

REVIEW

Competition for the academic position Professor
in the professional field 4 Natural Sciences, Mathematics and Informatics,
professional direction 4.6 Informatics and computer sciences,
scientific specialty Informatics (Data protection, Internet of things)
for Institute of Mathematics and Informatics, BAS
announced in State Gazette No. 65/02.08.2024
and at the webpage of IMI-BAS

This review is prepared by corr. member prof. dr.sci. Peter Boyvalenkov, Institute of Mathematics and Informatics, BAS, as a member of the Scientific Jury for the competition according to Order № 348/01.10.2024 of the Director of IMI-BAS.

1. Competition information. The competition was announced by IMI-BAS in the State Gazette on August 2, 2024. Documents were submitted by one candidate - Hristo Nikolov Kostadinov, associate professor at IMI-BAS. The set of documents submitted by the only candidate for the competition is complete. The scientific jury for the competition was elected by the Scientific Council of IMI and was appointed by order 348/01.10.2024 of the Director of IMI.

2. Candidate information. Hristo Kostadinov graduated from higher education (master's degree) in 2001 in Faculty of mathematics and informatics of SU "St. Kliment Ohridski", specialization Coding theory. He defended his thesis (PhD) at the University of Electro-Communications in Tokyo, Japan in 2005 (recognized by Higher Attestation Commission in 2006) as a result of doctoral studies in 2002-2005 at the same university. Since 2005 he is working at IMI-BAS consecutively as a specialist with higher education (2005-2006), chief assistant (2006-2012) and associate professor since October 2012. There is one doctoral student who has defended his thesis under his supervision, and very soon (on 26.11.2024) a second doctoral student of his will appear for his defense. He is a member of the Attestation Commission of IMI-BAS, of the Scientific Council of IMI-BAS since May 2024 and at the BAS General Assembly from June 2024.

3. General characterization of the scientific works and compliance with the minimum requirements. There are 15 scientific papers submitted for participation in the competition, all published in the period 2013-2024 (after the procedure for his election as an "Associate Professor" at IMI, i.e. not used in other procedures). Of these works, 3 are articles

in specialized international journals with impact factor, 11 are in publications indexed in WoS/Scopus (no impact factor, 9 of them with SJR) and 1 is in a peer-reviewed international conference proceedings. The total list of publications contains 36 works.

I confirm the conclusion of the first meeting of the Jury on meeting the minimum national requirements and the minimum requirements of IMI-BAS. Specifically, the comparison with the minimum requirements of IMI-BAS, which are higher or equal to the national ones, shows the following: by group A – 50 points (with a required minimum of 50), group B not applicable, group C, indicator 4, – 112 points (with a required minimum of 100), group D, indicators 5-10, – 254 points (with a required minimum of 220), group D, indicator 11, – 144 points (with a required minimum of 140) and group E, indicators 12-20, – 180 points (with a required minimum of 150).

In conclusion to this part, I accept for evaluation the 15 scientific works described in this way.

4. Scientific contributions. Assoc. prof. Hristo Kostadinov's research interests are in coding theory (data protection), in particular construction of codes over Z_m and applications, watermarking, smart contract platforms, Internet of Things. The scientific works submitted for participation in the competition are in these important areas, which I will focus on separately, and to cite Kostadinov's works, I will follow the numbering from the list of publications presented for the competition.

4.1 Construction of codes over residue rings Z_m and applications. Works [1, 5, 12] are devoted to the task of finding and researching codes that are capable of correcting the most common errors (symmetric and asymmetric) in flash memories. For this purpose, new codes over rings of residues in appropriate modules have been constructed and studied. The codes are represented by their parity check matrices. Their correction capabilities with respect to errors that commonly occur in flash memories have been investigated. The works [2-4, 13] have investigated codes for application in triangular quadrature amplitude modulation (TQAM), which is more energy efficient than traditional square quadrature amplitude modulation (SQAM). In [2] the exact value of the probability (quantity) "symbol error" (SER) for the codes under consideration was found and it was shown that this probability is close to the known upper bound. In [3, 4], the application of codes over residue rings in TQAM was investigated, and bounds (and some exact values in [4]) were obtained for SER in a Gaussian channel (for this purpose, corresponding software was also developed; results are presented from simulations). The six coded modulation schemes investigated in [13] show an improvement over the uncoded ones. In the paper [14], codes over the ring of residues modulo

2^{b+1} are constructed and studied. A comparison made between one of the resulting codes and a BCH code with similar parameters shows similar behavior.

4.2 Methods for embedding watermarks in audio files. This problem is addressed in the work [6], where the possibility of embedding compression-resistant watermarks (AAC and MP3 compression) in music audio files was investigated. The analysis of the proposed method shows audio improvements in some situations and gives the BER (bit-error-rate) values for an appropriate choice of step.

4.3 Application of smart contract platforms based on distributed ledger technologies. Publications [7-10], which are result of the collaboration of Assoc. prof. Kostadinov with his successfully defended doctoral student Biser Tsvetkov are devoted to this new and modern area. The work [7] investigated the applicability of smart contract platforms to support multi-sided SLM processes with on-premises, cloud, or end-device components. A prototype of a distributed system based on Distributed ledger technology (DLT) has been developed. Such a solution is shown to meet natural performance and scalability requirements while requiring a relatively low level of investment. This research is continued in [8, 10], where a concrete example of EOSIO distributed system is shown [8] and three DLT-based systems are analyzed [10]. In [10], the dependence of the choice of DLT on the environment and the nature of the tasks to be solved was analyzed. In the work [9], a distributed system based on a platform for smart contracts, designed to directly stimulate the obtaining of scientific research results (in the sense of interactions between organizations and individual scientists in solving complex computational tasks) was investigated. The characteristics of such a system are described.

4.4. Internet of Things. In this rapidly developing field are the publications [11, 15]. In work [11], a solution for monitoring and controlling carbon emissions from vehicles is proposed. The device has a hardware part that receives the relevant data and a set of cloud services for storing, analyzing and presenting data and results. Analysis of the device shows that it is a complete solution for monitoring and controlling harmful emissions that can be used in the fight against climate changes. In the paper [15], a new technique for network dynamic distribution of interconnected microservices on moving objects (infrastructure nodes) is proposed, again focusing on the practical application of the developed system. The inevitable optimization task is solved with a mixed-integer linear programming (MILP) algorithm, which is implemented in a cloud platform. Comparison with existing similar systems shows a reduction in overall network latency.

In conclusion in this part, I will note that the author's reference correctly expresses the contributions of the candidate.

5. Approbation of the scientific contributions. The applicant has submitted a list containing 24 citations for participation in the competition. Scopus shows 29 independent citations (as of Nov. 13, 2024) of Kostadinov's works. The candidate actively participates with reports at conferences and seminars. I have attended more than 10 of his presentations, and I have formed the impression that he is able to present both known and new results well, as well as to motivate the research being conducted.

The authorship of the publications is as follows: 12 have one co-author each and 3 have two co-authors each. I believe that Kostadinov's contribution to these joint publications is equal to the contributions of the corresponding co-authors. There are no signs of plagiarism proven according to the law, I don't see any either, including auto-plagiarism.

My personal impressions of the work of Assoc. prof. Hristo Kostadinov are excellent. Apart from the obligatory activities with scientific and scientific-applied activities, he manages to find time and energy to assist the management of the institute in many administrative activities. I am sure that he will be very useful at IMI-BAS and as a professor.

6. Teaching and participation in projects. In the documents submitted by the candidate, I did not find any information about teaching work. This is compensated, of course, by his activity as a scientific supervisor of doctoral students. Participation in contracts and projects is impressive and sufficient to cover the minimum requirements, but it can be more active, for example in projects with NSF.

7. Conclusion. On the basis of the documents presented by the candidate, described above, as well as the fact that they meet the minimum national requirements and those of IMI-BAN for occupying the academic position "Professor" in scientific field 4. Natural sciences, mathematics and informatics, professional direction 4.6. Informatics and computer sciences, scientific specialty of Informatics (Data protection; Internet of Things). I propose that Hristo Nikolov Kostadinov be elected to the academic position of "Professor" in this field, with a scientific specialty of Informatics (Data protection; Internet of Things).

Sofia, 13.11.2024 г.

Prepared by:

Corr. Member, prof. dr.sci. Peter Boyvalenkov
IMI-BAS