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
(Approximation models and applications)
For the needs of The Faculty of Mathematics and Informatics,
Paisii Hilendarski University of Plovdiv,
Announced in the State newspaper, number 96 of 17.11.2023,
and online on the website of the Plovdiv University

Accordingly with Order №21-389/16.02.2024, I have been appointed for a member of the Scientific jury on the procedure of electing an Associate Professor for the needs of the Faculty of Mathematics and Informatics, Paisii Hilendarski University of Plovdiv. On the first session, held on 22-23.02.2024 I was voted to write a review (protocol №1/23.02.2024).

The review is prepared according to the requirements of the Act of the Development of the Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for its implementation (PPZRASRB), as well as the specific regulations of Paisii Hilendarski University of Plovdiv.

One candidate is admitted to the competition, namely Maria Tonkova Vasileva-Chilibinova, PhD. I was provided with all the necessary documents, including

1. The application to the Rector of the University of Plovdiv 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 University of Plovdiv.
5. Reference for teaching activity.

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

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

8. Lists with all publications and citations.

1 Information about the candidate

The candidate Maria Vasileva-Chilibinova graduated from the Mathematical high school of Silistra. She has a master's degree in Applied Mathematics from Plovdiv University and later she defended her PhD in the field of Mathematical analysis in 2016. After that, Maria Vasileva-Chilibinova worked as an Assistant Professor at Plovdiv University giving lectures in different mathematical areas including mathematical analysis, differential equations, information technologies, applied and insurance mathematics, etc.

2 Publications

Twelve papers, one monograph, and one book are presented for application. Four of the papers are published in journals indexed in Web of Science (total IF of 10.7770), seven have SJR (two of them are published in conference proceedings), and one is not indexed in WoS or Scopus. Four of the presented publications are independent, five are with one co-author, four are with three co-authors, and one is with four co-authors. The papers fall mainly into two mathematical fields. The first one is related to the approximation of the polynomial roots, [1–3], whereas the second one considers some probability distributions in the light of the approximation theory. In addition, all results in the presented publications are illustrated by a variety of numerical and graphical examples. Below we discuss the publications point by point.

- The paper [1] is expired by investigations of (Farmer and Loizou, 1977), (Gargantini, 1978), and (Kyurkchiev,Andreev,Popov, 1984) and generalizes some recent results of Prof. Petko Proinov for approximation of polynomial roots. More precisely, two theorems for a local convergence of the algorithms are proven as well as their speed and efficiency are discussed. The papers [2] and [3] are devoted to the same topic and generalize the famous results of (Ehrlich, 1967) and (Nourein, 1977). A new family of high-order iterative methods is suggested. Several theorems for a (semi-) local convergence under different initial conditions are proven. In addition, the polynomials in the complex plane are admissible.

- The rest of the papers provide several results for some composite probability distributions related to the Hausdorff metrics between the cumulative distribution function (CDF) and some contour. Typically this contour connects the CDF endpoints by lines parallel to the axes. This way the so-called Hausdorff saturation arises. In addition to

the approximation interpretation, this term can be considered in the light of different scientific fields. For example, in the survival theory, it can be viewed as a speed of occurrence, whereas it can be used as a risk measure in the risk-management. Also, some approximations for the above-mentioned saturation are provided. They seem to be based on a first-order Taylor expansion. These results are summarized in the monograph [13]. Some inverse trigonometric compositions based on the Log-logistic and Weibull distributions are considered in [4] and [11]. A similar construction is proposed in [12]. The corresponding results for several exotic distributions, namely Omega and Pliant ones, are considered in [5]. A composition based on an underlying distribution $C(\cdot)$ and transformation $F(t) = 1 - \frac{C\left(\mu e^{-t}\right)}{C(\mu)}$ is discussed in [7]. For example, the distribution $C(\cdot)$ is chosen amongst the Binomial, Poisson, Geometric, and Logarithmic ones. A specific exponential composition named *odd Weibull inverted Topp-Leone* is studied in [8]. Another power-exponential composition is proposed in [9]. The so-called unit-Rayleigh distribution is discussed in [10].

- We state the paper [6] in a separate point because, in addition to the CDF approximation, the authors examine the relations between bell-shaped functions and a II-curve.
- The last presented publication is a joint book with Prof. Nikolay Kyurkchiev devoted to insurance mathematics. The book has scientific and real-life usefulness for teaching purposes as well as in the insurance practice.

3 Suggestions

I would like to recommend that publication activity be primarily in reputable scientific journals. Ratings and impact factors are not of primary importance.

4 Conclusion

To conclude, in my opinion, the provided materials indicate that the candidate Maria Vasileva-Chilibinova satisfies the formal and informal requirements of Plovdiv University. Thus, I give a **positive appraisal** and recommend the Scientific Jury to suggest Dr. Maria Vasileva-Chilibinova for the academic position *Associate Professor* in the Scientific field: 4. Natural Sciences, Mathematics and Informatics; Professional direction: 4.5 Mathematics (Approximation models and applications).

Reviewer:

/Assoc. Prof. Tsvetelin Zaevski, PhD/

Sofia, 21.03.2024