

## OPINION

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**Subject:** Competition for the academic position of "associate professor", announced in the State Gazette, issue no. 10 of 27.01.2026, in the field of higher education: 5. Technical Sciences, Professional field: 5.2. Electrical Engineering, Electronics and Automation, scientific specialty: "Automated Systems for Information Processing and Control" for the needs of the "Distributed Information and Control Systems" section at the Institute of Information and Communication Technologies - BAS with the only candidate in the competition, Senior Assistant Professor Dr. Yordanka Lyubomirova Boneva.

### 1. General characteristics of the submitted materials

For participation in the competition, materials were submitted by the only candidate, Dr. Yordanka Boneva, Senior Assistant Professor at IICT. The materials submitted by the candidate meet the requirements of Art. 10(1) of the Regulations on the specific conditions for acquiring scientific degrees and occupying academic positions at IICT-BAS.

Yordanka Boneva acquired the scientific degree "Doctor" on 26.03.2020 and, according to the submitted official note, has 15 years of experience at IICT of BAS, of which the last 4 years were as a Senior Assistant Professor.

### 2. Evaluation of the scientific works

All submitted scientific works are in the scientific field of the competition announced in the scientific specialty "Automated Systems for Information Processing and Management". For participation in the competition, the candidate participates with a total of 27 scientific works, which do not repeat those submitted for acquiring the educational and scientific degree "Doctor". The candidate's publication activity is aimed at research, modeling and optimization of intelligent control systems, mainly in the field of urban transport systems and the application of information and communication technologies in education and other applied areas.

#### 2.1. Description of scientific publications in journals that are referenced and indexed in world-renowned databases of scientific information (group B)

The candidate participates in the competition with 11 publications, equivalent to a monographic work, which is in accordance with the requirements of the Law on the State Administration of Transport and Communications of the Republic of Bulgaria and the Regulations on the Specific Conditions for the Acquisition of Scientific Degrees and for Holding Academic Positions of the Institute of ICT - BAS. All publications are in English, and 3 of them are independent. They are focused on the development and research of methods for intelligent urban traffic management. The publications cover modeling of transport networks through analytical and simulation approaches, development of algorithms for controlling traffic light systems based on fuzzy logic and optimization methods, as well as a comparative analysis of different control strategies at different load levels. Research is aimed at increasing the efficiency of transport systems by reducing congestion, optimizing throughput, and assessing environmental impacts.

#### 2.2. Description of publications from group G

Publications outside the monographic work, which are 16 in number, of which 7 are publications in group G7 (scientific publications in publications that are referenced and indexed in world-renowned databases with scientific information) and 9 from group G8 (scientific publications in

non-refereed journals with scientific review or in edited collective volumes). From group G7, all publications are in English, and 1 is independent. In group G8, two of the publications are in English, and the remaining 7 - in Bulgarian. 4 of the publications in this group are independent. Publications from these groups (G7 and G8) expand the thematic scope to interdisciplinary applications of intelligent methods. They include research in the field of management and optimization of transport networks, application of information and communication technologies in education, development and analysis of game-based learning, as well as modern approaches in STEM education. Part of the research is aimed at extracting knowledge from data and its application in areas such as agriculture and resource management.

### **2.3. Description of the candidate's scientific and applied activities**

Document 12, representing the "Report on the fulfillment of the minimum requirements of IICT", presents the scientific and applied projects in which the candidate has participated. There are 5 of them and cover the period 2016 - 2024. 4 of the projects are funded by the Scientific Research Fund and 1 by the Ministry of Education and Science.

### **3. Main scientific, scientific-applied and applied contributions**

The scientific subject matter of the presented publications is characterized by an interdisciplinary approach, combining methods from the theory of control, optimization, artificial intelligence, and information technologies, with a clearly expressed practical focus on solving real engineering and educational tasks. The contributions have been realized in publications from groups C and D and cover the development of new models, methods and applications in the field of intelligent control systems, with an emphasis on transport systems, education and applied information technologies.

#### **3.1. Contributions in group B4**

##### **3.1.1. Scientific contributions**

- Models for hierarchical (bi-level) optimization of transport networks based on store-and-forward models have been developed and formalized. (B4.1, B4.2, B4.11)
- Original approaches for traffic management using fuzzy logic and intelligent methods have been proposed. (B4.3, B4.5, B4.6, B4.7, B4.8)
- Models of interconnected transport networks (up to four intersections) with a hierarchical structure have been developed. (B4.5, B4.6, B4.7, B4.8)
- A comparative analysis of fuzzy and classical controllers has been performed, proving the advantages of intelligent approaches under dynamic conditions. (B4.3, B4.4, B4.6, B4.7, B4.8)
- Scientific statements have been developed for the integration of optimization, control theory and computer modeling in transport systems. (B4.1 – B4.8, B4.11)

##### **3.1.2. Scientific and applied contributions**

- Methods for the design and tuning of traffic management controllers have been developed. (B4.3, B4.4, B4.5, B4.6, B4.7)
- An integrated framework combining mathematical optimization and microsimulation (Aimsun) has been created. (B4.1, B4.2, B4.4, B4.5, B4.6, B4.7)
- Simulation models for different scenarios (low, high and oversaturated load) have been developed. (B4.5, B4.6, B4.7, B4.8)
- Indicators for assessing the effectiveness of management (queues, travel time, flow, etc.) have been introduced. (B4.3 – B4.8, B4.11)
- The impact of management on environmental indicators has been studied. (B4.9)

##### **3.1.3. Applied contributions**

- Solutions for optimizing traffic light regimes in real urban conditions have been proposed. (B4.2, B4.11)
- Models for assessing infrastructure changes (e.g. intersection → roundabout) have been implemented. (B4.10)
- Reduction of congestion and pollution through optimization of signaling has been proven. (B4.9)
- The developed solutions are applicable in intelligent transport systems (ITS), (B4.1 – B4.11)

### **3.2. Contributions by group G (G7 and G8)**

#### **3.2.1. Scientific contributions**

- Models for optimal management of transport networks (incl. LQG) have been formalized. (G7.2)
- Methods for extracting knowledge from data have been developed. (G7.7)
- Dependencies between traffic and environmental indicators have been studied. (G7.1)
- Criteria for evaluating STEM educational methods have been formulated. (G7.5, G7.6)

#### **3.2.2. Scientific and applied contributions**

- Models for assessing the impact of parking on traffic have been developed. (G7.1)
- A methodology for developing educational games (7 phases) has been proposed. (G7.4)
- The implementation of ICT and game-based learning has been analyzed. (G7.3, G7.5)
- Approaches for optimizing STEM education have been developed. (G7.5, G7.6)
- Methods for data analysis in applied areas have been validated. (G7.7)

#### **3.2.3. Applied contributions**

- Traffic cases have been implemented in Sofia. (G7.1, G7.2)
- Prototypes of educational games have been developed. (G7.4)
- The impact of game-based learning has been proven. (G7.3)
- Intelligent methods have been applied in agriculture. (G7.7)

### **4. Scientometric indicators**

To participate in the competition for associate professor, the candidate has submitted 27 scientific papers, which are as follows:

- To cover the minimum scientometric indicators in Group B, 11 scientific peer-reviewed publications in English were selected, referenced in the international SCOPUS database with a total of 360 points. The total impact factor of the publications in this group is 7.592. 8 of the publications appeared in specialized journals, and the remaining 6 appeared in proceedings of international conferences (reports published in full text).
- To participate in the competition and cover the minimum scientometric indicators in Group G, a total of 16 scientific peer-reviewed publications were included with a total of 225 points.
  - Scientific publications from Group G7, referenced in the international SCOPUS database – 7 pcs., of which 1 pc. - in specialized journals and 6 pcs. – in papers from international conferences (reports published in full text);
  - Scientific publications from Group G8, including 9 papers, 3 of which were published in specialized journals, and the remaining 6 were published in papers from international conferences (reports published in full text).

The scientific publications submitted for participation in the competition were cited by independent authors, as follows: publications from Group B were cited in 12 publications, indexed and referenced in SCOPUS and 3 times - in other sources; publications from Group G were cited in 4 publications, indexed and referenced in SCOPUS and 5 times - in other sources. In the

competition for associate professor, senior assist. Boneva participated with a total of 25 citations, 16 in SCOPUS/WoS and 9 in non-refereed journals with scientific review, which equals 178 points under the group of indicators E.

Yordanka Boneva's results are summarized quantitatively in Table 1. The candidate meets the minimum requirements for holding the academic position of "associate professor", set out in the Regulations on the specific conditions for acquiring scientific degrees and for holding academic positions of IICT - BAS.

Table 1: Comparative table of indicators

Group of indicators	Contents	Associate Professor	Assist. Prof. Dr. Boneva
A	Indicator 1	50	50
Б	Indicator 2	-	-
В	Indicator 3 or 4	100	350
Г (G)	Sum of indicators from 5 to 11	220	225
Д	Sum of indicators from 12 to 15	60	178
Е	Sum of indicators from 16 to the end	20	50

## 5. Notes and recommendations

I have no significant comments on the materials presented by the candidate and her scientific achievements and contributions. I recommend that in future research she expand the methodological apparatus used by implementing modern approaches (for example, machine learning), as well as to focus on larger and more realistic systems, while at the same time increasing the share of publications in journals with a high impact factor to increase international visibility.

## CONCLUSION

Based on the positive assessments made of the candidate's scientific and research activities, the relevance and significance of the contributions in the presented works and the fact that the indicators of her previous activities meet the legal requirements of the ZRASRB and PURZAD of IICT-BAS under this competition, I believe it is convinced and justified to recommend to the Honorable Jury to propose to the Scientific Council of IICT-BAS to elect Ch. Assoc. Prof. Dr. Yordanka Boneva for the academic position of "Associate Professor" for the needs of the "Distributed Information and Control Systems" section at IICT-BAS, professional field 5.2 "Electrical Engineering, Electronics and Automation" in the specialty "Automated Information Processing and Control Systems".

Sofia, May 1, 2026

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