

## Review

**Authored by Prof. Valentina Ilieva Markova, PhD, Technical University of Varna**



**Concerning scientific works submitted for participation in 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,**

**Candidate: Assoc. Prof.: Milena Nikolova Mileva-Karova, PhD**

### **1. General and biographical data**

The only candidate in the competition is assoc. prof. Milena Nikolova Mileva-Karova, associate Professor in the "Computer Science and Engineering" department, TU-Varna, working in the fields of "Communication and computer technology".

Assoc. Dr. M. Karova has submitted all the necessary documents and evidence specified in the Regulations for the terms and conditions for holding academic positions at the Technical University - Varna.

Assoc. Prof. Karova has been working at the Technical University-Varna since 1989, initially holding the position of assistant, then chief assistant, and since 2014 - associate professor in the Department of Computer Science and Technology, Faculty of Computer Sciences and Automation (FITA). Over the years, Assoc. Prof. Karova has led lectures and laboratory exercises in a number of disciplines, including "Basic Programming", "Office Programming", "C/C++ Programming", "Object-Oriented C++ Programming", "Parallel Algorithms and Systems", "Project Management", "Software Project Management", "Cryptography and Data Protection", "Dialogue Systems", "Artificial Intelligence", "Genetic Algorithms", "Program Interface Design", "Interfaces with virtual 3D reality".

Since 2019, Assoc. Prof. Karova holds the position of deputy dean for scientific activity and personnel development at FITA. Responsible for the development of scientific activity, work on research projects and staff development of FITA.

### **2. General description of the presented materials**

According to the current competition for the academic position of "professor" in the field of higher education 5 "Technical sciences", professional direction 5.3 "Communication and computer technology", the candidate submitted for review a total of 42 scientific works and one textbook.

To cover the relevant minimum national requirements for a group of indicators of category "B" (min. 100 points), the applicant presents ten publications (total 230 points) in refereed publications indexed in SCOPUS. These publications are equivalent to a habilitation work (indicator C.4-- "Habilitation work - scientific

publications (not less than 10) in publications that are referenced and indexed in world-famous databases with scientific information").

To meet the minimum requirements for a group of indicators of category "D" (minimum 200 points), the applicant presents a total of 32 publications (total 288.2 points), of which:

- 2 publications (total 205 points) in collections of conference reports that are indexed in SCOPUS, meeting the requirements of indicator D.7 "Scientific publications in publications that are referenced and indexed in world-renowned databases with scientific information" and

- 30 publications (a total of 205 points) that meet the requirements of indicator D.8 "Scientific publications in non-refereed journals with scientific review or in edited collective works".

The group of indicators "D" defines several categories of citations/references of scientific works of the author in publications of other authors, according to the indexing of the citing publication. In order to cover the minimum requirements under the group of indicators "D" (minimum 100 points), lists of citations falling into the category "D.12 -- Citations or reviews in scientific publications, referenced and indexed in world-renowned scientific information databases or in monographs" are attached and collective volumes'. The list includes the 20 citations of 5 of the candidate's publications.

To meet the minimum requirements for a group of indicators of category "E" (minimum 150 points), the applicant provides lists of points for the following indicators:

- Guidance of a successfully defended doctoral student - 80 points
- Participation in national scientific and educational projects - 70 points
- Participation in an international scientific and educational project - 20 points
- Management of a national scientific or educational project - 140 points
- Published university textbook - 5 points

In order to meet the minimum requirements for a group of indicators of category "Ж.29" (minimum 120 points), the applicant provides a reference for conducting lecture courses in 9 different disciplines to students from different specialties. The total number of points in category "G" is 622.

In conclusion, the presented information shows that Associate Professor Milena Karova meets, and by some indicators exceeds the minimum national requirements, as well as the criteria of TU-Varna for occupying the academic position "professor" in the professional field 5.3 "Communication and computer technology".

In addition, Assoc. Prof. Karova presents a report on 5 mobilities carried out under the Erasmus program in the last 6 years, as well as a report on membership in scientific organizations and in program committees of prestigious international scientific forums.

### **3. General characteristics of the candidate's research and scientific-applied activity.**

A major part of the research activity of Associate Professor M. Karova is thematically related to methods and algorithms for recognition, prediction, classification and encryption of information.

The publications presented in the competition, other than those equivalent to the monographic work, are summarized in 5 main thematic areas:

- Software applications in the field of encryption and data protection
- Project management and information security
- Robot control software applications
- Innovative solutions with Genetic Algorithms and machine learning
- Software applications to support the learning process in the disciplines "Basic programming", "Language processors" and "Compilers and interpreters"

42 publications, including 12 indexed in the Scopus databases, are submitted for participation in the competition for the academic position of "professor". Of these, 9 have been presented at international conferences in Bulgaria, 2 at conferences abroad, and 2 in magazines abroad.

Out of 30 publications in non-refereed journals and conferences, 4 were published in journals abroad, and the remaining 14 in journals in Bulgaria. Five reports have been presented at conferences abroad, and 7 at international conferences in Bulgaria. Of the presented publications - 34 are in English and 8 in Bulgarian.

70% of the publications have up to three authors, and one is independent. In addition, in 16 of the publications, the candidate is the first author, which testifies to a significant and leading contribution to the conducted research.

Evidence of participation in 5 national research and educational projects, 9 internal for TU-Varna research projects, and 1 international project is presented. Assoc. Prof. Karova is the head of 7 research projects at TU-Varna.

#### **4. Assessment of the candidate's pedagogical preparation and activity**

From the applicant's CV it is clear that she has extensive teaching experience and a wide range of competences in the field of communication and computer technology. A significant part of Assoc. Prof. M. Karova's time is engaged in conducting lectures on several disciplines at the "Bachelor's" and "Master's" of the two specialties. She took part in the development of study programs in 7 disciplines (4 - in OCS "Bachelor" and 3 - "Master"), including the study discipline "Basic Programming".

Assoc. Prof. Karova is also very active in training doctoral students. Information is available on the scientific guidance and supervision of 4 doctoral students in the Department of Computer Science and Technology, of whom 2 have defended their degrees and the rest are in the process of training.

It is also important to note the additional pedagogical work of Associate Professor Milena Karova with students. She is the mentor of one of the most prominent student clubs "Creative Code".

## **5. Basic scientific and scientific-applied contributions**

The more significant scientific and scientific-applied contributions in the presented materials are the following:

- A conceptual design of a cryptocurrency price prediction system using a neural network is proposed.
- An approach for recognizing secret keys for information encryption and increasing their robustness using kNN and SVM machine learning algorithms is proposed.
- Based on a comparative analysis of the accuracy and speed of various methods and algorithms for text classification in Bulgarian and in English, a modified algorithm for text classification with increased accuracy is proposed.
- An algorithm for recognition of iris parameters was synthesized and implemented
- A model is proposed for estimating the charge of lithium-ion batteries using machine learning.
- Approaches and software solutions for formation and transmission of symmetric and asymmetric key for information encryption are proposed.
- An application was created for the comparative analysis of information encryption algorithms in terms of the resources used.
- Risk management issues in information security management systems are analyzed and a concept for an information security management system is proposed.
- A modified GA for path finding in a robot motion environment is presented and a hybrid algorithm for finding the shortest path in a maze is proposed by using the DFS algorithm and GA with appropriate settings.
- An image processing algorithm is proposed to create a stylized image of a maze and a mobile robot movement algorithm according to the position of a controlling mobile device.
- A GA is presented for finding the amplitude-phase distribution of an optical field.
- A modified version of the machine learning nearest neighbors (kNN) algorithm for handwritten digit recognition is proposed and implemented.
- A parser for a training compiler was proposed and implemented.

## **6. Significance of the contributions to science and practice**

The contributions made by Assoc. Dr. Milena Karova are due to her in-depth work in the researched scientific field and are useful for practice. The quantitative indicators of the criteria for occupying the academic position "professor" have been met.

The results of the candidate's research and scientific-applied activities have found a significant response among the international scientific community. An Internet search shows the presence of 80 citations of the candidate's publications for the last five years by authors from all over the world, 21 of which are in proceedings of prestigious international conferences indexed in Scopus. According to Scopus, the Hirsch index (h) of Assoc. Prof. Milena Karova without self-citation is 4.

## **7. Critical notes and recommendations.**

I have no objections to the candidate's scientific works, which are prepared and formatted according to the requirements and standards established in the scientific field.

## **8. Personal impressions and position of the review**

I know Associate Professor Milena Karova personally and I think that she is a teacher with very good professional training who works successfully both independently and in a team. He knows how to motivate students and doctoral students and help them to accumulate knowledge and skills useful for their career development.

## **CONCLUSION**

Based on my acquaintance with the presented scientific works, their importance, and the scientific, scientific-applied, and applied contributions contained in them, I find it reasonable to propose Assoc. Prof. Milena Nikolova Mileva - Karova to occupy the academic position of "Professor" in the professional direction 5.3 "Communication and computer technology", study discipline "Basic programming".

Заличена информация  
по Регламент (ЕС)  
2016/679

Data: 09.06.2023г.

Reviewer  
/prof. V. Markova/