REVIEW

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On the competition for an academic position of Assoc. Professor
Scientific field: 4. Natural Sciences, Mathematics and Informatics
Professional direction: 4.5 Mathematics
Specialty: Probability theory and mathematical statistics
For the needs of Institute of Mathematics and Informatics,
Bulgarian Academy of Sciences,
Announced in the State newspaper, number 8 of 26.01.2024,
and online on the website of IMI-BAN

Accordingly with Order №64/21.03.2024, I have been appointed for a member of the Scientific jury on the procedure of electing an Associate Professor for the needs of the Institute of Mathematics and Informatics, Bulgarian Academy of Sciences. On the first session, held on 5.04.2024 I was voted to write a review.

The review is prepared accordingly to the requirements of the Act of the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), Regulations for its implementation (PPZRASRB), as well as the specific regulations of the Bulgarian Academy of Sciences (PURPNSZAD-BAN) and the Institute of Mathematics and Informatics (PURPNSZAD-IMI-BAN).

One candidate is admitted to the competition, namely Assen Tchorbadjieff , PhD. I was provided with all the necessary documents, including

1. The application to the president of IMI-BAS for admission to the competition.
2. Higher education and PhD diplomas.
3. Professional CV.
4. Reference on the minimum national requirements under the ZRASRB as well as the specific requirements of the Bulgarian Academy of Sciences and the Institute of Mathematics and Informatics – BAS.

5. Lists of publications and citations related to the competition as well as the full texts of the publications.

6. A list of the scientific contributions of the candidate.

7. Lists with all publications and citations.

1 Information about the candidate

The candidate Assen Tchorbadjieff has a master's degree in Engineering Physics from the Faculty of Physics, Sofia University *st. Kliment Ohridski*. Later he defended his PhD in the field of High Energy Physics in 2013 at the Institute of Nuclear Research and Nuclear Energy, Bulgarian Academy of Sciences, where he worked till 2015. Since then, he has been an Assistant professor at the Institute of Mathematics and Informatics – BAS. The candidate has published 33 articles (18 of them are presented in the current competition) and they have 32 independent citations (15 of them are used in the competition).

2 Publications

Eighteen papers are presented for application. Seven of them are published in journals indexed in Web of Science, ten are indexed in Scopus, and one is indexed in ZentralBlatt. Two of the presented publications are independent, nine of them are with one co-author, one is with two co-authors, three are with three co-authors, two are with five co-authors, and one is with six co-authors. The papers fall mainly into two areas. The first group contains several empirical studies in different real-life areas such as meteorology, hydrology, astronomy, anthropology, etc [1-6,8,9,14,15]. The second group falls in the field of stochastic processes – branching, Lévy, birth-death [7,10-13,16-18]. Below we discuss the publications point by point.

- As I mentioned above, the papers [1-6,8,9,14,15] are empirical studies of several real-life phenomena based on some mathematical methods. The topic of article [1] is the transport of Saharan dust based on information from the observatory on Mussala Peak. Other data from the same observatory are presented in [2], see also [5]. Some anthropological studies are summarized in the article [3]. The influence of cosmic radiation has been studied by various statistical methods in [4,6,9]. The K-means clustering algorithm has been applied to some ecology tasks in [8], see also [14]. In article [15], the dynamics of COVID-19 is modeled.

- Various aspects of the theory of branching processes are discussed in articles [7,11,13,16,17]. The Kolmogorov equations arising from the Markov property are studied in [11,13,17]. In paper [16], it is proven that the alive particles in some moment follow a shifted Shibuya distribution if the branching mechanism is based on a mixture of logarithmic distributions. Some software applications are presented in [4,18]. A supercritical

branching process is studied in [7] under the assumption that the initial number of particles is random and follows a geometric (shifted or unshifted), negative binomial, or Pólya-Aeppli distribution. In addition, a linear birth-death process is modeled under similar assumptions in [12].

- I put the article [10] in a separate point because it is devoted to a different class of stochastic processes – the Lévy ones. A process, whose distribution at time one, is logarithmic is defined. Its main probabilistic properties as well as some subordinations have been studied – a negative-binomial process driven by a Gamma process and a logarithmic process driven by a standard Poisson one. In fact, the logarithmic Lévy process is a compound Poisson subordinator. In this light, it would be interesting to investigate a subordination when it is the driving process – for example, Brownian motion with a logarithmic time change.

3 Originality of the results

I do not detect any plagiarism in the presented materials.

4 Conclusion

To conclude, in my opinion, the provided materials indicate that the candidate Assen Tchorbadjieff satisfies the formal and informal requirements of the Institute of Mathematics and Informatics – BAS. Thus, I give a **positive appraisal** and recommend the Scientific Jury to suggest to the Scientific Council of IMI-BAS to elect Assen Tchorbadjieff for the academic position *Associate Professor* in the Scientific field: 4. Natural Sciences, Mathematics and Informatics; Professional direction: 4.5 Mathematics (Probability theory and mathematical statistics).

Reviewer:

/Assoc. Prof. Tsvetelin Zaevski, PhD/

Sofia, 30.05.2024