

R E V I E W

***Authored by Prof. Raicho Todorov Ilarionov, D.Sc.,
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***concerning materials submitted for participation in a competition for
awarding the academic position of “Professor”
in the field of higher education 5. Technical Sciences;
professional field 5.3. “Communication and Computer Engineering”,
scientific specialty “Communication Networks and Systems”,
 (“Wireless Communications and Cybersecurity in WiFi Networks”, “Internet
of Things (IoT) and Cybersecurity Systems”)***

***The competition was announced in State Gazette, issue 8 from 13.06.2021,
and on the website of Technical University of Gabrovo (TU-Gabrovo) for the
needs of the Department of “Communication Equipment and
Technologies” at the Faculty of Electrical Engineering and Electronics;
with applicant***

Assoc. Prof. Krasen Kirov Angelov, PhD – Technical University of Gabrovo.

1. Brief biographical data

Assoc. Prof. Krasen Kirilov Angelov, PhD is a graduate of the Technical University of Gabrovo. In 2016, he defended his dissertation work on the topic " Research on the possibilities for two-way digital information transmission in the upstream channel of cable television networks" under the doctoral program "Communication Networks and Systems". Since 2020, he has been an associate professor in the scientific specialty - "Communication Networks and Systems" (Wireless Communications and Broadcasting, Security Equipment), and from 2023 to the present, Assoc. Prof. Angelov has been the head of the Department of "Communication Equipment and Technologies" at the Faculty of Electrical Engineering at the Technical University of Gabrovo.

The candidate has indicated the following areas of professional interest: wireless communication systems for the Internet of Things (IoT) and industrial Internet of Things, broadband wireless communications; signal security and fire alarm systems, access control and video surveillance; optical communication networks and systems; cybersecurity.

2. General description of the submitted materials

For participation in the competition, a total of 43 scientific papers were submitted:

- 26 scientific publications in journals that are referenced and indexed in world-renowned scientific information databases (indicators B.4 and Г.7);
- 15 scientific publications in non-refereed peer-reviewed journals or in edited collective volumes (indicator Г.8);
- two textbooks (indicator E.23).
- All submitted scientific papers are in the scientific field of "Communication Networks and Systems".

3. Reflection of candidate's scientific publications among the scientific community (known citations)

The list of citations for participation in the competition includes 26 publications in scientific journals, referenced and indexed in world-renowned databases (Д.12).

The citations of the publications of Assoc. Prof. Krasen Angelov, PhD show that he is well known to the scientific community in the country and abroad.

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

The publications submitted by the candidate in the competition for the academic position of "professor" are divided into three thematic areas of communication networks and systems, directly related to the competition.

The first thematic area, "Cybersecurity in wireless communication networks," presents scientific results related to: the development, research, and analysis of encryption, authentication, and access control mechanisms for data protection and ensuring the integrity and confidentiality of communications, security, and management of the large amount of data generated by IoT devices; development of models for integrating AI into image encryption systems. A customized encryption algorithm with implementation of AES-128 encryption in Cipher Block Chaining (CBC) mode is presented; a methodology for analyzing the challenges associated with managing the huge amounts of data is proposed, and a structured synthesis and application of a hyperchaotic synchronization system for secure communication using chaotic masking is developed.

The publications in the second thematic area "Communication technologies and applications in the Internet of Things" are related to: synthesis of methodologies for optimal prediction and analysis of the radio coverage of wireless communication networks; modeling, research and analysis of the performance of communication networks and protocols for IoT; development and research of experimental setups and practical experimental demonstration models and prototypes of systems related to the implementation and application of communication technologies in IoT. A methodology for prediction and analysis of the radio coverage of IoT networks (5G, WLAN (IEEE 802.11ax) and LoRaWAN) for industrial networks is proposed; models for research and analysis of LoRaWAN performance are presented; experimental setups and practical experimental demonstration models and prototypes of systems are proposed; a system for measurement, visualization and control of electrical and non-electrical parameters of low-voltage power supply networks [Г.7.7]; a visible light communication (VLC) vehicle-to-everything (V2X) system is proposed for traffic management and road safety in urban and non-urban environments.

The third thematic area "Monitoring, control, management and optimization of resources in communication networks" considers models and solutions oriented towards ensuring the Quality of Services, operability and reliability and effective management of communication networks. The following have been developed: computer models for experimental study of factors affecting the quality of radio coverage in wireless communication networks [B.4.1, Г.7.2]; models with advanced methods for channel coding, power control and signal amplification intended for new generation mobile cellular networks [B.4.2, B.4.3, B.4.7, B.4.9]; models for assessing and optimizing the performance of 5G NR mobile cellular networks through the analysis of spatial data obtained using convolutional neural networks (CNN) and sequential data; models for performance analysis and solving optimization problems for high-speed multi-channel active and passive optical communication networks [Г.7.8, Г.7.14, Г.7.15,

Г.8.4]. An approach for analyzing and evaluating a transmission channel under different conditions of communication with artificial pico- and nanosatellites is presented; various solutions for SDR-based systems for monitoring radio frequency signals are developed and studied; a prototype of a universal integrated system for monitoring communication networks and devices, mounted in a chassis for embedding, is developed.

5. General description of candidate's activity

5.1. Educational and pedagogical activity (work with students and postgraduate students)

Assoc. Prof. Krasen Angelov has participated in the development of the curricula and lectures on the disciplines "Wireless Communications and Cybersecurity in WiFi Networks", "Broadband Mobile Networks", "Electromagnetic Compatibility", "Access Control Systems", "Security and Monitoring Systems", "Internet of Things (IoT) and Cybersecurity Systems", "Information Cybersecurity Management Systems", included in the curricula of specialties at the Faculty of EE - full-time and part-time study for the educational and qualification degrees "Bachelor" and "Master".

To ensure the educational process involving the candidate, textbooks on "Digital Television Technologies" and "Wireless Communications" have been published.

He is the supervisor of over 110 graduates with bachelor's and master's degrees. Currently, he is the scientific supervisor of three doctoral students and one doctoral candidate who has defended his doctoral thesis in the doctoral program "Communication Networks and Systems."

5.2. Scientific and scientific-applied activity

To participate in the competition, the candidate has submitted 41 scientific publications (articles in journals and conference papers), 26 of which are in publications referenced and indexed in world-renowned scientific information databases (Scopus/ Web of Science), three of which have an impact factor and eight have an SJR rank. Of the total number of 41 publications, 6 are self-authored and 35 are co-authored (four with two authors, 14 with three authors, and 17 with more than three authors, with the candidate being the first author in 10 of them). There are 15 articles and papers in scientific conferences in Bulgarian and 26 in English. A total of 2 textbooks have been published, one of which he is the author and the other a co-author.

The publications do not repeat the articles, papers, textbooks, and teaching aids for the doctoral degree and the academic position of associate professor included in the competition documentation.

The candidate has participated in a large number of national and international scientific and educational projects. In the competition materials, he has listed 11 national projects (indicators E.18 and E.20), of which he is the project manager in 4 and a participant in 7, and 1 international project as a participant (indicator E.19).

The competition documentation provides evidence of compliance with the minimum national requirements and the requirements of the Technical University of Gabrovo for holding the academic position of "professor":

Group of indicators	Contents	Minimum required points by groups of indicators for holding the academic position of "Professor"	Declared points by groups of indicators for holding the academic position of "Professor"
A	Indicator 1	50	50
Б	Indicator 2	-	0
B	Indicator 3 or 4	100	138
Г	Sum of indicators 5 to 11	200	394,03
Д	Sum of indicators 12 to 15	100	260
E	Sum of indicators 16 to 28	150	261,92

Contents	Minimum requirements of TU - Gabrovo for holding the academic position of "Professor"	Declared indicators by the candidate for "Professor"
Total number of publications (articles and papers)	30, of which at least 5 self-authored and 3 with IF (WoS)	41, of which 6 self-authored, 3 with IF (WoS), 8 with SJR (Scopus)
Number of known citations by other authors	20	26
Published textbooks/books	2	2
Published teaching aids	-	-
Number of successfully defended doctoral students	1	1
Project and contract management	3	4

5.3. Implementation activity

There are no officially presented company documents for implementation. The candidate has participated in the construction of laboratories and bench equipment for laboratory and practical training of students in the disciplines of "Wireless Communications and Cyber Security in WiFi Networks", "Broadband Mobile Networks", "Access Control Systems", and "Internet of Things (IoT) and Cybersecurity Systems". He is also actively involved as an expert in various projects with businesses and the Municipality of Gabrovo related to the implementation of innovative communication technologies in the field of the Internet of Things and Smart Cities.

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

Scientific contributions:

1. A modified image encryption scheme based on the OTP (One-Time Pad) algorithm has been developed, consisting of chaotic synchronization (based on feedback control to create complex and unique encryption keys) and artificial neural networks (ANN) for improved security, efficiency, and resistance to various cryptographic attacks (brute force attack, differential attack, noise and data clipping attacks, key sensitivity, and computational complexity).
2. A hyperchaotic synchronization system has been developed and investigated for two identical new mathematical models of fourth-order hyperchaotic systems. Synchronization combines projective, marginal, and hybrid chaotic synchronization.

Active control based on Lyapunov's second stability law has been synthesized. Stable chaotic synchronization between two nonlinear systems has been achieved, which serves as a basis for secure data transmission through chaotic masking over unprotected communication channels.

3. An improved neural network model has been created and researched, combining spatial data obtained using convolutional neural networks (CNN) with sequential data analyzed using long short-term memory (LSTM) networks for the purpose of predicting radio wave attenuation in 5G networks.
4. Robust control for a class of nonlinear systems with parametric uncertainties has been synthesized using modified input-output linearization through feedback with linear-nonlinear decomposition.

Scientific-applied contributions:

1. An approach to categorization (through clustering, categorization, and cross-validation using various algorithms) has been proposed and investigated of the key roles and responsibilities of stakeholders and their impact on ensuring cybersecurity in IoT ecosystems and prioritizing and allocating resources to address the most critical security risks in building a secure and reliable IoT platform.
2. Simulation models have been developed for forecasting and analyzing the radio coverage of a LoRaWAN network to determine its maximum range, parameters, quality of service (QoS), and performance when configuration parameters are changed in a complex manner.
3. An approach for designing, building, and deploying low-energy mesh networks in an indoor scenario based on IQRF technology has been proposed and investigated.
4. Advanced methods for power control and signal amplification designed for next-generation mobile cellular networks, including centralized, distributed, and machine learning-based approaches, have been investigated and analyzed.
5. A conceptual model of a communication system in the visible optical spectrum has been synthesized and studied, using wavelength division multiplexing (WDM) for simultaneous transmission of data streams from different sources over an optical channel in free space (FSO), with application for communication with vehicles in urban and non-urban environments.

Applied contributions:

1. A universal integrated system for monitoring wired and wireless communication networks and communication nodes has been developed, and its functionality and applicability have been demonstrated in several different applications.
2. Demonstration models have been developed for the implementation of an energy-efficient narrowband long-range communication network (LoRa) in the Internet of Things (IoT) concept for the management and monitoring of indoor lighting systems; real-time measurement, visualization, and control of electrical and non-electrical parameters of low-voltage power supply networks; remote intelligent management and control of household appliances in a home automation system.
3. A vehicle tracking system based on the LoRaWAN IoT network has been developed as part of the Smart City concept.
4. Practical approaches have been developed for optimizing the energy consumption of LoRaWAN end devices with autonomous power supply in different modes of operation.

5. A simulation model of the physical layer for downlink communication based on MATLAB 5G NR has been developed and tested for the purpose of realistic assessment of 5G NR performance.
6. Approaches for modeling and simulation models for research, analysis, and evaluation of performance, and solving optimization problems in high-speed multi-channel passive and active optical networks using different formats for optical signal modulation (NRZ, RZ, CSRZ, DM, MDRZ), and different dispersion compensation schemes (symmetric compensation, pre- and post-compensation).

7. Assessment of the candidate's personal contribution

The research, conclusions, and contributions from the candidate's scientific output have been published in national and international scientific journals and forums indexed in Scopus or Web of Science, which is a guarantee of the significance of the achieved results and contributions.

The content of the competition materials speaks of a highly trained specialist, as the candidate's scientific and applied contributions are a team effort, but with his significant creative participation. The rich educational and research activities are evidence of a high level of professional competence.

8. Critical remarks and recommendations

The following formal remarks may be made on the documents presented:

1. I recommend more self-authored publications.
2. Recommendations can be made for building on and expanding the results achieved.
3. Deepening experimental analyses and conducting comparative studies with other established approaches related to artificial intelligence methods.
4. In the future, it would be appropriate to integrate these results into large-scale international projects and partnerships, which will enhance the practical value and applicability of scientific achievements.
5. The results of the research should be presented more widely in specialized international publications with an impact factor, which will enhance their visibility and sustainable academic impact.

The comments made are entirely constructive in nature and do not diminish the high scientific and professional assessment of Assoc. Prof. Angelov's work.

9. Personal impressions

I have observations on the professional and academic activities of Assoc. Prof. Angelov. He is distinguished by high competence, responsibility and consistency in the implementation of his scientific and teaching commitments. He demonstrates exceptional initiative and analytical thinking, combining in-depth theoretical knowledge with practical experience. In his work he is demanding, organized and correct, demonstrating a high culture of academic communication and cooperation.

10. Conclusion

Based on the materials presented, I conclude that Assoc. Prof. Angelov possesses all the professional and scientific qualities necessary to hold the academic position of "professor".

My argument is as follows:

- The candidate has demonstrated a high level of scientific achievement, originality in his research, and sustained research and educational activity. His works and achievements meet and exceed the minimum national requirements of the Law on the Development of the Academic Staff and the Regulations of the Technical University of Gabrovo.
- He is an established researcher and scientist in the field of communication technology.
- Demonstrates the ability to identify priority scientific areas, propose original solutions, and seek practical solutions.

Considering the above, I propose that Assoc. Prof. Krasen Kirilov Angelov, PhD be awarded the academic position of “Professor” in the field of higher education - 5. Technical Sciences, professional field - 5.3. Communication and Computer Engineering, scientific specialty “Communication Networks and Systems” (Wireless Communications and Cybersecurity in WiFi Networks, Internet of Things (IoT) and Cybersecurity Systems)

24.10.2025

Reviewer:

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