SHORT REVIEW

on a competition for occupation of the academic position "Associate Professor"

in professional field 4.6. Informatics and Computer Science (Neural Network Architectures),

announced in State Gazette No. 69 of August 11, 2023

by the Institute of Mathematics and Informatics – BAS

This short review is prepared by Prof. Dr. Maria Nisheva-Pavlova as a member of the scientific jury for the competition according to Order No. 468/10.10.2023 of the Director of the Institute of Mathematics and Informatics (IMI) – BAS.

One applicant has submitted documents for participation in the announced competition: Dr. Galina Dimitrova Momcheva.

1. General description of the materials presented

The applicant has submitted for the competition:

- European CV,
- Copy of higher education diploma,
- Copy of diploma for educational and scientific degree "Doctor",
- List of all publications of the applicant,
- List of scientific publications for participation in the competition,
- Reference for original scientific and applied scientific contributions,
- Abstracts of the publications of Dr. Galina Momcheva presented at the competition (in Bulgarian and in English),
- Copies of the scientific publications for participation in the competition,
- Lists of citations of publications of the applicant,
- Reference for the fulfillment of the minimum national requirements and the requirements of IMI – BAS for the professional field 4.6. Informatics and Computer Science,
- Certificate of internship in the speciality,
- Declaration that there is no proven plagiarism in the scientific works of Dr. Galina Momcheva,
- Other documents at the discretion of the applicant: references for educational and teaching activities, participation in research projects, etc.

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

2. Details of the applicant

The applicant Dr. Galina Momcheva has a higher education in Mathematics and Informatics, completed in 1993 at the Konstantin Preslavsky University of Shumen. In 2011 she received a doctoral degree. She worked as a teacher of informatics and information technologies; supervisor of informatics competitors; lecturer and associate professor of computer science at Varna Free University "Chernorizets Hrabar" (VFU). He is currently a mathematician at IMI - BAS.

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

The research activities of Assoc. Dr. Galina Momcheva and the topics of her scientific works are mainly 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 occupying the academic position of associate professor at VFU.

The monograph submitted for participation in the competition is single-authored, and all presented scientific papers (15 in total) are co-authored. I assume that the personal contribution of the applicant in the collective publications is equal to that of each of the other co-authors.

There is no proven plagiarism in the scientific works of Dr. Galina Momcheva.

In accordance with the requirements of the Rules for the specific conditions for acquiring scientific degrees and for occupying academic positions at IMI – BAS, the candidates for an academic position of associate 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 220 points in group of indicators "Г", at least 70 points in group of indicators "Д", at least 20 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 and supporting materials, the applicant covers:
- 50 points in group of indicators "A",
- 100 points in group of indicators "B",
- 266 points in group of indicators "Г",
- 111 points in group of indicators "Д",
- at least 83 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 associate professor in the professional field 4.6. Informatics and Computer Science have been completely covered by Dr. Galina Momcheva.

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

The monograph and the scientific papers, presented by Dr. Galina Momcheva for participation in the competition, contain original research results, which can be grouped and summarized as follows:

- Group 1: *Image processing and generation and computer vision*. An approach for the application and adaptation of texture analysis methods for objectifying the staining of microscopic preparations by the *in situ* hybridization method is proposed. Specialized image classification and evaluation methods have been developed. A deep learning process is proposed to detect and classify regions of microscopic images with similar gene expression levels. A method is proposed for generating defective images suitable for training purposes of specific neural networks.

- Group 2: *Artificial neural networks*. A methodology for the development of new architectures of neural networks, applicable in solving tasks from a certain subject area, is proposed. An extension of the standard U-Net model is proposed, with the help of which the quality of biomedical image segmentation can be improved. New models of neural networks with dendritic computations have been developed.

- Group 3: *Automation of business processes*. A methodology for studying biological processes using techniques from the field of process mining is proposed.

5. Critical notes and recommendations

Some of the documents of Dr. Galina Momcheva for participation in the competition are prepared insufficiently precisely and are structured in an inappropriate way.

I recommend that Dr. Momcheva in the future strives more towards single-authored publication of research results, in obtaining which she has a leading contribution, as well as to focus more actively on working with PhD students.

6. Personal impressions of the applicant

I have no immediate personal impression from the applicant.

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 Dr. Galina Momcheva meet the requirements of the ADAPRB, the Regulations for its implementation and the corresponding BAS Regulations and IMI Rules for the occupation of the academic position of an associate professor in the professional field "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 Dr. Galina Momcheva.

GENERAL CONCLUSION

Based on the above, **I recommend the scientific jury to vote on a proposal to the Scientific Council of the Institute of Mathematics and Informatics of the Bulgarian Academy of Sciences to select Dr. Galina Dimitrova Momcheva for the academic position of "Associate Professor" in the professional field 4.6. Informatics and Computer Science (Neural Network Architectures).**

December 4, 2023   Reviewer: ....

                                                              (Prof. Dr. Maria Nisheva-Pavlova)