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STATEMENT

by Prof. Snezhanka Petrova Kostova, PhD
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on the materials submitted for participation in the competition for the academic position of *Associate Professor* for the needs of the section "Control of Robots and Mechatronic Systems", Institute of Robotics "St. Apostle and Evangelist Matthew" at BAS

Field of Higher Education: 5. "Technical Sciences"
Professional Field: 5.2 "Electrical Engineering, Electronics and Automation"
Scientific Specialty: "Elements and Devices of Automation and Computer Engineering"
Scientific Organization: Institute of Robotics "St. Apostle and Evangelist Matthew" – BAS
Scientific Unit: Section "Control of Robots and Mechatronic Systems"
Announcement in the State Gazette: Issue 39 of May 13, 2025

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1. Data on the procedure

The competition for the academic position of *Associate Professor*, announced in the State Gazette, issue 39 of May 13, 2025, and on the website of the Institute of Robotics – BAS, for the needs of the CRMS Section, has one applicant: Chief Assistant Professor Vanya Dimitrova Markova, PhD. The candidate is currently employed as Chief Assistant Professor in the same section of the Institute. The competition was announced based on a decision of the Scientific Council of the Institute of Robotics – BAS, according to Minutes No. 4, item 7 of May 28, 2025.

By Order No. 79/17.07.2025 of the Director of the Institute of Robotics – BAS, Prof. Avgust Ivanov, PhD, I was appointed as a member of the Scientific Jury for the competition. At the first meeting of the Scientific Jury, held on 23.07.2025, I was elected to prepare an opinion on the competition.

The candidate, Chief Assistant Prof. Vanya Dimitrova Markova, PhD, submitted all materials required by the Law for the Development of the Academic Staff in the Republic of Bulgaria (LDASRB), its Implementing Regulations, and the Internal Rules for Academic Staff Development of the Institute of Robotics – BAS. These were provided to me in electronic form and later supplemented. I have found no formal violations of the competition procedure at this stage, nor any cases of unauthorized use of others' results (plagiarism) in the submitted works.

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2. Scientific biography of the candidate

Chief Assistant Prof. Vanya Markova, PhD, was born in 1965. She graduated from Plovdiv University "Paisii Hilendarski" in 1987 with a degree in Mathematics, specialization in Informatics. In 2013, she defended a doctoral thesis entitled *"Methods and Algorithms for Describing the Behavior of an Autonomous Mobile Sensor Agent"* in the specialty "Elements of Automation and Computer Engineering" at the Institute of System Engineering and

Robotics, BAS. She has worked as a Researcher (2001–2008), Assistant Professor (2008–2013), and Chief Assistant Professor (2013–present) at IUSI, ISER, and IR – BAS.

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3. General description of the submitted materials

For the competition, the candidate submitted a list of 31 publications in Bulgarian and international scientific editions. Ten of them are refereed and indexed in globally recognized scientific databases and are designated as the habilitation work under criterion B4 of the Implementing Regulations of ППЗРАС; 4 publications correspond to criterion G7; 17 publications are in non-refereed peer-reviewed journals or edited collective volumes (criterion G8). The candidate also presented a list of 26 citations in indexed scientific databases of 6 of her publications, corresponding to criterion D12.

The results of her work have been presented at international scientific forums in Bulgaria and abroad. Thirteen publications are indexed in Scopus and one in Web of Science; one has an IF (Q4), and one has an SJR.

Her works include both single-author and co-authored publications: 4 single-author papers, 16 as first author, 10 as second author, and 1 as fourth author. No overlap with her doctoral thesis publications is observed.

According to the submitted materials, her total score under the Implementing Regulations is 880 points, distributed as follows:

- **A:** 50 points (PhD degree)
- **B4:** 330 points (minimum required 100)
- **G:** 240 points (minimum required 200)
- **D:** 260 points (minimum required 50)

This exceeds the minimum requirements for the position of *Associate Professor* in professional field 5.2.

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4. Remarks on the submitted materials

- **Criterion G7** – Publication No. 4 has two authors; therefore, the candidate should receive 20 points instead of 10, increasing G7 (and G) by 10 points, i.e., from 240 to 250.
- **Criterion D12** – One citation is a self-citation; these points should be removed, decreasing D12 (and D) from 260 to 250.

These adjustments do not change the overall total of 880 points, which still exceeds the minimum requirements.

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5. Teaching activities of the candidate

The candidate has taught courses as an adjunct lecturer at the Technical University – Sofia, Plovdiv branch, in:

- Systems Analysis
- XML Technologies
- Artificial Intelligence and Robotics
- Advanced Machine Learning
- Introduction to Deep Learning
- Applied Deep Learning

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6. Contributions

Her scientific work can be grouped into three main areas:

- Formation and control of collectives of autonomous agents and robots;
- Cooperative learning and agent strategies through reinforcement learning and knowledge transfer;
- Modeling and prediction of autonomous agent behavior via deep machine learning methods.

She has presented 11 contributions: 4 scientific and 7 applied-scientific.

Scientific contributions include:

- Sequential development and application of encoder-decoder and sequence-to-sequence models for agent behavior in game and dynamic environments;
- Investigation of new initialization methods for autonomous robot groups using unsupervised learning in geometric graphs;
- Definition and formalization of knowledge transfer through Markov decision processes;
- Robust and efficient methods for consensus in multi-agent systems.

Applied-scientific contributions include:

- Application of optimization algorithms for role and position allocation in robot formations;
- Development of an adaptive deep RL approach for autonomous robot collectives;
- Proposed framework for an autonomous mobile agent with built-in meta-learning capability;
- New approaches for nonlinear system identification;

- Formation and control of swarms of agents in obstacle environments;
- Off-line knowledge transfer system between agents;
- Mathematical modeling of nonholonomic mobile robot dynamics in collective formation.

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7. Critical notes and recommendations

- Some contributions could be consolidated to reduce the total count.
- Continue active publishing in high-impact international journals.
- Expand the range of international scientific forums to increase visibility in the global scientific community.

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8. CONCLUSION

Having reviewed the submitted materials and scientific works, and based on the analysis of their significance and contributions, I confirm that the scientific achievements meet the requirements of the ЗРАСРБ its Implementing Regulations, and the Internal Rules of the Institute of Robotics – BAS for holding the academic position of *Associate Professor* in the relevant scientific field and professional area.

The candidate meets the national minimum requirements for professional field 5.2 and no plagiarism was found.

I give my positive evaluation and recommend that the Scientific Jury propose to the Scientific Council of the Institute of Robotics – BAS that Chief Assistant Prof. Vanya Dimitrova Markova, PhD, be elected to the academic position of *Associate Professor* in professional field 5.2 "Electrical Engineering, Electronics, and Automation."

Sofia, 04.09.2025

Prepared by:
/Prof. Snezhanka Petrova Kostova, PhD/