

REVIEW

of the submitted works for participation in a competition for the academic position of “PROFESSOR” in professional direction 4.6 “Informatics and computer sciences”, scientific specialty “Informatics” announced by ICT-BAS in SG No 21 of 15.03.2022 for the needs of the Department “Information Processes and Decision Support Systems”

Reviewer: Professor Daniela Ivanova Borissova, DSc

Candidate: Associate Professor Leoneed Mihaylov Kirilov, PhD

Pursuant to Order No 311/13.12.2024 of the Director of ICT-BAS, I am determined to be a member of the scientific jury under the announced procedure, and according to the minutes of the first meeting held on 17.12.2024, I am determined to prepare a review. For this purpose, I have received all the documents submitted by the applicant under the procedure.

I. BRIEF BIOGRAPHICAL DATA ON THE CANDIDATE

Assoc. Prof. Dr. Leoneed Mihaylov Kirilov was born on 09.07.1961. He graduated from Sofia University "St. Kliment Ohridski", Faculty of Mathematics and Mechanics, majoring in "Operations Research" in 1984, and in 1993 he acquired the educational and scientific degree "Doctor" (Candidate of Technical Sciences). From 1999 to now he holds the academic position “Associate Professor” in the department “Information Processes and Decision Support Systems” at ICT-BAS.

II. ASSESSMENT FOR COMPLIANCE WITH MINIMUM NATIONAL REQUIREMENTS AND REQUIREMENTS OF ICT-BAS

According to Art. 61 of the Regulations for the Implementation of the Law for Development of the Academic Staff in the Republic of Bulgaria (LDASRB) (respectively, Article 29 of the LDASRB and the Regulations on the Specific Conditions for the Acquisition of Scientific Degrees and for the Occupancy of Academic Positions at ICT-BAS), the candidates for occupation of the academic position “professor” is assessed against the fulfillment of the conditions under Art. 60, para. 1 and 2 and in accordance with the information from the references under Art. 60, para. 3. The fulfillment of these conditions is shown in the following table:

Candidates for the academic position of “professor” must meet the following conditions:	Submitted documents
Art. 60, para. 1(1) to have acquired an educational and scientific degree “doctor”	Diploma for educational and scientific degree “doctor” No 28987 from 30.06.1993 issued by VAK
Art. 60, para. 1(2) have held the academic position of “associate professor” in the same or in another higher school or scientific organization for not less than two academic years or not less than five years: a) have been lecturers, including part-time, or members of a research team at the same or another university or scientific organization, or b) have exercised artistic activity, or c) to have been specialists in practice and have proven achievements in their field	Submitted curriculum vitae; Service note for work experience, of which 24 years as “associate professor”
Art. 60, para. 3 Candidates submit a certificate of compliance with the minimum national requirements, the requirements under Art. 1a, para. 2, as well as a reference to the original scientific contributions to which the relevant evidence is attached	Certificate of fulfilment of the minimum national requirements; Reference to original scientific and applied scientific contributions

The fulfillment of the minimum points for the groups of indicators for the academic position “professor”, in accordance with the specific requirements of IICT-BAS, is as follows:

Area 4. Natural sciences, mathematics and informatics,
Prof. direction 4.6. Informatics and Computer Science

Group of indicators	Contents	Professor (min. points)	Presented by the candidate in the competition
A	Indicator 1	50	50
B	Indicator 2	---	---
C	Indicator 3 or 4	100	100
D	Sum of indicators from 5 to 10	260	341
E	Indicator 11	140	207
F	Sum of the indicators from 12 to the end	150	576

For group D, 18 scientific papers were presented, 17 of which were indexed publications in WoS, Scopus, IEEE Xplore and AMC, and 1 published book chapter. For

the citations concerning group D, the candidate presented a reference for 15 publications, cited a total of 41 times. The data presented for groups D and E exceed the required minimum. For group E, the candidate presented information on: defended a doctoral thesis (1); participation in a national scientific or educational project (16); participation in an international scientific or educational project (7); leadership of a national scientific project (3); leadership of the Bulgarian team in an international scientific or educational project (2); attracted funds for projects led by the candidate. The data presented for group E significantly exceeds the required minimum.

From the analysis made in this way, it is easily established that the candidate fully satisfies both the minimum national requirements and the specific requirements of IICT-BAS.

Scopus, Web of Science, and Google Scholar database reference show the following scientometric indicators for the candidate:

	Scopus	Web of Science	Google Scholar
h-index	7	4	11
Author documents	42	17	88
Citations	134	58	435

III. MAIN CONTRIBUTIONS IN THE SCIENTIFIC AND SCIENTIFIC-APPLIED ACTIVITY OF THE CANDIDATE

From the 18 publications presented in total, it can be summarized that the scientific interests of Assoc. Prof. Dr. Leonid Kirilov are related to modeling and development of algorithms for optimization and decision-making. The main contributions in the publications presented for participation by Assoc. Prof. Dr. Leonid Kirilov can be systematized in the following main areas:

1. Scientific results in the field of modeling and decision-making for hydrological processes and river basin management,
2. Scientific results in the field of modeling and development of algorithms for optimization of mono- and bi-metallic nanostructures,
3. Scientific results in the field of development of models, methods and algorithms for decision-making in the management of various resources.

In the field of modeling and decision-making related to hydrological processes and river basin management: 1) Hydrological models of the Mesta and Struma river catchments have been developed using the HEC-HMS program. The models have been

calibrated and tested with real data. 2) Hydrological models for the analysis of extreme events have been developed - during torrential rain (for the Mesta River) and during flooding for the Bistritsa River catchment (Sovolyanska Bistritsa - left tributary of the Struma) in the area of the town of Kyustendil in 2009. 3) Models for water assessment and planning (water balances) of the Mesta River and the Struma River have been developed using the WEAP water resources assessment decision-making system. 4) A multi-criteria model with a finite number of alternatives has been proposed for the task of water quality management and in particular monitoring of the BOD5 and N-NO2 indicators. The specific task considers the section from the confluence of the Iztok River into the Mesta River to Momina Kula (Gospodintsi village). 5) A model for flood risk assessment based on logical rules and derivation of relevant alternatives for decision-making has been developed. The model was built using the PRODEC system and tested for the Yakoruda area near the Mesta River.

In the field of modeling and development of algorithms for optimization of mono- and bi-metallic nanostructures: 1) The layer-by-layer growth process of a bimetallic Au-Ag nanoparticle was studied using the Monte Carlo method combined with a molecular dynamics approach. It was found that the order of addition of atoms (simultaneous or layered) affects the chemical ordering in the studied gold-silver equiatomic nanoalloys. 2) To improve the overall efficiency, a hybrid approach was proposed, combining universal, task-agnostic swarm intelligence (SI) algorithms with simple deterministic heuristic algorithms specific to the specific area/domain. 3) A two-stage lattice Monte Carlo approach was proposed for optimization of bimetallic nanoalloys: simulated annealing on a larger lattice, followed by simulated diffusion. This combination gives significantly better solutions than simulated annealing alone. 4) A combined method for optimizing metal nanostructures is proposed. The core of the method is a lattice Monte Carlo method with different lattices, combined with a molecular dynamics approach. It is found that the most stable mixed configuration of a bimetallic nanowire has an Ag-rich surface and an Au-rich subsurface. 5) The parameter “initial temperature” of the simulated annealing method for optimizing metal nanoparticle structures is studied and several calculation options and its functional representation are proposed.

In the field of developing models, methods and algorithms for decision-making in managing various resources: 1) Optimization models and approaches for overcoming economic crises, natural disasters and pandemics, classified into three types: natural disasters, pandemics and economic crises, are considered. Conclusions are made

about the current state and some development trends are outlined. 2) A model for estimating the volume of medical care in the event of an earthquake is proposed. The model is based on the apparatus of generalized networks. 3) A method for generating a set of admissible schedules for solving FJSP-type problems of arbitrary size is proposed. 4) A necessary condition for solving the problem of an optimal portfolio of financial assets is proven. The model for optimal portfolio management is represented by a system of first-order ordinary differential equations, and the proof is based on the Pontryagin maximum principle. 5) A group decision-making approach is proposed, which allows IT service management personnel to select an appropriate set of key performance indicators to measure the operational state of the “e-mail” service. 6) An engineering robust design approach is proposed, using a multi-criteria approach in the solution phase. 7) An interactive population-based evolutionary algorithm called EVALIMCO is proposed, designed to solve multi-criteria optimization convex integer problems. 8) A generalized scalarization model is proposed for solving multi-criteria problems with continuous and/or integer variables (GENS). The model is the basis of the developed generalized scalarization interactive method GENS-IM, used for the created web-based system WebOptim. 9) A prototype of a BigData platform designed for elderly care, including a complete package of microservices and implemented with FIWARE components, is proposed.

IV. CRITICAL NOTES AND RECOMMENDATIONS

I have no critical remarks about the candidate Assoc. Prof. Dr. Leoneed Kirilov. I believe that the documents have been prepared with the necessary precision.

V. PERSONAL IMPRESSIONS OF THE CANDIDATE

I personally know Assoc. Prof. Leoneed Kirilov as a motivated scientist in the field of informatics and computer science, and more specifically in the field of decision-making. Evidence of this is not only the publications, but also the number of citations and projects, including those with foreign scientists.

VI. CONCLUSION

Taking into account the fulfillment of all the regulatory requirements, according to the LDASRB, the Regulations for its implementation, as well as the Regulations for the terms and conditions for acquiring scientific degrees and for occupying academic positions at IICT-BAS, including the references on the fulfillment of the minimum national requirements, the scientometric indicators from Scopus, Web of Science and

Google Scholar, it was established that the candidate fully satisfies the requirements for occupying the academic position according to the announced competition. **All this gives me enough reason to give a categorically positive assessment and I suggest that the scientific jury vote on a proposal to the Scientific Council of the Institute of Information and Communication Technologies at the BAS to elect Assoc. Prof. Dr. Leoneed Mihaylov Kirilov to the academic position of “professor” in professional direction 4.6 “Informatics and computer science”.**

21 of January 2025

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