

OPINION

by **Associate Professor Leoneed M. Kirilov, PhD**

Inst. of Information and Communication technologies – Bulgarian Academy of
Sciences

on the Thesis for awarding educational and scientific degree “Doctor of Philosophy”
(PhD), under the Scientific field: 4. Natural Sciences, Mathematics and Informatics;
the Professional area: 4.6. Informatics and Computer Sciences, the Doctoral
program: Informatics

Author of the PhD Thesis: Emiliano Maksim Mankolli

**PhD thesis title: OPTIMIZATION METHODS FOR MACHINE
LEARNING APPLICATIONS**

According to the Order No. 319 from December 6, 2023 of the Director of the
Institute of Information and Communication technologies – Bulgarian Academy of
Sciences, I have been appointed as a member of the Scientific Jury regarding the
PhD thesis of Emiliano Maksim Mankolli for awarding educational and scientific
degree “Doctor of Philosophy” (PhD) in the Scientific field: 4. Natural Sciences,
Mathematics and Informatics; the Professional area: 4.6. Informatics and Computer
Sciences, the Doctoral program: Informatics.

At the first meeting of the Scientific Jury on December 8, 2023, it was decided that
I would write an opinion on the dissertation.

As a member of the Scientific Jury I have received:

1. Text of the Thesis for awarding educational and scientific degree "Doctor of Philosophy" in English;
2. Abstract of the Thesis both in Bulgarian and English;
3. Full text of the articles attached to the dissertation as an integral part of it in accordance with the requirements of ZRASRB and the Regulations for its implementation - five articles;
4. A reference for Emiliano Maksim Mankolli on fulfillment of the minimum requirements of the Institute of Information and Communication Technologies - BAS for awarding the educational and scientific degree "Doctor";
5. Order No. 319 from December 6, 2023 issued by IICT – BAS for designation of Scientific Jury (protocol No 12/29.11.2023).

Scientific advisor of the PhD student is Prof. Vassil Guliashki.

The dissertation is written on 138 pages and it consists of Introduction, 3 Chapters, Conclusion, Summary of contributions, List of publications attached to the dissertation, Declaration of originality, Acknowledgments. The text is illustrated with 17 figures and 5 tables.

The aim of the dissertation can be presented as follows: to develop methods based on machine learning (ML) and natural language processing (NLP) and apply them to the recruitment industry in order to optimize the selection process.

To achieve the aim, the following tasks are formulated:

- 1) Development of new efficient algorithms and models to improve the personnel selection process and in particular the screening of candidates for job matching.
- 2) To use MO and OEE approaches to improve the initial applicant screening process.

- 3) To use the approaches of the semantic analysis in order to improve the extraction of information and to refine the evaluation of the possibilities of job candidates.
- 4) To propose optimization approaches for screening candidates based on MO and OEE.

I believe that the set goal and tasks accurately reflect the main ideas developed in the dissertation work. The obtained results and their relevance are well presented in the main text.

The contributions of the dissertation are as follows:

Scientific contributions:

- 1) Analysis of the application of machine learning (ML) and natural language processing (NLP) methods in the recruitment industry is made.
- 2) A method combining Word2vec and SVM is proposed for systematic candidate screening with application in the recruitment industry.
- 3) A method based on BERT and XGBoost is proposed to further refine candidate selection.
- 4) A holistic approach is proposed to assess candidates' potential for recruitment success.
- 5) A model for predicting job success is formulated.

Scientific and applied contributions:

- 6) An algorithm for optimizing the set of candidates on the basis of «job title-similarity» for effective recruitment is proposed.
- 7) An advanced hybrid method using BERT and XGBoost models is proposed to refine candidate selection. The method works faster and uses less memory.
- 8) A new vision for the development of the recruitment industry in the context of globalization and Artificial Intelligence (AI) is proposed.

Attached to the dissertation work are five publications in English in which part of the scientific results are reflected. Four of the articles are co-authored. One of the articles was published in an international publication with an impact rank. The other four are published in IEEE and are viewable in Scopus. It can be concluded that the obtained results are recognized in scientific circles.

The abstract has a volume of 39 pages. I believe that it faithfully reflects the content of the dissertation work.

Conclusion

I accept that the requirements of the Law on the Development of Academic Staff in the Republic of Bulgaria (ZRASRB), the Regulations for its implementation, the Regulations on the terms and conditions for obtaining scientific degrees and holding academic positions at BAS and the Regulations on specific conditions for acquisition of scientific degrees and for holding academic positions at the Institute of Information and Communication Technologies – BAS are met.

I give my **positive assessment** for the acquisition of the educational and scientific degree "doctor" of Emiliano Maksim Mancolli.

I recommend to the esteemed Scientific Jury members to award the educational and scientific degree "Doctor" of Emiliano Maksim Mancolli in the scientific field: 4. Natural Sciences, Mathematics and Informatics, Professional field: 4.6 Informatics and Computer Science, doctoral program: Informatics

Date: 6.02.2023

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