

OPINION

on the competition for the academic position "Professor"
in the area of higher education 4. Natural Sciences, Mathematics and Informatics,
professional field 4.6. Informatics and Computer Science

This opinion has been prepared by **Assoc. Prof. Dafina Yordanova Petkova, PhD**, Faculty of Mathematics and Informatics, Sofia University "St. Kliment Ohridski", in my capacity as a **member of the Scientific Jury of the competition**, according to Order No. 695/15.07.2026 of the Director of the Institute of Biophysics and Biomedical Engineering (IBPhBME) – Bulgarian Academy of Sciences (BAS), Prof. Tanya Pencheva.

The competition for the academic position "Professor" was announced in the State Gazette, issue 54 of 12.06.2026, for the needs of the "Bioinformatics and Mathematical Modelling" Section at IBPhBME – BAS, in accordance with the requirements of the Act on the Development of the Academic Staff in the Republic of Bulgaria (ADASRB), the Rules for the Implementation of the ADASRB (RIADASRB) and the Rules for the Implementation of the ADASRB at IBPhBME.

Assoc. Prof. Lyudmila Pavlova Todorova, PhD, is the sole candidate for the announced competition.

The submitted documents comply with the Rules for the Implementation of the ADASRB at IBPhBME – BAS.

Data on the candidate

Assoc. Prof. Lyudmila Todorova, PhD, holds a Master's degree in engineering in "Automation and Telemechanics". In 2006, she earned her PhD in the scientific speciality 02.21.10 "Application of the Principles and Methods of Cybernetics in Various Fields of Science" after defending a dissertation entitled "A System for Analysis of the Condition of Patients during Weaning from Prolonged Mechanical Ventilation". Since 2011, she has held the academic position of "Associate Professor" at IBPhBME – BAS, and as of July 2026, she has more than 40 years of total work experience.

Assoc. Prof. Lyudmila Todorova, PhD, fully meets the conditions and requirements set out in the ADASRB, the RIADASRB and Art. 5 of the Rules for the Implementation of the ADASRB at IBPhBME – BAS.

General description of the submitted materials

34 scientific publications were submitted for participation in the competition, as follows:

- under indicator **V4** Habilitation work – scientific publications: **12 publications**, **5 of which in journals with an impact factor**, **4 with an impact rank**;
- under indicator **G7** Scientific publications outside the habilitation work: **21 publications**, **11 of which in journals with an impact factor**, **7 with an impact rank**;
- under indicator **G8** Published chapter of a book or collective monograph: **1 publication**.

The total number of publications with an impact factor is **16**, which **meets the additional requirement** of IBPhBME – BAS for at least 15 articles with an impact factor.

The publications submitted for the competition do not repeat any from previous procedures for acquiring a scientific degree or holding an academic position. No plagiarism has been proven, in the manner prescribed by law, in the scientific publications submitted for the competition.

All of her publications are collaborative works. Assoc. Prof. Lyudmila Todorova is the lead author of 7 publications, second author with equal contribution on 14 others, and the last author on 6. A significant part of her research is interdisciplinary, resulting from long-standing collaboration with medical specialists across neurology, neurosurgery, ophthalmology, intensive care and urology. The main focus is the application of advanced mathematical frameworks (intuitionistic fuzzy sets, InterCriteria Analysis, index matrices, generalised nets) to analyse real clinical data.

The number of declared citations is 520, 208 of which are indexed in Web of Science and Scopus. This is evidence of the influence and impact of her work within the scientific community.

According to the submitted documents, Assoc. Prof. Lyudmila Todorova, PhD, has participated in 9 projects. Among these are 4 grants funded by the National Science Fund, 3 international bilateral cooperation contracts, and 2 projects under the Operational Programme “Innovation and Competitiveness” 2014–2020.

She has successfully supervised one PhD student—Aleksandar Marazov, who completed his part-time studies in professional field 4.6 between 2018 and 2024. With this, **she fulfils the requirement** set by the IBPhBME – BAS Rules for the Implementation of the ADASRB.

Since 2019, she has been a member of the Temporary Scientific Expert Committee in Technical Sciences at the National Science Fund.

Her score exceeds the minimum national standards for the academic position of "Professor" under the Rules for the Implementation of the Act on Development of the Academic Staff in the Republic of Bulgaria (RIADASRB – BAS). She also surpasses the institution-specific criteria outlined in Appendix 1 of the IBPhBME – BAS implementation rules (Table 1).

Table 1. Indicators

Indicator group	Minimum requirements for “Professor” (Appendix 1 to the Rules of IBPhBME – BAS)	Points of Assoc. Prof. Lyudmila Todorova, PhD
A	50	50
V	100	144
G	220	248
D	120	2184
E	100	190
Total	590	2816

Scientific and scientific-applied contributions

The contributions described in the “Extended Habilitation Reference” are in the field of intuitionistic fuzzy sets (IFS), InterCriteria Analysis (ICrA), index matrices and generalized nets (GNs), and their application in biomedicine:

Scientific contributions:

- (1) extension of the IFS theory – a new ordering over intuitionistic fuzzy pairs, a new relation, new operators with geometric interpretation and a scheme for graded assessment of Kaplan–Meier curves;
- (2) extension of the ICrA theory – new algorithms for similarity estimates between criteria and new modifications of the method, tested on real data from neurosurgery and urology in comparison with classical statistical methods;
- (3) new approaches to aggregation with index matrices, based on “full relevance”.

Scientific-applied contributions:

- (4) discovery of interactions (consonance and dissonance) between criteria for decision support in neurology, ophthalmology, intensive care and neurosurgery;
- (5) formation of indices for clinical practice in neurology and neurosurgery;
- (6) participation in the development of the Rila CogniSoft system for assessment and rehabilitation of cognitive impairments in multiple sclerosis, with a new methodology and two new approaches for evaluating neuropsychological results;
- (7) formal description with GNs of algorithms for medical software – weaning from mechanical ventilation, monitoring of multiple sclerosis through multimodal evoked potentials, registration and rehabilitation of cognitive impairments.

The research is timely and significant. Contributions (1) and (2) are convincingly supported by publications in Q1 (Mathematics, 2023; Interface Focus, 2026) and verified using real clinical data. Contribution (5) is formulated somewhat vaguely. Indices have been formulated, but what impact do they have on clinical practice? Contribution (6) could be more specific. What does the candidate's participation consist of?

CONCLUSION

Having familiarised myself with the materials and scientific works submitted in the competition, and based on my analysis of their significance and of the scientific and scientific-applied contributions contained in them, I **confirm** that the scientific achievements **meet all the requirements and criteria** of the ADASRB, the RIADASRB and the Rules for the Implementation of the ADASRB at IBPhBME – BAS.

I fully support the candidacy of Assoc. Prof. Lyudmila Pavlova Todorova, PhD, in the competition for the academic position “Professor” in professional field 4.6. Informatics and Computer Science, scientific speciality “Informatics (Informatics Tools in Biomedicine)”.

Based on the above, I do **recommend** that the Scientific Jury propose to the Scientific Council of IBPhBME – BAS the election of Assoc. Prof. Lyudmila Pavlova Todorova, PhD, to the academic position “Professor” in the area of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.6. Informatics and Computer Science.

01.10.2026

Member of the Scientific Jury:

Assoc. Prof. Dafina Petkova, PhD