

Review

for associate professor Nina Dobrinkova
in the competition for academic position "Professor"
in the professional field 4.6 "Informatics and computer science"
scientific specialty "Informatics"

Reviewer: Prof. Stefka Fidanova

By Order No. 310 dated 13.12.2024 of the Director of Institute of Information and Communication Technologies at Bulgarian Academy of Sciences, Prof. Svetozar Margenov, pursuant to Art. 4, para. 2 of the Law on the Development of Academic Staff in the Republic of Bulgaria (LDASRB) and decision of the Scientific Council of IICT-BAS (Minutes No. 12 of 27.11.2024) I have been appointed a member of the scientific jury under the procedure for the academic position of "Professor" in the professional field 4.6 "Informatics and computer science" scientific specialty "Informatics", announced for the "Modeling and optimization" department, of State Gazette issue 87 of 15.10.2024. As a member of the jury on 18.12.2024 I have received all the documents, attached to the application to the Director of IICT-BAS of the only candidate for the competition Assoc. Prof. Nina Dobrinkova.

According to Law on the Development of Academic Staff in the Republic of Bulgaria, the rules for its implementation and the specific requirements introduced in the regulations of IICT-BAS, applicants must meet the following requirements:

1. Have acquired a doctorate degree in education and science;
2. Have held the academic position of "Assistant Professor" at the same or another higher education institution or scientific organization for at least two academic years;
3. Have submitted published monographs or equivalent publications in specialized scientific editions which do not repeat the ones submitted for the degree of PhD, the Doctor of Sciences and the academic position of Associate Professor;
4. Have submitted other original research papers, publications, inventions and other scientific and applied research works which are evaluated in aggregate;
5. Meet the national minimum requirements;

6. They must not have plagiarism proven in accordance with the statutory procedure in their scientific works.

Associate Professor Nina Hristova Dobrinkova has a defended dissertation for the educational and scientific degree of "Doctor" (diploma №000127/09.04.2012) based on a defended dissertation on the topic "Information systems for simulating the behavior of forest and field fires".

Associate Professor Nina Dobrinkova holds the academic position of Associate Professor since 01.07.2016. She has a total work experience of 16 years and 04 months, of which 8 years and 06 months as an Associate Professor.

Assoc. Prof. Nina Dobrinkova has a total of 70 publications and 77 citations by other authors.

For indicators from group B of the requirements, Assoc. Prof. Nina Dobrinkova has presented a monograph on the topic "BOUND LIABILITY AND RISK ASSESSMENT - AN EFFECTIVE MEASURE AGAINST CLIMATE CHANGE, DISASTERS AND FLOODS", Amikum Publishing House, Bulgaria. The total number of points is 100 with a required score of 100.

For indicators from group D, a total of 17 publications are presented, 11 of which have an impact rank, and 6 are referenced in the global system for reviewing and referencing, as well as one useful model. The total number of points is 317 with a required score of 260.

Associate Professor Nina Dobrinkova has presented 29 citations visible in SCOPUS, which were not used for acquiring the academic position of associate professor. The total number of points is 168 with a required 140 on indicator D.

Associate Professor Nina Dobrinkova was the scientific supervisor of a successfully defended doctoral student (Stefan Kostadinov Stefanov - topic of the dissertation "Innovative methods for supporting decision-making in forest fires and floods" - year of defense 2021). She participated in 4 projects with national funding. She was the leader of one project with national funding. She was the leader of the Bulgarian team of 6 international projects. The total number of points is 410 with a required 150 on indicator E.

Associate Professor Dobrinkova fulfills, and in some indicators significantly exceeds, the

national requirements, as well as the specific requirements of the Bulgarian Academy of Sciences and the Institute of ICT for the academic position of "professor.

The scientific works of Associate Professor Nina Dobrinkova are in the field of modeling crisis situations caused by natural or man-made disasters, and optimal decision-making in the event of such a situation. The main emphasis is placed on modeling the development and consequences of natural disasters such as field and forest fires, floods, landslides, etc. Various approaches to modeling and decision-making have been studied, and the proposed algorithms have been tested in the field with real data. A comparison has been made between the development of the event proposed by the model and its real development. It has been shown that the deviation is within the permissible range.

Disaster situations caused by humans such as chemical, biological, radiological and nuclear have also been studied.

The main contributions to her research can be systematized as follows:

1. A methodology for modeling flood zones has been developed based on data from riverbeds, geodetic surveys and Schezi's formulas for river runoff.

A categorization of floods has been made according to their frequency and the damage caused. A methodology for collecting meteorological information has been developed. This information, together with information on river runoff, serves to assess the risk of flooding. The developed methods have been implemented in a software application that can be used by the relevant services, both in the field and in the operating room, and serve for timely decision-making for an adequate response. The developed methods and software applications have been tested for the territory of the Svilengrad municipality and for 4 risk areas in Armenia.

2. Web-based modules have been developed to support decision-making in disaster situations.

Software tools have been developed to support medical teams during disasters. This tool calculates the shortest route to medical teams. It assesses damage to infrastructure and possible injuries to people. The purpose of these tools is to support rescue teams in search and rescue activities for survivors. The developed modules have been tested to support decision-making in landslides in the Smolyan region; for forest fires in the municipalities of

Zlatograd, Madan, Nedelino and the Gegi Dam region in Armenia. The flood modules have been tested in several regions in Armenia.

3. A classification of Bulgarian plant species in non-urban areas was made according to 53 vegetation classes, which are used by various models for simulating forest and field fires around the world.

In forest and field fire simulation models, combustible plant materials are divided into 53 main classes. An assessment and classification of the most common plant species in Bulgaria was made according to these 53 vegetation classes. This classification allows for the optimization and calibration of existing models for simulating forest and field fires. The idea was tested on the development of a forest fire in the Kresna Gorge area in 2017. A great similarity between the simulated fire behavior and the real one was shown.

4. A model of the spread of infection with a biological agent that has a high degree of infectivity has been developed. The developed model is based on the Dirichlet method.

The Dirichlet method for extracting mixed models allows for a numerical description of disease outbreaks with multiple sources. The proposed method can be combined with existing models for the spread of a specific disease. It can be applied in emergency situations and pandemic situations.

5. A system for analyzing and controlling the mechanical properties of biological tissues has been developed.

The developed system for analyzing and controlling the mechanical properties of biological tissues aims to support the sensitivity of the operating physician during bloodless operations. During bloodless operations, work is carried out through three holes in the patient's tissues and the doctor's visibility and sensitivity are severely limited. A special wireless control and management system has been developed for the designed model, as well as a program to store and process information related to the biomechanical properties of tissues. The information obtained from the designed and manufactured sensor structure serves to find the corresponding tissue model and to issue the necessary commands for force interaction between the tip of the instrument and the tissue. This development is protected as a utility model.

All of these contributions are of a scientific and applied nature. They have been tested on real

test cases and have shown applicability and significance for both science and practice.

I have known the candidate since 2007, when she began her doctoral studies at the former Institute of Parallel Information Processing, now part of the Institute of Information and Communication Technologies. I can describe her as very hardworking. She has shown that she is able to win and manage international projects and work in an interdisciplinary and international team. She has participated in 5 committees for the preparation of concepts and opinions related to the assessment of the risk of natural disasters such as fires, floods and landslides. She has participated in the preparation of 3 expert reports to assist institutions and management bodies. She is the editor of 3 thematic collections. She is a member of the organizing committee of the Envirorisks conference, which is held in Sofia every 2 years. I am fully convinced of her qualities as a researcher and organizer, which are the basis for further development in science. I have a recommendation that she should emphasize more on publications with an impact factor and open access. Thus, its scientific achievements will become available to an even wider circle of scientists and potential users.

CONCLUSION

According to the presented documents, the candidate Assoc. Prof. Nina Hristova Dobrinkova fulfills all the requirements of the LDASRB, of its Rules of Procedure and of the Rules on the Specific Requirements for Acquisition of Academic Degrees and Occupation of Academic Positions of BAS and ICT-BAS. I give a positive conclusion for the selection of Associate Professor Nina Hristova Dobrinkova in the competition for the academic position of "Professor" in the professional field 4.6 "Informatics and computer science" scientific specialty "Informatics".

I propose that the Scientific Jury unanimously vote on a proposal to the Scientific Council of the Institute of Information and Communication Technologies of the Bulgarian Academy of Sciences to select Assoc. Prof. Nina Hristova Dobrinkova for the academic position of "Professor" in the professional field 4.6 "Informatics and computer science" scientific specialty "Informatics".

24.01.2025

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