REPORT

on a competition for the occupation of an academic position "Associate Professor"
in the scientific area 4. Natural Sciences, Mathematics and Informatics
professional field 4.6 Informatics and Computer Science (Image Processing),
declared in the State Gazette no. 68 of 31 July, 2020
with an only applicant: **Dimiter Petkov Prodanov, PhD**

by member of the scientific jury: **Olga Ilieva Georgieva, PhD, Professor**

1. General description of the presented materials

According to the order of №194 from 7.10.2020 of the Director of IICT-BAS I have been appointed a member of the Scientific Jury of the competition. The following materials of the candidate were presented to me for preparation of the opinion at the first meeting of the jury on 12.10.2020.

1. Autobiography; 2. A copy of the diploma and documents for acquiring educational and scientific degree "Doctor"; 3. Certificates for internship in the specialty; 4. List of scientific publications for participation in the competition; 5. Information on participation in scientific forums; 6. Lists and information for participation in scientific projects; 7. List of citations for participation in the competition; 8. Abstracts of scientific publications for participation in the competition - in Bulgarian and English; 9. Copies of the scientific publications for participation in the competition; 10. Reference for the fulfillment of the minimum requirements of IICT-BAS for the position of "Associate Professor", including lists of publications; 11. Author's reference for the contributions of the scientific works; 12. Declaration of originality and lack of plagiarism.

Dimiter Prodanov holds the scientific degree "Doctor", obtained at the University of Twente, Enschede, Netherlands. The diploma is recognized by Bulgarian authorities and entered in the Register of Academic Staff in the Republic of Bulgaria. Official notes are presented, proving membership in research teams in scientific organizations and universities for a period of more than 2 years.

2. General characteristics of the applicant's scientific research and publication work

To participate in the competition, Dr. Dimiter Prodanov presented a list of a total of 28 titles, 25 of which are scientific publications, divided as follows: 11 articles in journals and series, 11 publications in proceedings of international scientific conferences and 3 chapters of books. From the rest three titles on the list two are abstracts, published in scientific journals and one is a presentation at a scientific meeting of FENS. All scientific publications and both abstracts are referenced in the *Web of Science* and/or *Scopus* systems, and some in *IEEE Explore* or *Zentralblatt*. The candidate is a sole author in five of the presented scientific publications and in another seven he is a first author.

The work of the candidate is well presented to the scientific community. At the time of writing, a total of 505 citations of the candidate's publications were visible in the Scopus system. The formed h-index is 12. Evidence for participation in international research projects within different programs is presented: IBRO Fellowship, FWO-BAS, BrainSTaR, which also emphasizes the available expertise in the field of competition.

Of the publications submitted for participation in the competition, 18 are indicated for the implementation of the minimum national requirements and the minimum number of points specified in the requirements of IICT-BAS. The points are divided into groups of indicators, defined in the normative documents. The reference of the candidate shows the points formed according to the rules of IICT, which are higher than those of ADAPRB. For group B, the candidate indicates three publications presented in journals with impact factor and quartile with, scoring of 50 points each, a total of 150 points. My report showed the reliability of the scoring, except for the fact that article P2011B was published in 2011 in a journal with quartile Q1, visible since 2014. The publication has an SJR, which provides 20 points. Thus, in my understanding, for this indicator the candidate collects 120 points, which fully covers the requirements of 100 points for this group of indicators. For group of indicators D the candidate has declared a total of 343 points from the required minimum of 260 points. Since publication A2019B is in a non-SJR edition, the publication carries 12 points, not the 20 points entered. The other publications in this group are correctly scored. As a result, according to indicators D, the candidate has 335 points. For group E, 151 citations and 876 points, respectively, are presented. However, there are also auto-quotes on the list that should be excluded from the list. Despite this, the candidate collects points that significantly exceed the required minimum of 70 points. For indicator group E, a total of 50 points out of the required 20 points were presented. In summary, all minimum requirements of the law and Art. 1a, para 2 and para 3 under the Rules for the Implementation of the Act of the Development of the Academic Personnel of the Republic of Bulgaria (RIADAPRB) for holding the academic position "Associate Professor" in professional field 4.6. Informatics and Computer Science are fully covered.

There is no plagiarism proven by law in the publications presented for evaluation of Dimiter Prodanov.

All the presented materials assure that Dimitar Prodanov meets the conditions for holding the academic position of "Associate Professor".

3. Scientific results and contributions of the candidate

The publications submitted for the competition contain contributions of scientific and applied nature, grouped and summarized as follows:

Group 1. Signal processing and data analysis in solving problems of neuro-informatics

- Nerve fibers and axons are classified on the basis of statistical assessments of their specific parameters using a specially developed by the candidate information system for data exchange

between image processing platform, relational database, applied layer for annotation and data editing, as well as and a specialized computing system.

- An approach that quantify the very early response of hippocampal neurons to topographic stimuli has been developed

- The use of Gaussian multiscale spaces for image analysis is presented and the advantage of the anisotropic decomposition of the Laplacian Gaussian filter for leukocyte segmentation is demonstrated.

- Based on the comparison of approaches for image segmentation, examples of pipelines for image analysis and segmentation are analyzed.

- An original non-template algorithm for decomposition of digital signals constructed on the basis of local extremums is proposed.

Group 2. Computer-mathematical methods and relevant tools applied to biological data to describe biological systems and relationships.

- Solutions for visualization of geometric objects coordinate transformations, variation problems and physical phenomena descriptions based on Clifford's algebra are presented. A software package for Clifford's algebra application has been developed and implemented in the Maxima computer computational software system.

- A mathematical model of cell migration and diffusion of soluble substances around the implant has been developed. Analytical solutions were obtained for individual cases of examination and the impact of the boundary conditions on the stationary distribution was established.

Group 3. Neuroprostheses and plasticity of the Central nervous system

- Studies have been analyzed and significant results to characterize the activity of neurons have been obtained. The biocompatibility of the level of the interface with the neuron is defined and guidelines for its optimization are noted. The applicability of a neural interface for studying the activity of the local synaptic network in populations of neurons near the recording electrodes has been demonstrated.

- A certain role of proteins on the redox processes of the electrode surface during the electrostimulation cycle has been established.

- An original method for measuring electrochemical parameters is proposed. The method can be applied under non-stationary conditions and under complex signals.

- The effect of dexamethasone on a possible risk in the treatment of neonates with concomitant nerve injuries has been demonstrated.

The papers presented for an opinion show a strong level of scientific achievements by providing solutions in highly interdisciplinary areas related to computer science, such as neuroinformatics and mathematical modeling in biology. They demonstrate innovation and present research in intensively developing fields of the contemporary science.

I have no doubt about the candidate's significant personal contribution to the collective publications.

I am convinced that the scientific achievements shown have a high value of significance. They fully meet the criteria for holding the academic position of "Associate Professor"

Conclusion

Based on what has been said about the presented materials, the scientific works, their significance and the scientific contributions contained in them, I am convinced that Dr. Dimiter Prodanov satisfies all the requirements of ADAPRB, the Regulations for its implementation, as well as the requirements of IICT-BAS for the academic position of "Associate Professor" and I give a positive assessment to the candidate. I find it reasonable to propose Dr. Dimiter Petkov Prodanov to take the academic position of "Associate Professor" in scientific field 4. Natural Sciences, Mathematics and Informatics, professional field 4.6. Informatics and Computer Science (image processing).

7.12.2020

Member of the Scientific Jury:
/Prof. Olga Georgieva/