

REVIEW

by prof. Valentina Ilieva Markova, Technical university of Varna

of the materials submitted for participation in a competition
for the academic position of "Professor"
Field of Higher Education – 5. Technical Sciences,
Professional Field – 5.3. Communication and Computer Engineering,
Speciality– "Automated Information Processing and Control Systems"

Assoc. Prof. Dr. Eng. Rosen Stefanov Ivanov (from TU-Gabrovo) is participating as a candidate in the competition for the position of Professor—announced in the State Gazette, Issue 61/03.07.2026, and on the TU-Gabrovo website—for the Department of Computer Systems and Technologies within the Faculty of Electrical Engineering and Electronics.

1. Brief biographical details

The candidate, Assoc. Prof. Dr. Eng. Rosen Ivanov, was born in the town of Karnobat in 1967. He earned a Master's degree in Electronic Engineering and Microelectronics from the Higher Institute of Mechanical and Electrical Engineering (VMEI) in Gabrovo in 1990. In 2001, he obtained a PhD degree in the field of Automated Information Processing and Control Systems from the Technical University of Sofia. Since 2005, he has held the academic position of Associate Professor in the Department of Computer Systems and Technologies at the Technical University of Gabrovo. He is a member of the global organization IEEE and the Union of Automatics and Informatics in Bulgaria (SAI). He has authored numerous scientific publications in reputable journals—such as *the Journal of Network and Computer Applications*, *the International Journal of Geographical Information Science*, and various journals published by MDPI—and serves as a reviewer for prestigious international journals, including *IEEE Access*, *IEEE Transactions on Intelligent Transportation Systems*, and *ACM Transactions on Interactive Intelligent Systems*.

2. General description of the presented materials

To participate in the competition for the academic position of "Professor," Assoc. Prof. Dr. Eng. Rosen Stefanov Ivanov has submitted comprehensive materials reflecting his extensive research, applied, and teaching activities at the Technical University of Gabrovo. The candidate's research work is characterized by in-depth studies in key contemporary areas within the field of "Communication and Computer Engineering"—specifically, intelligent localization and navigation in indoor and outdoor environments, distributed systems, IoT technologies, artificial intelligence, and specialized applications for people with disabilities and the preservation of cultural heritage.

The candidate's submission includes a body of research and pedagogical work comprising 35 scientific publications (articles and conference papers), a sole-authored monograph, 5 university textbooks, and one study guide.

A central component of this submission is the habilitation work, presented as a collection of 12 scientific articles published in journals indexed and referenced in globally recognized databases (Scopus and Web of Science). Category G.7 (scientific publications in indexed and referenced journals within global databases) includes 6 publications, while Category G.8 (scientific publications in non-indexed journals) comprises 17 works.

Additionally, there is a second sole-authored monograph, which is not included in the documentation as the primary habilitation work. It was published in 2026 and is titled "Methods and Algorithms for Intelligent Localization and Navigation in Indoor and Outdoor Environments".

The candidate's teaching activity is significantly supported by the publication of 5 fundamental university textbooks (indicator E.23), covering key contemporary subjects such as network programming, JavaScript, knowledge discovery from data, mobile programming, and distributed systems. Additionally, a study guide for laboratory exercises on non-relational databases is included, falling under group E.24.

Distribution of points by indicator groups:

- Group A (Dissertation for the educational and scientific degree of "Doctor" [PhD]) – 50 points.
- Group B (Habilitation thesis) – 720 points.
- Group G (Scientific publications in refereed and non-refereed editions) – 428.33 points.
- Group D (Citations in scientific publications) – 1,610 points in total, based on 161 recorded citations.
- Group E (Textbooks, study guides, projects, and doctoral students) – 410 points in total, including 200 points for textbooks (indicator E.23), 20 points for a study guide (indicator E.24), as well as points derived from project activities and the supervision of a doctoral student. With this, the candidate's total score amounts to 3,218.33 points, significantly exceeding the required minimum of 600 points for the academic position of "Professor."

Table of scientometric indicators for Assoc. Prof. Dr. Eng. Rosen Ivanov regarding the appointment to the academic position of "Professor" in professional field 5.3 "Communication and Computer Engineering," presenting the requirements of the Technical University of Gabrovo alongside the candidate's corresponding achievements.

Indicator	Requerments (professor)	Candidate's data
Total number of publications (articles and reports)	30 (of which at least 5 independent and 3 with IF (WoS))	35 (of which at least 24 independent and 6 with IF (WoS))
Number of known citations by other authors + reviews	20	1610
Published textbooks / books	2	5
Published teaching aids	—	1
Number of PhD students who have successfully defended their theses	1	1
Management of projects and/or contracts involving external funding	3	5
Total number of points across indicator groups (A – E)	600	3218,33

3. Impact of the candidate's scientific publications within the scientific community (known citations)

The scholarly work of Assoc. Prof. Dr. Eng. Rosen Ivanov enjoys widespread recognition within the international academic community, as evidenced by a substantial number of citations in peer-reviewed publications and his active role as an international reviewer.

Scientometric data from the Scopus database indicate that Assoc. Prof. Dr. Eng. Rosen Ivanov has an h-index of 9 and a total of 308 citations, while Google Scholar records 509 citations (with an h-index of 11 and an i10-index of 13).

For the purposes of this competition procedure (under indicator group D), 127 citations by independent authors have been submitted, all appearing in publications indexed and peer-reviewed in Scopus and/or Web of Science. This result significantly exceeds the minimum requirement of 20 citations stipulated by the specific criteria of the Technical University of Gabrovo. The citations primarily concern the author's foundational research in the fields of navigation systems for people with disabilities, smart solutions for museums, and algorithms for geospatial data processing.

In recognition of his expertise, he has served as a reviewer for 34 manuscripts submitted to a number of leading, high-impact-factor scientific journals. Notable among them are publications from global publishers and organizations such as IEEE (IEEE Access, IEEE Internet of Things Journal, IEEE Transactions on Intelligent Transportation Systems, IEEE Transactions on Mobile Computing, IEEE Sensors Journal, etc.), Springer, and Elsevier (Technovation), as well as the renowned journals Sensors, ISPRS International Journal of Geo-Information, and Computers.

4. Overview of the content and results in the presented works

The candidate's research activities focus on current technological areas such as intelligent localization and navigation, software engineering, distributed systems, the Internet of Things (IoT), and artificial intelligence, as well as applied solutions designed to support individuals with special needs and to preserve cultural heritage.

The candidate's scientific works are categorized into three main areas, based on the specific nature of the research and the contributions made.

The first area covers outdoor navigation and positioning systems (comprising 7 publications). Research in this field focuses on the development of methods, algorithms, and systems for outdoor navigation and positioning, with an emphasis on resource-constrained mobile platforms and applications for the visually impaired. The research originated from early systems for automatic vehicle tracking—utilizing GPS, wireless communications, and the Internet—as well as mobile Java applications and algorithms for voice-guided GPS navigation.

The second area encompasses 11 publications focused on indoor navigation and positioning. Research in this domain centers on the development of methods, algorithms, and systems for navigation and positioning within enclosed environments. The work emphasizes accessibility for the visually impaired, building modeling, and localization via wireless technologies.

The third area includes context-aware, IoT-based, and personalized systems and services (comprising 12 publications). Research in this field encompasses the development of intelligent systems and services based on IoT, microservices, and artificial intelligence, with applications in museum environments, healthcare, and human-environment interaction. A key focus is the distributed architecture ExhibitXplorer, which combines contextual geofencing, integration with the GPT API for content generation, and microservices to deliver personalized information within museum settings. The principles of distributed cloud and microservice architectures have also been successfully extended to the healthcare sector through remote pregnancy monitoring systems and energy-efficient IoT hardware platforms (ESP32).

5. General Overview of the Candidate's Activities

5.1. Teaching and Pedagogical Activities (Work with Students and Doctoral Candidates)

Assoc. Prof. Dr. Eng. Rosen Ivanov's teaching activities encompass delivering lectures and conducting practical exercises in a range of key disciplines related to the development of modern computer technologies and communication equipment. The candidate has made a significant contribution to the educational process by authoring and publishing five fundamental university textbooks (indicator E.23) in fields such as network programming, JavaScript, data mining, mobile programming, and distributed systems, as well as a laboratory manual on non-relational databases (indicator E.24). These educational materials reflect the latest technological innovations, trends, platforms, and applications essential for training highly qualified specialists.

Assoc. Prof. Ivanov has successfully demonstrated his mentorship capabilities by supervising Eng. Viktoriya Tsvetanova Velkova. Under his guidance, she successfully defended her doctoral thesis titled "Development and Investigation of a Service for Delivering Personalized Content to Open-Air Museum Visitors" within the doctoral program "Automated Information Processing and Management Systems" (Professional Field 5.3: Communication and Computer Engineering) at the Technical University of Gabrovo in 2025.

5.2. Scientific and Applied Scientific Activity

The scientific and applied work of Assoc. Prof. Dr. Eng. Rosen Ivanov is characterized by sustained involvement and a leading role in the development of numerous national research and educational projects. These projects have been funded through the state budget—via the Technical University of Gabrovo—as well as by the Bulgarian National Science Fund.

The candidate has successfully led five internal research projects focused on innovative solutions in areas such as mobile augmented reality technologies, specialized navigation systems for the visually impaired, cloud-based services for medication monitoring and management, and IoT-based architectures for personalized content delivery.

As part of his academic activities, Assoc. Prof. Ivanov has served as a team member on several national projects dedicated to the digital representation and preservation of cultural and historical heritage, as well as the development of virtual laboratories for digital hardware training. He also participated in a nationally funded project (supported by the National Science Fund) titled "Research on Architectures, Models, and Methods for Autonomous Management in the Future Internet," which was carried out in collaboration with the Technical University of Sofia.

5.3. Implementation activity

The research work of Assoc. Prof. Dr. Eng. Rosen Ivanov is characterized by a strong practical focus and the successful translation of theoretical models into functional prototypes operating under real-world conditions. Examples of successful technology transfer include a web-based controller for the remote monitoring of fermentation processes—tested within the production environment of the "ELVI" dairy—as well as hardware solutions for remote control, validated within the infrastructure of the Technical University of Gabrovo. In the social and cultural spheres, the candidate has implemented significant applied projects, such as "IndoorNavi"—a navigation system for the visually impaired, which has been deployed in an actual hospital setting—and "ExhibitXplorer," an architecture for personalized content that was successfully implemented and evaluated by visitors at an open-air ethnographic museum.

6. Contributions (scientific, scientific-applied, applied)..

The materials submitted for the current procedure present a number of contributions of a scientific, applied-scientific, and practical nature, which I accept in substance.

These contributions are focused on three main thematic areas:

1. Contributions in the field of outdoor navigation and positioning systems

The research in this area addresses navigation challenges involving resource-constrained mobile platforms, with a particular focus on assistive technologies for visually impaired individuals.

- ✓ A real-time online algorithm (RSTS) for simplifying GPS tracks has been developed; it achieves a reduction of over 90% in the number of points while preserving the route's shape, and reduces the size of the data file by more than 30 times. The algorithm enables direct navigation without the need to convert the trajectory into a formal route.
- ✓ Specialized mobile Java applications for voice-guided navigation in Bulgarian have been developed. These integrate adaptive Kalman filters to reduce errors in GPS data and include dedicated SOS modes for safety.
- ✓ A software toolbox has been designed within the MATLAB environment for in-depth offline processing, analysis, and visualization of raw GPS data in NMEA 0183 format.

2. Contributions in the field of indoor navigation and positioning systems

The contributions presented here relate to the creation of interior building models and localization using wireless technologies (BLE, NFC, RFID).

- ✓ A context-aware navigation system, RSNavi, has been designed; it incorporates 4D building modeling (3D geometry combined with the temporal status of sensors) and semantic interior models featuring multi-parameter route optimization.
- ✓ A Building Information Model (BIM) has been developed that supports a hierarchical topological description, enabling route planning—from coarse to precise—and obstacle avoidance. Based on this, an efficient algorithm for finding the K-shortest paths in multi-story buildings—utilizing directed multigraphs—has been created, optimizing both computational time and memory usage.
- ✓ Algorithms for micro-localization within public buildings using BLE beacons and NFC tags have been proposed, achieving an error margin of less than 1.5 meters. These are complemented by novel algorithms for the automated deployment of sensor nodes and the adaptive selection of beacons based on fuzzy logic.

3. Contributions in the field of context-aware, IoT-based, and personalized systems and services

Intelligent systems have been developed that combine the Internet of Things (IoT), microservices, geofencing, and artificial intelligence.

- ✓ In the field of cultural heritage, the distributed architecture ExhibitXplorer has been created. The system combines contextual geofencing and microservices with the integration of the GPT API (generative language models) to dynamically generate and deliver personalized content to visitors. To this end, a dedicated microservice interface to ChatGPT has also been developed, utilizing an AMQP broker.
- ✓ In the healthcare sector, the principles of distributed cloud architectures have been successfully implemented through a real-time medication monitoring system and a comprehensive IoT system for pregnancy tracking. The latter integrates a wireless sensor network (based on ESP32 and various sensors for biological indicators) with microservices that automatically alert medical personnel when risk-related symptoms are detected.

7. Assessment of the candidate's personal contribution.

The scientific and applied scientific contributions are indisputably the personal work of the candidate. His leading role in the conducted research is unequivocally demonstrated by the fact that, in nearly 90% of the submitted works, Assoc. Prof. Ivanov is the first or sole author. There is an exceptionally high proportion of entirely independent studies (68%), including the monograph and all 12 publications that constitute the equivalent of a primary habilitation thesis. The co-authored publications were produced primarily in collaboration with a doctoral student who successfully defended a dissertation under his supervision; this further underscores the candidate's individual contribution to the execution of the research and the resulting scientific and applied outcomes.

8. Critical remarks and recommendations

I have no significant criticisms regarding the candidate's scholarly works, which have been prepared and formatted in accordance with the requirements and established standards of the field.

Acknowledging the candidate's indisputable personal contribution and the high proportion of sole-authored publications to date, I offer the following recommendation for his future work:

It is advisable for Assoc. Prof. Ivanov to expand his participation in collaborative research teams. Attaining the academic rank of "Professor" implies not only proven individual achievements but also the development of a sustainable scientific school. This requires the active engagement, supervision, and collaboration with a broader circle of young researchers, doctoral

candidates, and students, through whom accumulated expertise can be transmitted and multiplied.

9. Personal impressions

I do not know the candidate personally, nor do I have any direct impressions of his research and teaching activities. Nevertheless, the application documentation submitted by Assoc. Prof. Dr. Eng. Rosen Ivanov makes an excellent impression. The materials are structured clearly, logically, and with great precision. The properly prepared summaries and well-organized information demonstrate a high level of professionalism, strong organizational skills, and a serious commitment to academic work.

10. Conclusion:

In view of the above, I propose that Assoc. Prof. Dr. Eng. Rosen Ivanov be appointed to the academic position of "Professor" in the field of higher education 5. Technical Sciences, professional field 5.3. Communication and Computer Engineering, in the specialty "Automated Information Processing and Control Systems".

15.10. 2026

Reviewer:

/prof.V. Markova/