities include membership in scientific organizations, editorial boards and boards of scientific publications, program committees of international conferences.

The presented biographical data show the upward professional development of the candidate, the availability of research activities, teaching experience and professional qualifications that meet the requirements for participation in the competition for the academic position of "professor".

3. Compliance with minimum national requirements and IICT requirements

The presented Reference for the fulfillment of the minimum national requirements and the requirements of IICT-BAS includes data on:

- habilitation work - scientific publications in editions that are referenced and indexed in world databases with scientific information: 3 publications with IF and/or SJR, 2 of which in quartiles Q1 and Q2 of WoS;

- Scientific publications in editions that are referenced and indexed in world databases with scientific information outside the habilitation work: 17 publications, of which 11 with IF and/or SJR, 1 publication in quartile Q1;

- Citations in scientific publications, monographs, collective volumes and patents, referenced and indexed in world databases of scientific information: 67 in publications indexed in Scopus;

- Successfully defended doctoral students: 4 in number;

- Participation in a national scientific or educational project: 3 items;

- Participation in an international scientific or educational project: 1 item;

- Management of the Bulgarian team in an international scientific or educational project: 3 items.

The reference has been correctly prepared, and the presented data convincingly show that the candidate has met and exceeded the requirements for occupying the academic position of "professor" in all indicators as follows.

Indicator B: achieved number of points 110 with a minimum required number of 100 points,

Indicator Г: achieved number of points 322 with a minimum required number of 260 points,

Indicator Д: achieved number of points 402 with a minimum required number of 140 points,

Indicator E: achieved number of points 420 with a minimum required number of 150 points.

4. Scientific research and teaching activity

To participate in the competition, Assoc. Prof. Dr. Tatyana Atanasova submitted 20 scientific works in English, which do not repeat those for acquiring the educational and scientific degree "doctor" and occupying the academic position "associate professor". All of them are indexed and referenced in the scientific information databases WoS and/or Scopus. 4 of the publications are in editions with IF of WoS, 2 of them in quartile Q1 and one publication in quartile Q2 of WoS. 14 of the publications are in Scopus SJR-ranked editions. The publications presented for review are grouped as follows: articles in journals - 5, chapters in collective editions - 4, reports in materials of international scientific conferences - 11. All works presented for the competition are in the field of informatics and fully correspond to the subject of the announced competition. As a thematic orientation, they are dedicated to research, development and application of methods and processes for collecting, storing, processing, transmitting, analyzing and evaluating information by means of modern computer

technologies. In terms of content, the candidate's works contain original scientific and scientifically applied results in the researched fields.

A positive assessment of the research activity of Assoc. Prof. Dr. Tatiana Atanasova also deserves the participation in international research and educational projects and national scientific programs. In the period 2004-2016, she participated in the work of 5 international projects, 3 of which she was the head of the Bulgarian team. From 2018 until now, she is a participant in 3 national scientific programs: "Information and communication technologies for a single digital market in science, education and security", "Intelligent animal husbandry" and "Security and defense".

Assoc. Prof. Dr. Tatiana Atanasova carries out an active teaching activity, leading courses in Higher Mathematics, Mathematical Methods in Economics, Mathematical Modeling, Engineering Mathematics and Communication Chains at the Higher School of Telecommunications and Posts, Sofia during the period 2010-2016. At Southwestern University "Neofit Rilski" she taught courses in Data Transmission and Computer Communications, NGN - Next Generation Networks and Digital Communications in 2017-2018. Assoc. Prof. Atanasova's pedagogical activity also includes the training of PhD students at IICT, and currently there are 4 successfully defended PhD students and she supervises another 2 PhD students studying in full-time doctoral studies.

In general, the scientific works and materials presented for the competition undoubtedly demonstrate the high results achieved by the candidate in research activities, competence and expertise in the implementation and management of research projects, as well as accumulated pedagogical experience in working with students and teaching doctoral students.

5. Citations

The list of citations of the works of Associate Professor Tatiana Atanasova, submitted for participation in the competition, contains data on 217 noticed citations. They are in the works of our and foreign authors, in prestigious editions, which for the most part are indexed and referenced in the world databases of scientific information WoS and Scopus. With this, the results of the candidate's works, submitted for participation in the competition, have obviously aroused interest and become known to the scientific community at home and abroad. Assoc. Prof. Atanasova has also presented a list of citations of all her publications, containing over 360 noticed citations, which shows that her overall research activity has also gained prominence and recognition in the national and international scientific community.

6. Basic scientific and scientific-applied contributions

I accept and positively evaluate the contributions formulated in the Reference of author's contributions. In summary, they can be listed as follows.

Scientific contributions.

- A system has been developed for monitoring data from IoT devices in a cloud environment and their processing in machine self-learning models for the purposes of intelligent animal husbandry. (Publication [B4-1]).
- A multidimensional classification and model is proposed for the analysis and prediction of the health status of dairy cows using machine self-learning and cloud services. (Publication [G7-1]).
- An extensible IoT architecture model has been developed for working with different communication protocols and centralized management of devices with big data processing capabilities. (Publications [B4-2], [G7-5]).
- Methods have been developed for collecting, processing and grouping data from heterogeneous sources in the Internet environment according to predefined rules and user requirements. (Publications [B4-2], [B4-3], [D7-6], [D7-10], [D7-12], [D7-14]).
- A cognitive approach is proposed for modeling human-computer interaction in a distributed information environment. The approach considers the human factor as a set of cognitive characteristics of the user and helps to study the human interaction with an intelligent environment. (Publications [G7-7], [G7-13]).

Scientific and applied contributions.

- A scalable cloud-based architecture of an intelligent livestock monitoring system was implemented following the Agile methodology and including monitoring of animals' environment, health, growth, behavior, reproduction, emotional state and stress levels. (Publication [B4-2]).
- A methodology has been developed for the implementation of a workflow in a modular IoT system when working with heterogeneous data by applying several data processing methods. (Publication [G7-14]).
- A solution for modeling and simulations of digital twins in intelligent agriculture in a cloud environment is proposed. (Publication [G7-2]).
- Properties and areas of application of machine self-learning methods enriched with ensemble methods for amplification, stacking and packaging are systematized. The application of regression analysis in modeling target variables in the predictive model is evaluated. (Publications [G7-11], [G7-4]).
- Methods for creating models in an open-source machine learning software environment were explored and possibilities for finding the hidden dependencies in the collected data sets were established. (Publication [G7-3]).
- The security factors of IoT devices and systems with the possible ways of security breaching and measures to counteract them have been investigated and determined (Publication [D7-16]).

- An approach is proposed that combines TSA and Blockchain technologies to ensure data traceability in an IoT system. (Publication [G7-4]).
- A correlational approach is proposed to identify indirect relationships between different types of incidents in a converged information infrastructure implementing artificial intelligence for IT operations (AIOps) (Publication [G7-8]).
- A positive effect of using virtual and augmented reality technologies on the learning ability of STEM students has been investigated and found. (Publication [G7-9]).
- A set of elementary (atomic) information functions ensuring the quality of information services in IoT systems is defined. (Publication [G7-17]).

The listed contributions are contained in publications of prestigious editions and determine the candidate as a highly qualified specialist in the field of informatics and modern information technologies.

7. Significance of contributions for science and practice

The scientific and scientific-applied contributions in the candidate's works relate to the following main areas: *Internet of Things (IoT), Cloud Computing, Data Analytics, Cybersecurity, Virtual Reality (VR) and Augmented Reality (AR) in e-learning.* They can be evaluated as the enrichment of existing knowledge, the development of new and the improvement of known methods and approaches in these areas. From a practical point of view, the candidate's works undoubtedly contribute to the wider implementation and expansion of the applications of informatics and information technologies.

8. Assessment of the degree of the candidate's personal involvement in the contributions

I personally know the candidate Assoc. Prof. Dr. Tatyana Atanasova and have direct impressions of her scientific, research and pedagogical activities. My acquaintance with the works submitted for participation in the competition, as well as my impressions of Assoc. Prof. Atanasova's overall research activity, give me reason to assume that the declared scientific and scientific-applied contributions are her personal work. I am not aware of any data on the presence of plagiarism in the presented works.

9. Opinion, remarks and recommendations

The scientific output of Assoc. Prof. Dr. Tatiana Atanasova, presented for evaluation in the present procedure, testifies to long-term systematic and in-depth scientific-research and teaching activities in the field of modern information technologies, their development and practical application. The scientific works contain original results of high scientific and applied value and are essential for the development and enrichment of theory and practice in the professional field of the

competition. In terms of volume and quality, the obtained results exceed the normative requirements for occupying the academic position of "professor".

I have no critical remarks on the candidate's documents and works. Given the importance of the problems and the presented results, my recommendation to the candidate is to continue the research activity and summarize the obtained results in a monographic work.

CONCLUSION

The candidate's documents and materials submitted for the competition meet all the requirements of the Law on the Development of the Academic Staff in the Republic of Bulgaria, the Regulations for its Implementation and the Regulations for the Specific Conditions for Acquiring Scientific Degrees and for Occupying Academic Positions at IICT-BAS .

After acquainting myself with the materials and scientific works presented in the competition, analyzing their significance and the contributions contained in them, I confidently give my positive assessment and propose to the respected Scientific Jury to vote unanimously on a proposal to the IICT Scientific Council for the election of Assoc. Prof. Dr. Tatiana Atanasova in the academic position of "professor" in professional direction 4.6. "Informatics and computer sciences" specialty "Informatics" in "Modeling and optimization" Department of IICT-BAS.

14/03/2024

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