REVIEW

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3.5. Public communications and information sciences (Professor) and 3.2. Psychology (Doctor of Sciences)

on scientific papers for participation in a competition for Professor of Assoc. Prof. Maurice Avram Grinberg, M.D., scientific direction 3.2. Psychology, announced in SN No. 51/18/06/2021

I. Assessment of compliance with the minimum national requirements and requirements of the New Bulgarian University

Assoc. Prof. Dr. Maurice Greenberg meets 100% on some of the minimum national requirements for a professor, while others – many times exceeds. In particular, on 2 of the indicators, A and C – a requirement for doctorate and habilitation work, a candidate meets 100% national requirements. By the other indicators, he exceeds them many times. Two things I would like to note specifically, which I think are particularly important:

1. Work of Assoc. Prof. Greenberg in teams. This is evident from the projects presented in which he participates and from the joint publications. For me, in the 21st century, science works teamwork to better explore the problems studied and achieve a higher score.

2. A large number of citations. Many of the publications are in English, in reputable magazines and collections, with serious research results in which the candidate participates, which in turn leads to the possibility of more citations.

II. Research (creative) activities and results

1. Evaluation of monograph work, creative performances or other publications corresponding in volume and integrity of monographic work, including an assessment of the scientific and applied contributions of the author.

The monographic work with which Dr. Grinberg participated in the competition for professor – "Social Dilemmas: Cognitive Perspective" was published by the NBU in 2020.

The contribution of Assoc. prof. Greenberg, in the very first part of the monograph, is that through his critical analysis, he emphasizes the dignity of the classic Game Theory for formalizing social interactions. At the same time, it debates the possibilities of cooperation in different games that could lead to the success of the participants, something that prevents classical theory. Therefore, the second part of the monograph follows quite logically, namely – the introduction of the models of social preferences and taking into account the interests of the other player. These models are highly psychological, working with complex, sometimes diffuse, constructions such as altruism, reputation building and reciprocity.

Very strong and contributing is the third part of the monograph. In it, Dr. Greenberg presents three models of his own, designed to take into account different cognitive aspects such as learning with reinforcement and dependence on choice of the presented game. The author calls them CSRL and SARL. The contribution is the so-called "cooperation index", which Assoc. Prof. Greenberg used to describe the dependency of cooperation.

The fourth part of the monograph focuses on the introduction of the agent-based modeling method with reinforcement learning. A contribution point is that by presenting various multi-agent simulations based on artificial neural networks, a significant conclusion is reached: The availability of predictive capabilities leads to increased cooperation.

Not to be overlooked is the fact that the presented monograph for a competition for "professor" is based on 18 publications, in which Dr. Grinberg is the lead author. I fully support the conclusion that the author makes: "All these publications are united by the idea of a cognitive approach when examining decision-making in the experimental economy, which is based on the use of complex cognitive patterns in agent-based simulations modeling social interactions."

2. Evaluation of contributions to the other attached publications (creative performances) made after the appointment of the academic position "Associate Professor". It shall also include an assessment of the requirement to review the publications.

For the competition, Dr. Greenberg provides 5 chapters of monographs. On one he is the only author, the other two are co-authored, respectively with Evgenia Hristova, Lyubomir Jalev and Encho Gerganov; and another – in co-authorship with Evgenia Hristova. The book is a guide

published in English and titled "Efficiency and Usability of E-Learning Systems: Project-Oriented Methodology Guide".

With regard to the articles included in the evidence part of the competition, only those "referenced in *SCOPUS and Web of Science* and peer-reviewed publications in foreign publications, some of which have been quoted in international journals and publications" are selected by the candidate.

Divided by districts, or directions, they are:

1. Development of cognitive architectures for the description of higher cognitive processes (analogy) and their application for artificial cognitive agents on the Internet – 5 articles, one own, the other – in co-authorship. Sub-areas are also noted – Development of new mechanisms for describing reasoning by analogy in cognitive architecture AMBR/DUAL – 3 articles in co-authorship and Development and realization of predictive mechanisms based on analogy in the cognitive architecture AMBR/DUAL and their application in cognitive robotics – 3 articles in co-authorship. Or first direction is supported by a total of 11 articles.
2. Models of decision-making with reinforcement in the experimental economy. This section includes the monograph – the habilitation work for a "professor" application of Dr. Greenberg, plus 6 other articles.
3. Empirical research in experimental economics – 8 articles, also divided into two sub-areas.

The candidate's contributions to the competition for professor in the directions presented by me are:

In the first direction:

1. A new cognitive architecture called TRIPLE has been proposed, which combines symbolic, conic modules and a module taking into account the modulating role of emotions. The architecture includes a different more flexible mechanism for establishing matches between a target situation (perceived by the model) and the content of long-term memory, as well as a module taking into account the role of emotions.
2. Another contribution is the creation of an AMBR/DUAL model that allows a description of the so-called AMBR/DUAL model. "Blending" of episodes extracted from memory thanks to making an analogy as the effects of mixing are confirmed experimentally. A

memory extraction mechanism has also been proposed, which expands the capabilities of cognitive architecture to describe cognitive processes.

3. Mechanisms have been developed that allow decision-making to be taken based on expectations derived from only one situation in long-term memory. The developed model was used on an AIBO (Sony) robot.

In the second direction – The main part of the contributions are in the field of experimental economics. Several models have been developed that allow for behavioral experiments.

In the third direction:

1. In a series of studies, experiments have been conducted examining decision-making within the prisoner's dilemma. For the first time, some of them used eye-tracking equipment in the prisoner dilemma game to analyze players' attention and access to game-related information.

2. For the first time, the theory of relational models with different games is connected, which are also constructed on the basis of the Prisoner's Dilemma with a different way of distributing profits and explicitly assigning roles to players. In fact, this is how games turn into other games. The results show that setting a relational model changes the way you play and the level of collaboration.

In conclusion to this paragraph, I would like to emphasize the seriousness of the contributions in Dr. Greenberg's work, which I fully accept. And once again to share that all publications (without the monograph) are in English, which gives the authors access and opportunity to introduce the scientific public to the results of their research in this field of cognitive science.

3. Citation by other authors.

As I mentioned at the beginning, Assoc. Prof. Dr. Grinberg provides a reference to citations of his publications, most of which are co-authored with colleagues. Publications cited are 61, for which according to the national requirements for professor, Assoc. prof. Greenberg collected an impressive number of points together with other citations – namely, 915. Let me reiterate that 61 publications are quoted in reputable peer-reviewed and indexed scientific publications.

4. Evaluation of the results of participation in research and creative projects and application of the results obtained in practice.

Assoc. Prof. Dr. Maurice Greenberg participated in 5 international projects, namely: Cost Action 2102 "Cross-Modal Analysis of Verbal and Nonverbal Communication"; Intellectual Humanity project; Diversity-Aware Ranking; Measuring and Evaluating Heuristic Problem Solving; WELKOM Project. It is a requirement in international projects to have access to practice, so this is respected. The results are significant and I think this is obvious even in the titles of the projects.

Dr. Greenberg also participated in 5 other projects realized by with external funding and developed in NBU. He is a head of 4 of them – two under the Sixth EU Framework Program, one under the EU TEMPUS Program, for one funding Program is TURBOMECA. In one project he participated as an expert – under the FIFTH EU Framework Program. The projects were reported and the results were highly assessed.

III. Teaching and teaching activities

1. Auditorial and Non-Auditorial activity, work in the electronic training module "MOODLE – NBU", supervising of student practices and internships, work with students and PhD students.

The load with audience and outside the audience occupancy of Assoc. Prof. Greenberg is large. I will only point to audience courses that he leads alone or in a team: Modeling human cognitive processes through neural networks; Integration of the symbolic and neural network approach; Dynamic approach in cognitive science; The approach of dynamic systems and its application in developmental psychology; Cognitive processes in social and economic interactions (game theory); Cognitive systems; Web-based training; Neural networks. Unsurprisingly, Dr. Griberg also leads lecture classes related to his basic physics education. Most of the non-audience courses are accompanying base courses of Assoc. Prof. Greenberg. Out-Auditorial activity includes also supervision of practices and internships by Dr. Grinberg.

According to the requirement of New Bulgarian University – in Muddle Assoc. Prof. Grinbrg provided materials for students in all courses he leads.

Dr. Greenberg has participated repeatedly in committees of the department of student graduation. He is a scientific supervisor of graduates, as well as of two PhD students.

2. Working with Erasmus students.

Assoc. Prof. Greenberg works with Erasmus students in its courses, which enroll international Erasmus+ students.

3. Assessments in student surveys.

Not a small part of the courses of Assoc. Prof. Greenberg were rated by students by a maximum score of 5 (5-point system). All the others – with above average score. Student grades are a good attestation for Dr. Greenberg's teaching.

IV. Administrative and public activity

1. Participation in collective bodies of management of the NBU

Assoc. Prof. Dr. Maurice Greenberg is part of the Department of Cognitive Science and Psychology. He has also participated in meetings of the Faculty Council of Master Programs.

2. Attracting students to the program.

Dr. Greenberg actively leads a policy to attract students to the department's program.

V. Personal impressions of the applicant

I know Assoc. Prof Dr. Maurice Greenberg, as a colleague with whom we have worked as vice-rectors, I also know him in connection with the review of an excellent thesis of his PhD student. Balanced and cooperative, I believe that as a professor, Dr. Greenberg will further support the very good image of the Department of Cognitive Science and Psychology and will continue to work in teams in it.

VI. Opinions, recommendations and notes on the applicant's activities and achievements

I don't have critical notes. I have a sincere wish to Dr. Greenberg when he becomes a professor to work with the same enthusiasm and creativity as before.

Conclusion

It is clear from my review that I highly appreciate Dr. Greenberg's overall academic work – as a researcher, lecturer, and project participant, as well as his ability to team up with Bulgarian and foreign researchers. Therefore, I strongly propose to the esteemed scientific jury in the competition

to vote "Pro" and to propose to the Academic Council in New Bulgarian University to choose and approve Dr. Maurice Avram Grinberg for a Professor.

Date 17th of Sept. 2021   Signature................