REPORT

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

in the professional field 4.6 Informatics and Computer Science,

specialty Informatics (Neural Network Architectures)

for the needs of the Institute of Mathematics and Informatics,

Bulgarian Academy of Sciences,

announced in the State Gazette, № 69/11.08.2023

by Prof. Dr. Kalinka Kaloyanova

Institute of Mathematics and Informatics - BAS

I am presenting this report as a member of the Scientific jury in the above-mentioned competition, based on the order № 468/10.10.2023 (updated by № 478/12.10.2023) of the Director of the Institute of Mathematics and Informatics (IMI) - BAS, which is based on the decision of the Scientific Council of IMI (Protokol №9/29.09.2023).

The only applicant who has submitted documents for the competition is Galina Dimitrova Momcheva, Ph.D.

As a member of the jury, I have received the following documents:

- Application for participation in the competition
- Professional autobiography
- Copy of diploma for higher education
- Copy of diploma for educational and scientific degree "Doctor"
- List of all publications
- List of publications presented at the competition
- Reference for original scientific contributions
- Abstracts of the publications for participation in the competition in Bulgarian and English
- Copies of publications presented at the competition
- List of citations of publications of the applicant
- List of citations presented at the competition
- State Gazette, № 69/11.08.2023
- Certificates of internship in the specialty
- Reference for the degree of fulfillment of the minimal national requirements - Application 2.2

- Declaration that the submitted publications, citations, and other materials have not been used for other procedures
- Declaration for agreement for storage and processing of personal data
- Additional documents - books, information about participation in projects, certificates for awards.

Short biographical data

Galina Momcheva graduated from Konstantin Preslavsky University of Shumen, in 1993 (Mathematics and Infromatics). In 2010 she defended a Ph.D. thesis on the topic "Heuristic schemes for solving tasks in the discipline "Algorithms and data structures" in university courses". She has held various positions as a teacher and lecturer at Varna Free University "Chernorizets Hrabar", where she headed the "Computer Science" department in the period 2013-2022. Dr. Momcheva also participates in the management of several organizations such as ICT Cluster Varna (2016-2021), BioMed-Varna Foundation, etc.

General presentation of the materials, submitted for the competition

According to the presented list of publications and Application 2.2, Galina Momcheva applies to the current competition for the academic position "Associate Professor" with a monography, a book, a chapter of a book, as well as with 15 publications: 2 papers in journals with impact factor (in quartile Q2 and quartile Q3), 13 papers indexed in Web of Science and/or Scopus, seven papers of them - with SJR.

All publications are coauthored. I accept as equal the participation of the applicant in all papers in which she is a co-author.

The publications are not used for other procedures.

The total number of publications with IF or SJR submitted for the competition is nine, which meets the specific requirements of Art. 3 (1) of the Rules on the Terms and Requirements for Acquisition of Academic Degrees and Occupation of Academic Positions of IMI-BAS.

Nineteen citations are listed in the citation report submitted by the candidate for the competition, eighteen of which are visible in Scopus & Web of Science.

G. Momcheva has participated in three international scientific projects and one project funded by the National Scientific Fund (Ministry of Education and Science of Bulgaria).

A brief analysis of the scientific and scientific-applied achievements of the applicant based on the documents presented for the competition

The research activities of the applicant present results in a new and emerging field. Significant results have been achieved in several directions.

The main results in the monograph "Artificial Neural Networks: Modelling, Engineering, and Design Architectures. Models. Approaches. Methods. Perspectives" are related to proposing approaches/techniques for designing the architecture of neural networks, mainly based on using the Fuzzy and Dendritic approach. These issues are also discussed in some of the papers presented for the competition.

A group of results is related to the classification and evaluation of microscopic images. The data analysis is performed using ANN – Deep Learning Autoencoders, and the performance of the model is optimized by balancing and tuning the parameters (papers [6], [7], [15]).

Here we can add the results of creating a method for generating defective grayscale images to be used for training neural networks in the case of microscopic scans (paper [12]).

Paper [13] explores video-related issues during TV transmission. A new method for visual fault/error detection and repair is offered based on a high-performing approach for automatically identifying various defects in any input video and automatically replacing the corrupted video or video segment.

Among the publications presented in the competition, several are related to improving the quality of biomedical image segmentation by extending the standard U-Net model and using Fuzzy Layers (papers [1], [2]).

Two models for the operation of the dendritic neuron in neural networks are presented in the paper [14]. A comparison is made with the perceptron model.

Paper [3] presents an adaptation and application of the FedMD framework to natural language processing. In the publication [4], several different text encoding techniques are presented in order to facilitate the regression analysis.

Paper [9] demonstrates how process mining can be applied to a particular study of biological processes by transforming information about a sequence of biological events into a register of events.

Several papers, as well as books present applications of the studied researched problems in education [8], 10]. For example, paper [8] presents an integrated approach for exploring both the skills of understanding the text of the task and the source code of the program among students in the 8th grade studying Informatics in Bulgarian schools with a specific profile.

Part of the results were obtained in research projects in which Dr. Momcheva participated.

It can be concluded from the submitted documents and declarations that: a) the scientific publications meet the minimal national requirements (the Act on Development of the Academic Staff in the Republic of Bulgaria) as well as the additional requirements given in the Rules for the conditions and regulations for acquiring scientific degrees and occupying academic positions in the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences, for occupying the academic position "Associate

Professor" in the professional field of the competition and for several indicators they exceed them.

Personal opinion about the candidate

I know Galina Momcheva from events related to Oracle's academic initiative and I have positive impressions on her activities in this field.

Critical remarks and recommendations

I recommend Galina Momcheva to aspire to single-authored publications in the future, too.

Conclusion

In conclusion, the documents and materials presented by Dr. Galina Dimitrova Momcheva declare results that meet all requirements for the academic position of "Associate Professor" of the Act on the Development of the Academic Staff in the Republic of Bulgaria, the Rules for its implementation, as well as of the Rules on the Terms and Requirements for Acquisition of Academic Degrees and Occupation of Academic Positions of IMI-BAS in the scientific field 4. Natural Sciences, Mathematics and Informatics, professional field 4.6. Informatics and Computer Sciences.

Therefore, I give a positive evaluation of the materials presented by Dr. Momcheva in the competition for the academic position of "Associate Professor" at IMI-BAS. I recommend to the members of the Scientific Jury to propose to the Scientific Council of the Institute of Mathematics and Informatics – BAS to select Dr. Galina Dimitrova Momcheva for the academic position of "Associate Professor" in the professional field 4.6 Informatics and Computer Science.

December 8, 2023   Member of the Scientific jury:
Sofia, Bulgaria   /Prof. Dr. K. Kaloyanova)