

REVIEW

for the competition for academic position “Professor”
by professional field **5.3 “Communication and computer technology”**,
course: “Artificial intelligence”,
announced in State Gazette issue 38/ 10.05.2019г.
with candidate Todor Dimitrov Ganchev, Assoc. Prof., PhD, Eng.
Reviewer: Ivo Tsvetanov Iliev, Prof., DSc

1. General and biographical data

The competition is announced according to decision of department “Computer sciences and technology (protocol No 10/13.02.2019), confirmed by decisions of the Faculty of Computing and Automation (protocol No 10/18.02.2019) and the Academic Council of TU-Varna (protocol No 41/22.04.2019).

The only candidate in the competition is Associate Professor Todor Dimitrov Ganchev. In 1993 he graduates from TU-Varna with specialty “Electrical Engineer”. During the period 1994-1998 he was consecutively engineer and part-time lecturer at Department “Electronic engineering and Microelectronic”. During the period 1998-2000 he held a position of assistant in the same department. The following is a relatively long period (12 years) in his career related to active research carried at the University of Patras, Greece. He has held positions as a research associate and researcher in a number of international projects funded under EU Framework Programs (FP5, FP6, FP7). In 2012 he returns as an assistant in Department “Electronic engineering and Microelectronic”, TU-Varna. From 2014 to March 2016 he is an associate professor in the same department, and since April 2016 so far, is an associate professor at the Department “Computer Science and Technology”, Faculty of Computer Engineering and Automation.

Since March 2019 he has been Vice-Rector “Learning activity” of TU-Varna.

2. General description of submitted materials

The applicant participates in the competition with a total of 50 publications and one training aids.

In addition, the lists of publications for the acquisition of Associate Professor (40 titles) and National Doctorate (20 titles) are presented. After reviewing the content of the publications, I accept all of them for review.

A sample of 152 citations (Scopus) of 7 author's publications is attached to the competition materials. As can be seen in "Google Science" system, the citations of the author is over 2000.

D-r Ganchev supervised one and co-supervised 1 successfully defended PhD students. He has participated in 2 national projects funded under the Operational Programs "Human Resources Development" and "Competitiveness", 2 projects of TU-Varna, purposefully funded by the state budget and 3 projects funded by the TU-Varna budget. The large number of international projects - 17 in which the applicant participated - should be emphasized.

Comparison of the submitted materials with the minimum national and institutional requirements for the candidates for the academic position of "professor" shows that:

Indicator A: Dissertation for the awarding of the PhD degree. Number of points - 50 (required - 50);

Indicator B(4): 13 scientific publications (with a minimum of 10 required) have been referenced in world-renowned scientific information databases and are accepted for review. Number of points - 239 (required - 100);

Indicator G(7+8): Accepted for review are 37 scientific publications, 22 of which have been referenced in world-renowned scientific information databases and 15 in non-refereed scientific peer-reviewed journals or in peer-reviewed collective works. Number of points - 338 (required - 200);

Indicator D(12): Citations in scientific publications, referenced in world-renown databases of scientific information - 152. Number of points - 1520 (required - 100);

Indicator E(17+18+19+20+22+24): The guidance of one doctoral student and the guidance of one. Participation in national and international projects, attracted funds, scientific aids issued. Number of points - 532.3 (required - 150);

Indicator J: The number of lectures at TU-Varna during the last three years - 444 hours. Number of points - 444 (required - 120);

3. General characteristics of the applicant's research, scientific and development activities

The candidate's work reflects a large volume of research and applied activities in the field of competition, with more significant emphasises are:

- Speech analysis and analysis of physiological parameters and biomedical signals in order to identify negative emotional states, mental disorders, etc.;

- Design and study of intelligent human-machine interfaces with specific application;
- Application of contemporary methods for automatic processing of data sets with high degree of confidence in classification by certain criteria

The applicant has participated in more than 20 international and national research projects, such as researcher, work package leader and activities member, board member, laboratory manager. Quite impressive is the work related to his participation as a member of technical and program boards at more than 30 reputable international conferences held abroad.

In the last five years, Assoc. Prof. Ganchev has reviewed of 1 book (Elsevier edition), 1 textbook, 3 dissertations for PhD students trained in Bulgaria, India and Brazil. Data are also provided for reviews of 25 articles in reputable foreign scientific journals.

Since 2013 Prof. Ganchev is the Head of the Faculty Research Laboratory "Applied Signal Processing and Analysis", active in fields such as: computer bioacoustics, intelligent human-machine interfaces, computer biometrics, etc. The laboratory maintains close collaboration with researchers from Germany, Brazil and Spain.

4. Evaluation of the applicant's teaching capabilities and activities

The applicant's pedagogical activity spans almost 13 years, from his admission as a part-time lecturer to the Department "Electronics and Microelectronics" at TU-Varna up to now. The information presented shows that in the last three years he has spent 444 lectures in 4 disciplines included in the Bachelor's Degree Programs in 4 specialties at FITA. During this period more than 15 graduates have successfully completed their bachelor's and master's diploma thesis under his supervision. In addition to the two successfully defending PhD students, he was the supervisor of two more, written off in 2019 as well as one with a completion date of 04.2020. Assoc. Prof. Ganchev was the mentor of two foreign PhD students who successfully defended their dissertations at Federal University Mato Grosso, Brazil. He has participated in 7 scientific juries, of which 2 abroad - India and Brazil. It should also be noted the pedagogical experience gained in the presentation of a series of lectures on "Machine learning" and "Computational Bioacoustics Methods" at Federal University Mato Grosso and on "Speech technology and parameterization" at TEI of Piraeus, Greece.

The training aids - "Handbook on Monitoring and Information Systems for RES", is intended to support the training of students of the Master's Degree

Program in the subject "Monitoring and Information Systems for RES" and contains materials covering the topic of the competition.

5. Key scientific and applied science contributions

The applicant has presented in a synthesized way the more significant contributions to the publication groups related to criteria B4 and G7 + G8. I accept the contributions formulated in this way, focusing on the following:

- New methods for recognizing and classifying human emotional states based on voice-speech analysis and / or physiological signals (EEG, ECG, skin-galvanic response) analysis have been synthesized and investigated.
- Existing methods for recognizing and interpreting emotional speech in conditions of intense stress or in the presence of mental disorders and cognitive impairments have been refined.

The above two contributions can be classified as: the creation of new methods of precise analysis in order to correctly identify the negative emotional states characteristic of certain psychological states of the individual.

- Adaptive systems have been created, with voice or multimodal control, as well as with the use of bio-feedback, to engage in dialogue with the end user in stress or in case of recognized negative emotional states.
- Methods and corresponding hardware implementations, applicable in intensive noise conditions, have been developed to control the voice communication process.

The two contributions mentioned above can be classified as: creation of new structures and technologies for the management of voice communication according to the condition of the perceived subject, as well as depending on the parameters of the environment.

- Methods have been synthesized to extract linguistic, par-linguistic and even anthropological information, as well as specific applications such as: in a smart home environment; very noisy environment; microphones with different acoustic characteristics; microphones defining the anthropological features of the speaker, etc.
- Hardware variants of probabilistic neural networks and locally recurrent neural networks with applications in the processing of both one-dimensional physiological signals and medical images have been implemented and investigated.

The last two contributions can be classified as: proving by means of new ways of already existing theories and hypotheses.

Considering the authors of the majority of the publications, as well as my personal impressions of the candidate from his participation in national and international scientific forums, I think that the formulated contributions correctly reflect his significant share in the achieved results.

6. Significance of contributions to science and

Most of the applicant's contributions are of a scientific and applied scientific nature and are related to:

- Development and improvement of specific hardware realizations based on a contemporary elemental base with applications in psychophysiological research.
- Synthesis of new approaches and methods with high diagnostic potential, using self-learning classifiers and multi-layered architecture (including multilayer locally recurrent neural networks), trained and tested with commonly accepted databases.
- Investigation of hardware solutions on neural networks for optimization and future applications in hardware implementations with optimal computing resource.

The participation of Assoc. Prof. Todor Ganchev in the editorial boards of reputable foreign and national scientific journals and forums, as well as in international teams of scientific projects, is evidence of his high scientific authority and the importance of his scientific achievements.

7. Critical remarks and recommendations

I have no significant remarks on the presented materials, only few recommendations:

- Some of the publications related to automatic voice and speech analysis can be consolidated into a separate edition (monograph).
- Demonstrated in-depth knowledge in areas such as multidimensional vector analysis, conventional neural networks, optimization and classification models, self-learning models, etc., are a prerequisite for writing a teaching aids, with specific examples and practical applications that would greatly support learning to students from several courses.
- It would be good to point out the benefits and possible applications of hardware based architectures (FPGA) of the algorithms for data processing, using neural networks?

8. Personal impressions and opinion of the reviewer

I have personal impressions of the research work of Assoc. Prof. Dr. Todor Ganchev since his first specialization at the University of Patras. Over the years, through joint participation in various scientific forums and discussions, he has always demonstrated erudition and professionalism, which have established him as a leading specialist in the field of modern means and methods for automatic analysis of physiological signals. The admirations are worthy of the effort he has put into the creation, equipment and functioning of the Signal Processing and Analysis Laboratory.

The administrative and organizational skills of Assoc. Prof. Ganchev were also noticed by his colleagues, as a result of which he was elected on the position Vice-Rector.

9. CONCLUSION

The submitted materials allow an objective and versatile assessment of the applicant. Assoc. Prof. Todor Ganchev, PhD is a highly qualified and recognized scientist with national and international authority. His scientific work have contributed to solving current problems in the field of methods and algorithms for psychophysiological studies, behavioural analysis, early diagnosis of mental disorders, cognitive disorders, etc., based mainly on voice/speech analysis. Serious publishing activities and an impressive number of citations are proof of the value of the achieved results as well as the high degree of popularization among the scientific community in the country and abroad. The requirements of the national and institutional criteria for the occupation of the academic position of "professor" have been exceeded. This gives me a reason to suggest Assoc. Prof. Todor Dimitrov Ganchev, PhD, to take the academic position of "Professor" in the professional field: 5.3 "COMMUNICATION AND COMPUTER TECHNOLOGY", course: "Artificial Intelligence".

25. Sept. 2019

Reviewer:

/Prof. Eng. Ivo Iliev, DSc/