R E V I E W

on the materials

submitted for participation in the selection process

for the academic position "Professor"

In the field of higher education:	4. Natural sciences, mathematics and informatics
Professional field:	4.6. Informatics and computer science
Scientific specialty:	Informatics (Modern technologies for preservation, accessibility and protection of scientific and cultural heritage)
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For the needs of:	Institute of Mathematics and Informatics (IMI) Software Technologies and Information Systems Section

The review was prepared by:

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/ scientific degree, name, surname, and family /   / academic position /

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/ University, scientific organization /

in the capacity of a member of the scientific jury by selection process, according to Order #11 / 29.01.2021 of the Director of IMI.

There is only one candidate in the selection process:

Assoc. Prof. Dr. Galina Todorova Bogdanova, IMI-BAS

(academic position, scientific degree, name, surname, surname, scientific organization)

1. Details for the candidate

Galina Bogdanova graduated from VMEI "Lenin" in 1980, majoring in Heat and Nuclear Energy. In 1981 she completed a one-year postgraduate specialization in Applied Mathematics.

From 1981 to 1988 she worked as a programmer in the Territorial Information and Computing Center in Veliko Tarnovo. Since 1989 she is at the Institute of Mathematics and Informatics of the Bulgarian Academy of Sciences, subsequently as a mathematician, a researcher, a senior researcher, an associate professor.

In 2000 she received the educational and scientific degree "Doctor".

2. General presentation of materials for the selection process. Compliance with minimum requirements.

It can be seen from the presented materials that the candidate Assoc. Prof. Dr. Galina Todorova Bogdanova meets the requirements of the Regulations on the terms and conditions for obtaining scientific degrees and for holding the academic position at IMI-BAS.

The following table presents the minimum requirements for the groups of indicators for the academic position of "Professor" at IMI in scientific field 4. Mathematics and Informatics and the correspondence with the points of the candidate.

Group of indicators	Minimum number of points	Number of points of the candidate
A	50	50
V	100	100
G	220	324
D	140	222
E	150	460

The candidate has acquired the scientific degree "Doctor" – she defended a dissertation "Bounds for optimal codes" (Diploma #26752 / 26.06.2000, issued by the Higher Attestation Commission).

The requirements of the indicators from group V are covered by 5 publications in journals indexed in Scopus, as journals with SJR. The publications were made in the period 2018-2020.

Eleven of the publications that meet the requirements of the indicators of group G are in editions indexed in Scopus or Web of Science – 132 points, four are publications with impact rank (SJR) – 80 points, two of the publications have IF (Q2 and Q3) – 70 points, one publication is indexed in MathSciNet – 12 points. Two published book chapters carry additional 30 points.

To cover the requirements for indicator D, data from Scopus have been applied: 4 publications cited a total of 37 times in editions indexed in Scopus, which give 222 points, with a minimum requirement of 140 points.

In the group of indicators E, Assoc. Prof. Bogdanova has four successfully defended doctoral students, for which 200 points are added, which exceed the required minimum of 150 points. In

addition, from the participation in 10 national projects (100 points) and 3 international projects (60 points) and the leadership of 5 national projects (100 points) another 260 points are added to this group of indicators.

The specific requirements for Art. 3 of the Regulations for the conditions and the order for acquiring scientific degrees and for holding academic positions in IMI-BAS are also fulfilled, as the candidate has 11 publications in editions with IF or SJR.

In this way, the criteria of IMI-BAS are covered and exceeded on some of the indicators. The minimum national requirements according to the Regulations for implementation of the Law on the Establishment of Academic Staff in the Republic of Bulgaria for Professional Field 4.6 "Informatics and Computer Science" are fully met, too.

3. General characteristics of the scientific works and achievements of the candidate

The candidate Assoc. Prof. Dr. Galina Todorova Bogdanova has submitted a total of 25 publications for participation in the selection process. The presented scientific papers are distributed by year of publication, as follows:

2003	2007	2008	2010	2011	2012	2016	2017	2018	2019	2020
1	1	2	1	1	1	1	1	3	10	3

The publications have not been used in previous procedures (ONS "Doctor" 1999, "Associate Professor" 2002).

A reference in Scopus shows that Assoc. Prof. Galina Bogdanova has 36 publications in refereed editions, 201 citations and h-index 7. Five of the publications in Scopus were used in the associate professor procedure, and 15 are included in the list of publications for the current procedure. Another 15 publications (all from 2017) have been visible in Scopus recently.

Galina Bogdanova is a co-author of world-class scientists such as Victor A. Zinoviev, Gyula O. H. Katona, Andries E. Brouwer.

All publications are in English, except for [22], which is in Russian.

All publications are co-authored. In most cases the co-authors are doctoral students of Assoc. Prof. Bogdanova.

The presented publications fall within the topic of the selection process.

I accept all scientific papers for review, except the two publications in which I am a co-author ([9] and [22] of the list of publications).

4. Main scientific and scientific-applied contributions

The contributions in the scientific works of Assoc. Prof. Bogdanova are scientific and scientific-applied. I accept the contributions presented in the attached "Author's reference for the original scientific contributions in the works". The content of the publications and scientific achievements with which the candidate participates in the selection process is correctly presented.

The publications presented by Assoc. Prof. Galina Bogdanova for participating in the selection process are systematized by the candidate in several thematic groups:

- Research relating to the processing and protection of information [2], [6], [18], [19], [20], [21], [22], [25];

- Modern methods and technologies for preservation, digital transformation and presentation of scientific and cultural heritage [5], [7], [17], [19], [23], [24];

- Toolkit, platforms and adaptation of the developed interdisciplinary methodologies and integrated approaches [3], [4], [7], [10], [12], [16];

- Approaches, methods and standards for ensuring accessibility and training for people with special needs [1], [8], [9], [11], [13], [14], [15], [16].

Some of the publications ([7], [16] and [19]) can be attributed to two of the considered thematic groups.

I think that the proposed systematization, according to the subject of the publications, is appropriate.

In several articles, Assoc. Prof. Bogdanova continues her research in coding theory from her dissertation on ONS "Doctor".

In [18] the software system QPlus is presented, which implements algorithms for studying linear, constant-weight and equidistant q-ary codes. A number of specific results have been obtained with the help of the system.

Significant results were obtained in the joint publication with V. Zinoviev [21]. The task of constructing equidistant codes is investigated. A complete classification of the maximum equidistant codes with $d = 3$ and $d = 4$ is made. Computer results and a table for the values of $B_q(n,d)$ for $n \leq 10$ are presented.

Studies on ternary equidistant codes with lengths $11 \leq n \leq 15$ are presented in [6].

Some of the research of Assoc. Prof. Bogdanova, which is of scientific-applied nature, is dedicated to the development of methods and different approaches for the protection of digital archives.

Methods for protection of interactive systems and digital archives against unauthorized distribution of digital content are studied in [2]. Techniques based on coding theory and steganography are applied. The results are applied in practice in the developed interactive system under the "North +" project. Similar approaches are used in [19] and [25] for digitalization and protection of the archive "Bulgarian Folklore Heritage" and the archive fund with folklore materials of the Institute of Folklore at BAS.

Co-filtering techniques apply knowledge-discovery algorithms to make personalized recommendations to users seeking information. In [20], a new co-filtering algorithm is proposed, based on the detection of functional dependencies for error correction in a data set using fractal dimension. The algorithm is compared experimentally with some of the known schemes.

The publications [5], [7], [17] are related to the research projects dedicated to approaches and methods for the creation, presentation and protection of cultural and historical heritage archives. The results are mainly scientific-applied with great public significance. The article [5] is devoted to the work of creating a digital archive of bells from the 16th to the 20th century in Belarus. Article [7] presents new solutions in the field of digitalization and presentation of national folklore heritage, created within the National FolkKnow program: "Technologies based on knowledge for creating digital resources and virtual presentation of significant collections of Bulgarian folklore heritage". The FolkKnow program is led by Assoc. Prof. Bogdanova and consists of 4 separate, interconnected projects with contractors from the Institute of Mathematics and Informatics and partners from the Institute of Folklore and VTU Veliko Tarnovo. In [17] the creation and presentation of semantic knowledge about bell objects is discussed.

Scientific papers [23] and [24] are book chapters. In [23] the processes of designing databases for cultural artifacts are discussed in detail. The methodology used was applied in two projects. Chapter [24] examines digital technologies related to the digitization, creation and indexing of digital resources for use by blind people.

Several publications present an interdisciplinary research related to medicine. In [3] the object of the study are the data from Holter monitoring of cardiological activity. The objects and the connections are analyzed and an ontology is built. In [12] a model of an information system for storage, processing and analysis of cardiological data is presented. Publication [16] describes the stages of design and implementation of a software system that provides the necessary functionality for visually impaired users.

Approaches and methods for creating, preserving and presenting digitized cultural and historical heritage are presented in [4]. A semantic model of knowledge about bells is presented. An

overview of the most popular application programming interfaces in the field of cultural heritage is presented in [10].

Eight of the publications submitted for participation in the selection process are dedicated to research related to ensuring access to digital resources for people with special needs.

Under the guidance of Assoc. Prof. Bogdanova, a study was conducted on the problems of web accessibility for visually impaired people. A methodology for assessing accessibility has been developed and 100 public websites have been evaluated. The results of the research are published in [1]. A Web Accessibility Handbook is developed [26]. The handbook presents standards, principles and guidelines for providing web accessibility for the visually impaired. It is aimed at website developers. A questionnaire for assessing the accessibility of web sites when working with speech support systems is also attached.

Some tools for testing the accessibility of digital cultural heritage are considered in [8]. Accessibility issues for people with sensory disabilities are addressed in [15].

The problems of accessibility for people with disabilities to educational resources and technologies are addressed [9], [11], [13] and [14]. In [11] the most common barriers for people with visual problems are considered and guidelines for overcoming them are given. Articles [13] and [14] are devoted to the use of serious educational games and the development of accessible games in the field of military-historical heritage.

The scientific and scientific-applied contributions in the publications submitted for participation in the selection process are:

- enrichment of existing knowledge;
- new approaches and methods;
- applications of scientific achievements in practice.

5. Characteristics and evaluation of teaching, project work and other activities

Galina Bogdanova has a variety of teaching activities. She has lectured in the disciplines Databases, Informatics, Compression and archiving of information, Modern database platforms, Business applications for analysis of economic information, Business information systems, Database management systems, Internet programming, Graphic design, etc. The lectures are for bachelor, masters and doctoral students from IMI - BAS, VTU "St. St. Cyril and Methodius ", Technical University - Varna, Medical College - Pleven and others.

The following special courses led by Assoc. Prof. Bogdanova for doctoral students at IMI are directly oriented to the topic of the current selection process:

- Interdisciplinary methods for preservation, presentation and digitalization of the cultural-historical and scientific heritage;

- Methodology for evaluating web accessibility of sites for people with disabilities;
- Standards, criteria and methods for assessing access to software applications and databases for people with disabilities;
- Digital accessibility and training methods for people with special educational needs.

Assoc. Prof. Galina Bogdanova has four successfully defended doctoral students, two of whom are associate professors at the University of Veliko Tarnovo, and two others are, respectively, a senior assistant and an assistant at IMI. She is currently the supervisor of two doctoral students.

Currently, Assoc. Prof. Bogdanova is the head of two research projects funded by the National Research Fund:
- Cultural and historical heritage: preservation, presentation, digitalization;
- Digital accessibility for people with special needs: methodology, conceptual models and innovative ecosystems.

She has led four other national research projects:
- Knowledge based technologies for creating digital resources and virtual presentation of significant collections of the Bulgarian folklore heritage;
- Digitalization of the architectural work of master Kolyu Ficheto;
- Creation, annotation and protection of a digital archive "Bulgarian Folklore Heritage";
- Design and construction of an experimental digital archive of authentic folklore materials.

Another interesting project funded by the National Research Fund, in which Assoc. Prof. Bogdanova currently takes part as a person in charge of IMI - BAS, is "Application of new mathematical methods for analysis of cardiological data".

6. Critical remarks and recommendations

I have no critical remarks.

7. Personal impressions of the candidate

I know Galina Bogdanova, as well as the other colleagues from the MOI section in V. Tarnovo, since 1989. In the period 1996-1999 I was the scientific supervisor of her doctoral studies at IMI. Our scientific cooperation has been resumed in recent years in connection with the joint participation in several projects.

8. Conclusion

After getting acquainted with the materials and scientific works presented in the selection process and on the basis of the analysis of their significance and the scientific and scientific-applied contributions contained in them, I confirm that the scientific achievements meet the requirements of ZRASRB, PPZRASRB, the procedure for acquiring scientific degrees and for holding academic positions at the Bulgarian Academy of Sciences and the Regulations on the terms and conditions for acquiring scientific degrees and for holding academic positions at the Institute of Mathematics and Informatics at the Bulgarian Academy of Sciences. In particular, the candidate satisfies the minimum national requirements in the professional field and no plagiarism has been noticed in the scientific papers submitted at the selection process. I give my positive assessment of the candidacy.

After getting acquainted with the materials and scientific papers presented in the selection process, analysis of their significance and the scientific, scientific-applied and applied contributions contained in them, I find it reasonable to give my positive assessment and recommend the Scientific Jury to propose to the Scientific Council of IMI – BAS to select Assoc. Prof. Galina Todorova Bogdanova for the academic position of "Professor" in the field of higher education 4. Natural sciences, mathematics and informatics, professional field 4.6. Informatics and computer sciences, scientific specialty Informatics (Modern technologies for preservation, accessibility and protection of scientific and cultural heritage).

March 21, 2021   Reviewer:

(Prof. DSc Stoyan Kapralov)