O P I N I O N

on the application of Assoc. Prof. Dr. Petia Koprinkova-Hristova to participate in the
competition to occupy the academic position of "Professor" in the professional field 4.6.
Informatics and Computer Science, topics Informatics
written by Assoc. Prof. Dr. Gennady Agre

1. Compliance with legal requirements

The competition is announced in the State Gazette no. 49 of 21.06.2019 for the needs of IICT-BAS, department "Mathematical Methods for Sensor Data Processing". The only candidate is Assoc. Prof. Dr. Petia Koprinkova-Hristova. As a member of the Scientific Jury, appointed by Order No 208/16.08.2019 of the Director of IICT-BAS, I received a complete set of documents meeting the requirements of Art. 61 and Art. 60 § 3 of the PPZRASRB for the occupation of the academic position "Professor". In accordance with the requirements of the Rules for the Specific Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at IICT-BAS, the candidates to be appointed to the academic position of "Professor" in the scientific field 4 and professional field 4.6 "Informatics and Computer Science" should have values of scientometric indicators exceeding the following minimum thresholds:

- 100 points for group of indicators B
- 260 points for group of indicators Г
- 140 points for group of indicators Д
- 150 points for group of indicators E.

Assoc. Prof. Petia Koprinkova-Hristova submits for the competition a certificate for the fulfillment of the minimum requirements of the ZRASRB and the "Rules for the Specific Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at IICT-BAS" with the following points:

- 302 points for group of indicators B
- 606 points for group of indicators Г
- 792 points for group of indicators Д
- 422.44 points for group of indicators E

I accept the points calculated by the applicant on all indicators without any remarks. They convincingly prove that the applicant not only does meet the formal requirements of the Rules, but also significantly exceeds them by all groups of indicators.

2. Brief CV of the applicant

Assoc. Prof. Koprinkova-Hristova completed her Master's Degree in Biotechnology at the Technical University of Sofia in 1989. In 2001 she defended her PhD thesis in the professional field 5.2 "Electronics, Electrical Engineering and Automation" on the topic "Training and sustainability of intelligent control systems with application to biotechnological processes", and in 2003 the Supreme Attestation Committee awarded her the academic title of "Senior Research Associate II degree" (equivalent to the modern "Associate Professor"). Since 2012, Dr. Koprinkova-Hristova has been working as an Associate Professor in the department "Mathematical Methods for Sensor Data Processing" of IICT-BAS. She has been

the leader of the Bulgarian team in 3 international research projects, the leader of 2 national scientific and educational projects, as well as a member of 18 national research and development projects. Assoc. Prof. Koprinkova-Hristova is a member of the editorial boards of 3 scientific journals; she is regularly invited to be a member of the Program Committees of prestigious scientific international conferences, as well as was the organizer of several editions of 2 renowned international conferences in the field of neural networks (ICANN) and intelligent systems (INISTA).

3. General description of the materials presented

In order to participate in the competition, Assoc. Prof. Petia Koprinkova-Hristova presented a total of 46 publications, which were neither presented in the previous habilitation for the position of "Associate Professor", nor for the acquisition of educational and scientific degree "Doctor of Philosophy". Among them, 6 publications are published in Impact factor journals (3 - in Q1, 1 - Q2, 1 - Q3 and 1 - Q4), 23 publications - in SJR-ranked journals or series, and 17 - in conferences proceedings indexed in Scopus or WoS. This is a very impressive scientific activity. The applicant also submitted 132 documented citations of her work in publications indexed in Scopus or WoS. All this speaks to a very good international recognition of the applicant.

In general, the scientometric indicators of Assoc. Prof. Koprinkova-Hristova are impressive: over 570 citations in Goggle Scholar with the corresponding h-index = 14; 81 her articles are indexed in Scopus and have a total of 153 citations (excluding self-citations) and her h-index = 7; 61 publications are indexed in the Web of Science with 136 citations (without self-citations) and her h-index = 9. All this proves that Petia Koprinkova-Hristova is an internationally recognized scientist in the field of informatics and computer science.

4. Applicant's scientific results and contributions

The results of the work of Assoc. Prof. Koprinkova-Hristova, obtained after her habilitation, can be summarized as belonging to the following sub-areas of informatics: neural networks, genetic algorithms, fuzzy set theory, and mathematical modeling (of the human visual system and of biotechnological processes). In my opinion, the most important results as well as scientific and applied contributions in these fields may be summarized as follows:

- *In the field of neural networks:* 1) An approach has been developed to apply the Adaptive Critic Design method for training Echo State neural networks; 2) Two algorithms for training Echo State neural networks by means of the reinforcement learning method are developed; 3) It has been developed an approach for solving optimization problems by the method of backpropagation of the target function over time, which is applied to determine the optimal parameters of the membership functions and the union operation.
- *In the field of genetic algorithms:* 1) The potential of genetic algorithms and fuzzy control systems for controlling nonlinear biotechnological processes have been explored; 2) The possibility of application of genetic algorithms for the purpose of identification of the parameters of models of technological objects in the oil-processing industry has been investigated.
- *In the field of fuzzy set theory:* 1) It has been investigated the influence of the parameters defining the form of the functions of the fuzzy values of the linguistic variables of the fuzzy controller, as well as of the parameters defining the fuzzy

unification operation on the properties of the closed system for linear object control - fuzzy controller; 2) A fuzzy set of rules for combining measurements of two types of sensors - gyroscopes and accelerometers - into a micro-electro-mechanical sensor has been proposed.

- *In the field of mathematical modeling:* 1) A spike timing neural model of the human visual system has been developed that includes the main stages of processing visual information and making decisions based on perception; 2) Identification of models of biotechnological processes of alcoholic fermentation and production of lactic acid fermentation has been proposed.

In most cases applicants' achievements are presented in scientific papers co-authored with a number of experts from the relevant scientific fields. I agree that the results described in the publications presented for the competition have been achieved with the equal participation of the authors of the respective works. The co-authorship does not diminish the importance of the achievements of Assoc. Prof. Koprinkova-Hristova, but rather emphasizes her position as a scientist with internationally recognized expertise in informatics and computer science. The large number of citations from a variety of international sources is the evidence of the importance and relevance of her contributions described above.

5. Conclusion

From all the documents presented for the competition and the facts stated above, it is evident that the applicant fully satisfies all the necessary requirements of the ZRASRB, PPZRASRB and "Rules for the specific conditions for acquiring scientific degrees and for occupying academic positions at IICT-BAS". The publications and the scientific and applied contributions of Assoc. Prof. Koprinkova-Hristova convincingly prove that she is one of the leading scientists in a number of advanced sub-fields of informatics and can successfully participate and lead national and international scientific projects - the qualities that are inherent for a professor at IICT-BAS. That is why, **my conclusion about the appointment to the academic position "Professor" announced by the competition by Assoc. Prof. Dr. Petya Koprinkova is POSITIVE and I firmly propose to the members of the Scientific Jury to vote unanimously for the election of Assoc. Prof. Petia Koprinkova-Hristova as a Full Professor in professional field 4.6. "Informatics and Computer Science", topics "Informatics" for the department "Mathematical Methods for Sensor Data Processing" at IICT-BAS.**

10 October 2019 г.   Member of the Scientific Jury:

                                     Assoc. Prof. Dr. Gennady Agre

3