R E V I E W

on the competition for the academic position of

"Professor"

in the scientific field: 4. Natural Sciences, Mathematics and Informatics,

professional field: 4.6. Informatics and Computer Science,

scientific specialty: Software Technologies (Information Retrieval from Data),

for the needs of Faculty of Mathematics and Informatics (FMI),

Sofia University "St. Kliment Ohridski "(SU),

announced in State Gazette (SG) no. 52 (02/07/2019) and on the web sites of FMI and SU

This review has been prepared by Prof. Boyan Paskalev Bontchev, PhD – Department of Software Technologies, Faculty of Mathematics and Informatics (FMI) at Sofia University "St. Kliment Ohridski" (SU), as a member of the scientific jury for the competition according to Order No. RD 38-525 / 28/08/2019 of the Rector of the Sofia University "St. Kliment Ohridski".

For participation in the announced competition, documents were submitted by **only one** candidate, namely Professor Olga Ilieva Georgieva, PhD – Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski ".

I. GENERAL DESCRIPTION OF THE PROCEDURE AND SUBMITTED DOCUMENTS

1. Details of the procedure and documents

The documents submitted by the candidate in accordance with the competition comply with the requirements of the Act for the Development of the Academic Personnel of Republic of Bulgaria (ADAPRB), the Rules for Implementation of the Act for the Development of the Academic Personnel of Republic of Bulgaria (RIADAPRB) and the Rules on the Terms and Conditions for Acquisition of Academic Degrees and Occupation of Academic Positions at Sofia University "St. Kliment Ohridski " (RTCAADOAP).

For participatation in the competition, the candidate Assoc. Prof. Olga Georgieva has submitted a list of documents, including curriculum vitae, a diploma for higher education and its annex, a diploma for educational and scientific degree "Doctor", a document for the scientific title "Associate Professor", certificate of seniority in the specialty, documents proving the fulfillment of the requirements of Art. 115, para. 1, item 2 (employment contract of 1.10.2008 and additional agreement to the employment contract of 21.03.2019); a list of all publications and a list of publications submitted for participation in the competition; a list of publications, conferences, projects and scientific guides generated by the system "The Authors" at SU; reference on a template for implementation of the minimal national requirements; reference for citations, reference for the original scientific contributions, to which the relevant evidence is attached; reference for the indicators under Art. 122, Par. 2 with appropriate evidence; scientific papers submitted for participation in the competition, structured and numbered according to the list under Item 10b; abstracts of the peer-reviewed publications in Bulgarian and English, and a copy of the announcement in the State Gazette. The scientific papers submitted for participation in the competition are structured and numbered according to the list under item 10b. 21 publications were presented to the competiion, which include: two articles in scholar volumes, 6 articles in peer-reviewed scientific journals, and 13 publications in conference proceedings. For 20 of them, proofs of referencing in Scopus are presented; for 8 of them – proofs of referencing in Web of Science; and one publication is referenced in MathSciNet. Evidence of the existence of a Journal Impact Factor (Journal Citation Report) or SCImago Journal Rank (SJR) of certain publications is provided in a document with

the name of the respective publication. In addition, the candidate provided a list of all her publications (80), whereupon for 42 of them there is provided evidence of their referral to Scopus, and for 23 of them – evidence for referral in Web of Science.

The candidate has presented a number of documents proving her pedagogical and research activities since 2008. A summary of the indicators under Art. 122, Par. 2 with appropriate evidence of teaching and research. There are official certificates for participation in 17 research projects, 4 of them have European funding (SISTER, COST, EUROWEB and GATE), 7 ot them are national and the other 6 projects are funded by the Science Research Fund (SRF) at Sofia University "St. Kl. Ohridski". Associate Prof. Georgieva is the leader of 5 of the projects funded by the SRF at Sofia University. As well, certificates for her participation in 11 international and national scientific forums are presented. There are provided Web addresses of 16 program and organizational committees of scientific conferences in Bulgaria and abroad, in which the applicant has participated since 2012. As well, testimony for leading sessions at two scientific conferences is presented. An official note certifies the membership of the candidate at the Union of Automation and Informatics "John Atanassov". Other documents testify to the intensive pedagogical activity of the applicant, known well by the reviewer thanks to working together with the applicant at the same department at FMI-SU. A certificate for courses delivered on *Models of software Systems* and *Fuzzy sets and applications* under ERASMUS at FMI-SU is presented, as well as for a lecture on *Soft Computing Methods and Applications* at University of Aveiro, Portugal.

2. Short presentation of the applicant

Assoc. Prof. Olga Georgieva graduated as an automation engineer at Technical University - Sofia in 1986. After completing her postgraduate specialization in Applied Mathematics at the same higher education institution, she is enrolled as a doctoral student at the Central Laboratory for Biological Instrumentation and Automatics at BAS. In 1995 she defends her doctoral thesis in the field of production automation at the Institute of Management and Systems Research at BAS, and continues working at in the same organization for the period from 1994 to 2008. She runs there as engineer (since 1994), Research Associate 2nd degree (since 1995), Research Associate 1st degree, and Senior Research Associate 2nd degree. During this period she was a postdoctoral fellow at the Technical University-Hamburg, Germany (3 months), at the University of Applied Sciences-Zitau, Germany (8 months in total), and at the University of Ghent, Belgium (5 months). At the same time, she has worked as a part-time lecturer at the FMI of the Sofia University and at the Faculty of Computer Systems and Control at the Technical University-Sofia, as well as a visiting Professor at the University of Applied Sciences of Braunschweig/Wolfenbüttel, Germany. She has made scientific visits to La Sapienza University in Rome and the University of Applied Sciences of Braunschweig/Wolfenbüttel, Germany, as well as teaching mobility under the Erasmus program at the University of Aveiro, Portugal. Since 2008, she is Assoc. Professor in Informatics (Software Technologies) at the Department of Software Technologies of FMI at Sofia University "St. Kliment Ohridski ". Since 2014 until present, she is head of the Department. She has been a member of various professional organizations, such as the Knowledge-Based Systems Group, European Operational Research Societies – Working Group on Fuzzy Sets (EUSFLAT), the Bulgarian National Association for Water Quality, and the Union of Automation and Informatics, where she is currently a member. Since 2008, she is a reviewer and a member of the program committees of 15 international scientific conferences. Since 2010 until present, she has written reviews of articles for renowned international scientific journals, such as Applied Soft Computing (Springer), Information Fusion Journal (Springer), Evolving Systems (Springer), WIREs Data Mining and Knowledge Discovery (Wiley), and IEEE Transactions on Fuzzy Systems (Thomson Reuters).

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

For the competition, the applicant has submitted 21 original research papers from a list of her 80 scientific publications in total. The 21 publications presented here are in specialized scientific publications in the field of the competition and do not repeat the competitions presented in the previous for the candidate for the acquisition of the

educational and scientific degree "Doctor" and for the occupation of the academic position "Associate Professor". All publications are in the scientific field of the announced competition, namely information retrieval from data. They prove convincingly significant scientific and applied contributions of the applicant in three topics:

1. Cluster data analysis – new approaches are proposed for clustering real-time data structures, for detecting significant clusters of noise data, and for identifying conditions in humans by analyzing brain activity data through analysis of EEG data;
2. Software quality assessment – here, new approaches to selecting a software service based on quality features and a model for evaluating software reliability are proposed;
3. Practical application of regression and neural models – a neural model for determining the values of electricity consumption, a regression model for recognition of loss of attention, and a model for recognizing playing style in educational games by linear regression are developed.

From the verification of the report on the fulfillment of the minimum national requirements under Art. 2b of the ADAPRB for the scientific field: 4. Natural Sciences, Mathematics and Informatics, professional field 4.6. Informatics and Computer Science, it becomes clear that the points for group of indicators A are 50 (at least 50), for group B – 222 (at least 100), for group D – 426 (at least 200), for group D – 1888 (at least 100), and for group E – 270 (at least 150). The total score for all indicators is **2856** whereupon the required minimal total score is **600**, which exceeds the minimum score of **4.76** times. Hence, in a motivated and determined way, the reviewer declares that:

a) the scientific works comply with the minimum national requirements (under Article 2b, Paragraphs 2 and 3 of ADAPRB) and respectively with the additional requirements of the Sofia University "St. Kliment Ohridski for occupying the academic position of "Professor "in the scientific field and professional direction of the competition and, in addition, they significantly exceed them;

b) the scientific papers submitted by the applicant do not repeat those of previous procedures for the acquisition of a scientific title and an academic position;

c) there is no proven plagiarism in the scientific works presented at the competition.

4. Description and evaluation of the candidate`s teaching experience

For the period 1996-2008, Dr. Olga Georgieva has been a part-time lecturer at FMI of Sofia University (where she has given lecture on software systems models) and at the Faculty of Computer Systems and Control of Technical University of Sofia (where she has conducted laboratory work on the analysis and synthesis of logic circuits and the basics of computer technology). She has been also a visiting Professor at the University of Applied Sciences of Braunschweig/Wolfenbüttel, Germany. In addition, he has delivered lectures on fuzzy logic, modeling and management theory at a number of universities abroad as a guest lecturer - at the Technical University-Hamburg, Germany, at the University of Applied Sciences-Zitau, Germany, at the University of Ghent, Belgium, and at the University of Aveiro, Portugal.

Since 2008 until present, she runs an associate Professor at the Department of Software Technologies of FMI at Sofia University "St. Kliment Ohridski ", where she has a very intensive teaching activity having various lecture courses in both Bachelor's and Master's programs at the Faculty:

- *Software Systems Models* (lectures and exercises) – a compulsory course in Master's Program in Software Technology
- *Fuzzy sets and applications* (lectures and exercises) - elective courses in masters programs in Artificial Intelligence and in Information Retrieval and Knowledge Discovery
- *Software Requirements Analysis* (lectures and part of the exercises) – a compulsory course in Bachelor's Program in Software Engineering
- *Professional Ethics* (lectures and exercises) - elective courses in the Master Programs in Software Technology and in Information Extraction and Knowledge Discovery

The course materials for the lectures and exercises of the first three of the above disciplines have been developed by the applicant and are published in electronic format in the MOODLE system at FMI. In addition, in the scope of a national project in 2010, the applicant participates in a creation of study materials with a chapter on intelligent computational methods. At the same time, the first two of the above courses were presented by the applicant in English to foreign students in the framework of FMI participation in international educational projects with universities abroad, under the names *Models of software Systems* (under EURECA, EUROWEB and ERASMUS projects) and *Fuzzy sets and applications* (under ERASMUS project).

For the period 2010-2019, Assoc. Prof. Olga Georgieva successfully managed 10 graduates as a supervisor of their Master's Degrees theses. As a reviewer of some of these MSc theses, I would like to point out that they were held at a very high academic level. The candidate was also an academic student mentor for the Student Practices project. On the other hand, Assoc. Prof. Georgieva is a scientific supervisor of PhD students at the Dep. of Software Technologies at FMI. Under her supervision, in 2017 Sergei Milanov successfully defended his dissertation on "Extracting dependencies in data flows". Another doctoral student of her finished with right to defend her PhD thesis, and a third doctoral student of her continues working on the topic of "Automated Decision-Making Methods for Large Data Sets". Five publications from the publications submitted for the competition, as well as 8 other publications from the total list of publications (13 publications in total), represent a joint research work with the participation of PhD students and graduates of FMI. At the same time, PhD students and graduates have participated in 5 scientific projects led by the applicant.

5. Detailed analysis of the scientific and applied achievements of the candidate contained in the materials submitted for participation in the competition

For participation in the competition, the applicant has submitted 21 scientific publications, of which two articles are in editorial volumes - one in IEEE Press Series on Computer Intelligence (John Wiley & Sons) and one in Studies in Fuzziness and Soft Computing (Springer), 6 articles in international scientific scholar journals, and 13 publications in conference proceedings. Presented works contain scientific and applied contributions that can be summarized in three main areas:

A. Cluster data analysis:

- A new approach is proposed for qualification the real-time data structure that identifies it in real time when the data is received in a stream, by means of an online GK-like clustering algorithm [works B1, B2, B9 and B10]
- A new non-iterative data clustering method is proposed that detects significant clusters of data with noise [works B3 and B21], which is a heuristic non-iterative clustering method that detects significant clusters and separates noise data
- An new approach has been proposed for recognizing conditions in humans by analyzing brain activity data by EEG data analysis [works B4, B5, B11 and B13], with a filter method chosen to reduce the data space, over which they are applied six known efficient clustering algorithms

B. In the area of software quality assessment:

- A new approach for selecting a software service is proposed, based on the comparison of a summary quality assessment of software services providing the same functionality [works B18 and B20]
- A method of selecting a software service based on specific quality characteristics of the service is proposed, which takes into account the inaccuracy in the quality of service information [works B7, B14, B15, B16 and B17], which combines different types of uncertainty about existing service information
- A fuzzy linguistic model for evaluating software reliability using fuzzy set theory and logic has been developed [work B12]

C. In the field of practical application of regression and neural models:

- A neural model has been developed to determine the electric energy consumption values of an electric arc furnace depending on the chemical composition of the charged mixture, which can describe 91% of the variations in specific electricity consumption [work B6]
- A regression model for recognition of loss of attention has been developed that applies a regression approach for detecting variable levels of attention based on spatio-temporal data extracted from EEG records [work B19]
- A model was developed to recognize playing style in educational games by a linear regression, using performance metrics for performance of game tasks [work B8]

For 20 of the research papers submitted in the competition, proofs of referencing in Scopus were submitted, and for 8 of them, there are provided references in Web of Science (at the moment, they are already 11). One publication is proven to be referenced in MathSciNet. In addition to the high number of refereed publications, the impact factor of the journals where the applicant publishes is rather high – two of the journals fall in quartile Q1, and other two journmals – in Q2. The total impact factor of the journals in the list of publications amounts to 13.636, and the total IF for the publications submitted for the competition is equal to 2.373. Five of the publications in the list were authored individually, and for the remaining 16 publications the candidate is first co-author in 9 publications, second co-author in 5, third co-author in one, and fourth co-author in one publication. The large number of independent publications in prestigious editions proves the substantial contribution of the candidate to the research work as a whole. All submitted publications are in English. Two of the articles in conference proceedings have been awarded awards of Best Conference Paper (CompSysTech'2009 and IEEE 8th International Conference on Intelligent Systems'2016). In addition, the candidate submitted a list of all her publications (80 in total), whereupon for 42 of them there is provided evidence of their referral in Scopus (currently they are 43), and for 23 of them – evidence of their referral in Web of Science (currently they are 29).

There is evidence of a candidate's results in the works of other authors. Submitted publications have been cited 75 times (excluding auto-citations and hidden citations). The number of citations in all publications is 236. These citations form the h-index of the candidate in Google Scholar and in Scopus, which is equal to 8, and Google Scholar i10-index, equal to 7.

6. Critical notes and recommendations

I have no significant critical comments on the works presented to the competition. All publications are at excellent methodological level and contain many in-depth analyzes of the current state of the art in the relevant scientific field, statement of the problem, accuracy and completeness of the proposed solutions and analysis of the results obtained, as well as adequate summaries and directions for future work. In all the published publications, the applicant shows a high level of professionalism and excellent literary knowledge.

However, I would like to note a discrepancy between the actual number of articles of the applicant refereed in Scopus and Web of Science, and the number of evidences for referencing in the same databases provided by the applicant for all the publications (80 in total). For 42 of the list of all publications, the candidate submitted evidence for referencing in Scopus, and for 23 publications of the same list – evidence for referencing in Web of Science. An up-to-date check done by the reviwer showed that her references in Scopus are already 43 (the BCI'2019 conference article now is included) and her references in Web of Science are 29 (instead of 23). On the other hand, for 8 of the publications submitted to the competition, there was presented evidence of referencing in Web of Science, while the check shows 11 refereed author's publications. The reason for these discrepancies is the continuous updating of information in both the Scopus and Web of Science databases. In addition, it should be emphasized that the new numbers of refereed articles are higher than those presented to the competition, which is of obvious benefit to the applicant.

7. Personal impression of the applicant

I know Olga Georgieva for over 12 years, and I can definitely say that she is a very thorough researcher, a highly valued teacher, a very good organizer, and a principled and correct colleague. I got a great impression of our collaborative work on the science projects we worked on together. It is very indicative that the submitted documents for the competition **exceed several times** the minimum national requirements set by Art. 2b of ADAPRB in the relevant scientific area and professional field. From the list of all her scientific works, it can be seen that she could submit more publications on the competition that would increase this difference.

In addition, I would like to point out that, as Head of the Department of Software Technologies, Assoc. Prof. Georgieva has emerged as an established leader and coordinator of activities in the scientific unit. All annual scientific seminars of the department are organized by her. In addition to completing her academic work, she finds time to participate in research projects, to lead sections at numerous international scientific conferences and to participate in their program committees, to provide expertise in international and national bodies and organizations, and to review articles in world-renowned magazines. In recent years, she has been a peer reviewer of two scientific books and of articles in the scientific journals Applied Soft Computing (Elsevier), Information Fusion Journal (Elsevier), Evolving Systems (Springer), and IEEE Transactions on Fuzzy Systems (Thomson Reuters). I am convinced that FMI at SU earns a lot from such colleagues who do not spare themselves time and effort for raising the organization to an even higher academic and scientific level.

8. Conclusion on the application

Having become acquainted with the documents and scientific papers presented in the competition and on the basis of the analysis of their importance and the scientific and applied contributions contained therein, I **do confirm** that the scientific achievements meet the requirements of the ADAPRB, its Implementing Regulations and the relevant Rules of the Sofia University "St. Kliment Ohridski" for the occupation of the candidate in the academic position "Professor" in the scientific area and the professional field of the competition. In particular, the applicant meets the minimal national requirements in the professional field, exceeding them several times. No plagiarism has been detected in the scientific papers submitted for the competition.

I give definitively my **positive** evaluation to the application.

II. GENERAL CONCLUSION

On the basis of the above said, I am convinced to strongly **recommend** to the distinguished scientific jury of the competition to propose to the Faculty Council of the Faculty of Mathematics and Informatics at Sofia University "St. Kliment Ohridski" to select Assoc. Prof. Olga Georgieva, PhD, for the occupation of the academic position "Professor" in professional field: 4.6. Informatics and Computer Science, scientific specialty Software Technologies (Information Retrieval from Data).

27.10.2019 г.   Signature: ....

Sofia   (Prof. Boyan Bontchev, PhD)