

**REVIEW**

**on a competition for occupation of the academic position “Professor”  
in professional field 4.6. Informatics and Computer Science,  
announced in State Gazette No. 41 of July 21, 2019  
by the Institute of Information and Communication Technologies – BAS,  
Department of Mathematical Methods for Sensor Data Processing**

This review is prepared by Prof. Dr. Maria Nisheva-Pavlova from Sofia University St. Kliment Ohridski as a member of the scientific jury for the competition according to Order No. 208/16.08.2019 of the Director of the Institute of Information and Communication Technologies (IICT) – BAS.

One applicant has submitted documents for participation in the announced competition: Dr. Petya Doicheva Koprinkova-Hristova, Associate Professor at IICT – BAS.

**1. General description of the materials presented**

The documents of the applicant comply with the requirements of the Act of the Development of the Academic Personnel of the Republic of Bulgaria (ADAPRB), the Rules for the Implementation of the Act of the Development of the Academic Personnel of the Republic of Bulgaria (RIADAPRB), the Rules for the conditions and the order for acquiring scientific degrees and for occupying academic positions in BAS and the Rules for the specific conditions for acquiring scientific degrees and for occupying academic positions in the Institute of Information and Communication Technologies.

The applicant has submitted for the competition:

- European CV,
- Copy of diploma for educational and scientific degree “Doctor”,
- Copy of certificate for occupation of the academic position “Associate Professor”,
- Certificate of internship in the speciality,
- Lists and copies of 46 scientific publications in journals and conference proceedings that are referenced and indexed in worldwide databases with scientific information,

- Abstracts of the publications of Assoc. Prof. Dr. Petya Koprinkova-Hristova presented at the competition (in Bulgarian and in English),
- Reference for original scientific and applied scientific contributions,
- Lists of 163 citations of publications of Assoc. Prof. Dr. Petya Koprinkova-Hristova in articles in Scopus and Web of Science,
- Documents proving participation in multiple (18 national and one international) projects, management of two national projects (with a total amount of BGN 128 938 earned), leadership of the Bulgarian team in three international projects,
- Copy of a published university textbook,
- Reference for the fulfillment of the minimum national requirements and the requirements of IICT – BAS for the professional field 4.6. Informatics and Computer Science,
- Declaration that there is no proven plagiarism in the scientific works of Assoc. Prof. Petya Koprinkova-Hristova.

The documents of the applicant have been prepared carefully and in full compliance with the requirements of the Rules for the specific conditions for acquiring scientific degrees and for occupying academic positions at IICT – BAS.

## **2. Details of the applicant**

The applicant Assoc. Prof. Dr. Petya Koprinkova-Hristova has a technical degree, completed in 1989 at the Technical University – Sofia. In 2001 she received a doctoral degree. Until 2012, she worked consecutively as a specialist, research associate and associate professor in various departments of BAS, and from 2012 until now holds an academic position of associate professor at the Institute of Information and Communication Technologies – BAS. She is a member of the Executive Committee of the European Neural Network Society and a member of the Technical Committee of IFAC CC 3 – Computers, Cognition and Communication.

## **3. General characteristics of the applicant's scientific work and achievements**

The research activities of Assoc. Prof. Dr. Petya Koprinkova-Hristova and the topics of her scientific works are entirely in the field of competition. The publications with which she

participates in the competition do not repeat those of the previous procedures for the acquisition of her doctoral degree and for the occupation of the academic position of associate professor.

Seven of the scientific papers submitted for participation in the competition are single-authored and the remaining 39 are co-authored. I have no doubt about the applicant's significant personal contribution to the collective publications.

There is no proven plagiarism in the scientific works of Assoc. Prof. Dr. Petya Koprinkova-Hristova.

In accordance with the requirements of the Rules for the specific conditions for acquiring scientific degrees and for occupying academic positions at IICT – BAS, the candidates for an the academic position of professor in professional field 4.6. Informatics and Computer Science must have: 50 points in group of indicators “A”, at least 100 points in group of indicators “B”, at least 260 points in group of indicators “Г”, at least 140 points in group of indicators “Д”, at least 150 points in group of indicators “E”.

Each of these conditions is stronger than the corresponding requirement under Art. 1a, para. 1 of the RIADAPRB.

According to the submitted documents the applicant covers:

- 50 points in group of indicators “A”,
- 302 points in group of indicators “B”,
- 606 points in group of indicators “Г”,
- 792 points in group of indicators “Д”,
- 422.44 points in group of indicators “E”.

Therefore, the minimum national requirements and the additional requirements under Art. 1a, para. 2 and para. 3 of the RIADAPRB for occupation of the academic position of “Professor” in the professional field 4.6. Informatics and Computer Science have been completely covered and exceeded by Assoc. Prof. Dr. Petya Koprinkova-Hristova.

#### 4. Substantive analysis of the scientific and applied scientific achievements of the applicant, presented in the materials for participation in the competition

The scientific papers, presented by Assoc. Prof. Petya Koprinkova-Hristova for participation in the competition, contain original research results, which can be grouped and summarized as follows:

- Group 1: *Heuristic dynamic programming using neural networks*. An approach is proposed to building dynamic recurrent neural networks with the so-called “echo” state (Echo State Networks, ESN) as components with specific roles in the structure of the Adaptive Critic Design (ACD) Method. Heuristic algorithms have been developed for training of certain types of elements in the ACD structure. ESN resilience is explored and an approach is proposed to improve the ESN resilience characteristics.
- Group 2: *Creation of spike timing neural (SNN) models for the purpose of simulation of human eye movements*. A model of the human vision system has been proposed and studied. Appropriate values of the parameters of this model are determined for the purpose of problem solving in recognition of orientation and direction of motion of objects with certain size.
- Group 3: *Neural networks, neuro-fuzzy approaches and their applications*. An original approach for solving optimization problems by the backpropagation through time method has been developed and successfully applied in various problem situations. A new hybrid architecture is proposed – a modification of an RBF neural network with intuitionistic fuzzy functions, designed to model nonlinear dependencies.
- Group 4: *Theory of fuzzy sets and its applications*. The influence of (1) the parameters defining the form of the functions of fuzzy value membership of the fuzzy controller linguistic variables, and (2) the parameters defining the fuzzy union operation in the form of a parameterized T-norm, on the properties of the system linear object – fuzzy logic controller is explored.
- Group 5: *Genetic algorithms and their applications*. The possibilities for application of genetic algorithms for identification of the parameters of technological object models are explored. Applications of genetic algorithms have been developed for identification of the parameters of fuzzy rule bases, defined in the form of a neural network, designed to solve fuzzy modeling problems.

In my opinion, the aforementioned results characterize the candidate Assoc. Prof. Dr. Petya Koprinkova-Hristova as a well-established scientist with significant achievements, which give reason to claim that she completely covers the concept of a leading researcher in the field of informatics.

The significance of the applicant's research results is evidenced by their reflection in the works of other authors. Dr. Petya Koprinkova-Hristova submitted data for a total of 132 citations of publications with which she participates in the competition, in articles of other authors that were referenced and indexed in Web of Science or Scopus.

#### **5. Critical notes and recommendations**

I have no significant critical comments on the materials in the competition and in particular on the scientific works of Assoc. Prof. Dr. Petya Koprinkova-Hristova. I am aware of the fact that serious research in the scientific field in which she works is generally a collective matter, but I recommend her to aspire in her future work to a larger number of single-authored publications, presenting results for which she has a key contribution. I also recommend that the candidate focus on working more actively with postgraduate and doctoral students, and in particular on supervision of doctoral students, so that she contributes to the preparation of the next generation of informatics researchers.

#### **6. Personal impressions of the applicant**

I have no immediate personal impression from the candidate other than our discussions regarding the excellent presentation by Assoc. Prof. Petya Koprinkova-Hristova at the 18th International Conference on Artificial Intelligence AIMSIA 2018.

#### **7. Conclusion on the application**

Having become acquainted with the materials and scientific works presented in the competition and on the basis of the analysis of their importance and the scientific and applied contributions contained therein, I **confirm** that the scientific achievements of the candidate Assoc. Prof. Dr. Petya Koprinkova-Hristova meet the requirements of the ADAPRB, the Regulations for its implementation and the corresponding BAS Regulations and IICT Rules for the occupation of the academic position of "Professor" in the professional field "Infor-

informatics and Computer Science". In particular, the applicant meets the minimum national requirements in the professional field and no plagiarism has been detected in her scientific papers submitted at the competition.

I give a **positive assessment** of the application of Assoc. Prof. Dr. Petya Koprinkova-Hristova.

#### **GENERAL CONCLUSION**

Based on the above, **I strongly recommend the scientific jury to vote on a proposal to the Scientific Council of the Institute of Information and Communication Technologies of the Bulgarian Academy of Sciences to select Assoc. Prof. Dr. Petya Doicheva Koprinkova-Hristova for the academic position of "Professor" in the professional field 4.6. Informatics and Computer Science.**

October 14, 2019

Reviewer: .....

**NOT FOR  
PUBLIC RELEASE**

(Prof. Dr. Maria Nisheva-Pavlova)