

STATEMENT REPORT

by **Prof. Daniela Ananieva Orozova, DCs - Trakia University – Stara Zagora**

of a dissertation submitted for the award of the educational and scientific degree **Doctor (PhD)**, **Field of Higher Education:** *4. Natural Sciences, Mathematics and Informatics*,
Professional Field: *4.6 Informatics and Computer Science*,

Doctoral Programme: *Informatics*

Dissertation Title: “Research on the Development of an Ambient-Oriented Route Generator”

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Scientific Supervisor: Prof. Asya Stoyanova-Doycheva, PhD, *Paisii Hilendarski* University of Plovdiv

1. General Description of the Submitted Materials

By Order No. RD-22-1309 dated 29.06.2026 of the Rector of “Paisii Hilendarski” University of Plovdiv (PU), I was appointed as a member of the Scientific Jury responsible for conducting the procedure for the defense of the dissertation entitled “*Research on the Development of an Ambient-Oriented Route Generator*” for the award of the educational and scientific degree Doctor (PhD) in the field of higher education *4. Natural Sciences, Mathematics and Informatics*, *professional field 4.6 Informatics and Computer Science*, doctoral programme *Informatics*. The author of the dissertation is Georgi Kostadinov Kostadinov, a full-time PhD student at the Department of Computer Systems, Faculty of Mathematics and Informatics, under the supervision of Prof. Asya Stoyanova-Doycheva, PhD from “Paisii Hilendarski” University of Plovdiv.

All documents included in the dissertation defense package have been prepared accurately and meticulously in accordance with the requirements of the Regulations for the Implementation of the Academic Staff Development Act in the Republic of Bulgaria and Article 36(1) of the Regulations for Academic Staff Development of PU.

2. Relevance of the Topic and Appropriateness of the Objectives and Tasks

The dissertation examines the design of an ambient-oriented intelligent tourist guide - a system that combines ontological (semantic) representation of cultural and historical heritage with a dynamic, context-dependent assessment of the accessibility of sites to be visited. The topic is undoubtedly relevant - it fits into the actively developing direction of “Smart tourism”, in which personalization, contextual awareness and explainability of recommendations are important requirements. The topic directly affects the problem of accessible tourism with a clear connection to the European Commission's strategy for the rights of people with disabilities for the period 2021–2030. The work concerns the controlled use of large language models (LLM) to supplement incomplete data - an issue of exceptional relevance, given the rapid penetration of generative artificial intelligence into practical systems and the new regulatory requirements

for transparency introduced by Regulation (EU) 2024/1689 (EU AI Act), to which the doctoral student refers.

The main objective is formulated clearly and specifically on page 11 of the dissertation “to design, implement and substantiate a two-stage model of an ambient-oriented intelligent tourist guide, in which a semantic retrieval of candidates based on ontological knowledge is followed by an ambient re-ranking that takes into account the user profile and the dynamic external context, with the aim of generating practically feasible and explainable routes to cultural and historical sites”.

To achieve this objective, three main sub-objectives are formulated, elaborated in specific research tasks. They are logically related to the main objective and lead to its realization.

The topic fully corresponds to Professional Field 4.6 “Informatics and Computer Science. The topic is undoubtedly relevant and significant both in scientific and applied terms, and the set goal, sub-goals and tasks are appropriate, specific and adequate to the subject of the study.

3. Knowledge of the Problem

The PhD student demonstrates a thorough and systematic knowledge of the problem area. **Chapter 1** presents a well-structured and critical review of the existing literature in several areas: classical and hybrid recommender systems, context-sensitive and mobile tourist guides, ontological and semantic modeling of the tourist domain, as well as the specialized issues of accessibility, explainability and working with incomplete/uncertain data.

A valuable element of the literature review is the systematic comparative analysis (Section 1.5), in which fifteen representative systems from the literature are compared along five key axes (semantic description, accessibility, meteorological context, AI-completion, explainability), supplemented with an axis for global route optimization for the purpose of a balanced comparison. This analysis does not simply list previous developments, but argues a specific research niche in which the current work is positioned. The doctoral student also shows good awareness of commercial platforms (Google Maps, TripAdvisor, Foursquare), correctly indicating the difference between their practical scope and the scientific task considered in the dissertation. The dissertation text is clear, precise, and analytical.

4. Research Methodology

The methodology employed in the dissertation is comprehensive and appropriate to the stated objective. The dissertation follows a logical sequence from theoretical formulation (Chapter 2), through engineering implementation (Chapter 3), to quantitative and qualitative experimental validation (Chapter 4).

An important methodological contribution is the use of two complementary corpora of data: a controlled synthetic set of 100 tourist sites in Plovdiv, with a precisely defined distribution of semantic categories, accessibility and exposure, and a real corpus of 143 sites of the cultural and historical heritage of Bulgaria with a center in Gabrovo, in which the missing characteristics (accessibility, exposure, opening hours) are supplemented through controlled AI-completion.

5. Characteristics and Evaluation of the Dissertation

The dissertation has a total volume of 157 pages and is structured in an introduction, four chapters, a conclusion, a list of publications, references and six appendices. The structure is logical, the presentation is consistent, and the language is precise and terminologically sound.

Chapter 2 offers a comprehensive architectural presentation of the ambient-oriented tour guide, with a clear division between presentation, application and integration layers and a knowledge base, as well as a well-founded distinction between ontological concepts and ontological instances.

Chapter 3 presents a technically sound implementation of the prototype (Spring Boot, JPA, Spring AI, relational database with JOINED inheritance, integration with the Open-Meteo weather service and with the GPT-5.4 language model for controlled completion of missing data, protected by circuit breaker and bulkhead mechanisms). Special attention deserves the precise distinction of the semantic function of the four ambient factors - location and working hours act as hard filters, accessibility - as a personal elimination filter, and exposure - as a multiplicative corrective factor that does not eliminate, but rearranges the objects. This distinction is related to the quality of the explainability layer.

Chapter 4 presents an experimental validation with clearly presented and well-commented quantitative results. The full ambient model shows a measurable and, in many cases, impressive improvement over the baseline proximity strategy: in the wheelchair profile Precision@10 increases from 0.100 to 0.900 (and feasibility from 70% to 100%), in hot weather nDCG@10 increases from 0.624 to 0.934, and in a limited time window from 0.237 to 0.791. The analysis shows that different ambient factors have different, clearly measurable contributions depending on the profile and context, which supports the main thesis of the dissertation.

The appendices (API specification, advanced validation scenarios, implementation guidelines, data quality risk analysis, error handling, glossary) significantly complement the main text.

6. Contributions and Significance of the Research for Science and Practice

I accept the main contributions that the doctoral student has formulated on pages 110 and 111 of the dissertation, divided as: conceptual and scientific-applied results, applied and methodological results.

I consider the claimed contributions to be genuine, well-argued, and substantially validated within the dissertation. They may be classified as contributions that enrich existing scientific knowledge and represent scientific achievements in practice, as well as the creation of new methods, approaches, and models, and the modification of existing ones for solving the problems addressed in the dissertation.

For science, the significance lies in the proposed reasoned model for the integration of semantics, personalization, dynamic context and controlled use of generative artificial intelligence - an issue of growing importance far beyond the tourism domain. The significance of the development for practice stems primarily from the fact that it does not remain at the level of a conceptual model, but is implemented as a working prototype with a transparent and well-documented architecture, which facilitates its future implementation and upgrading.

7. Evaluation of the Publications Related to the Dissertation

The PhD student has presented a total of four publications on the topic of the dissertation work, three of which are indexed in the scientific databases SCOPUS/WoS. All the presented publications are co-authored, and in two of the publications the doctoral student is the first author.

The Minimum National Requirements under Article 2b, paragraphs 2 and 3, respectively the requirements under Article 2b, paragraph 5 of the Academic Staff Development Act of the Republic of Bulgaria, as specified in the Regulations for its Implementation for obtaining the educational and scientific degree “Doctor” in Professional Field 4.6, have been fulfilled. According to these requirements, at least 30 points must be accumulated under indicator group G, whereas the doctoral candidate has achieved 54 points.

The doctoral candidate has submitted a declaration of originality and authenticity. There is no evidence of plagiarism established in accordance with the legally prescribed procedures concerning the submitted dissertation or scientific publications.

8. Abstract

The abstract complies with the requirements of the Regulations for the Implementation of the Academic Staff Development Act in the Republic of Bulgaria. It consists of 32 pages, is well structured, and accurately reflects the content of the dissertation, the main aspects of the research, and the achieved results.

9. Critical Remarks and Recommendations

The dissertation is characterized by the relevance of its topic, a strong practical orientation, and a substantial volume of research and scientific-applied work. Alongside its unquestionable merits, the following remarks may be made:

- The weighting coefficients and thresholds of individual ambient factors (e.g. the non-monotonic urgency curve during working hours or the modifiers for adverse weather) seem to be reasonably and carefully selected, but remain largely heuristically set by the author, without analysis against alternative values;
- The AI-inference mechanism relies on a single language model (GPT-5.4) without any comparative assessment of the robustness of the results against another model, version, or multiple executions, given the declared goal of system reliability;
- The size of the two experimental corpora (100 and 143 subjects) is not accompanied by statistical testing of the significance of the observed differences (e.g., confidence intervals, bootstrap estimates, or significance tests), which limits the strength of the quantitative conclusions.

I recommend that the doctoral candidate continue the initiated research, as the topic has a high degree of applicability and broad prospects for future development. In future work, it would be beneficial to place greater emphasis on developing objective criteria for evaluating the model's effectiveness under different application conditions.

The remarks and recommendations made above do not diminish the scientific value of the achieved results; rather, they outline opportunities for further development and improvement of the research.

10. Personal Impressions

I do not know the doctoral candidate personally.

CONCLUSION

The dissertation is an independent, in-depth and well-documented scientific study, addresses a relevant and practically significant scientific problem, demonstrates a high level of scientific-applied implementation, and exhibits strong applicability in the field of tourism and recommender systems. The stated objective and tasks have been successfully accomplished. The obtained results possess scientific, scientific-applied, and practical significance and comply with the requirements of the Academic Staff Development Act of the Republic of Bulgaria, the Regulations for its Implementation, and the corresponding Regulations of “Paisii Hilendarski” University of Plovdiv. The doctoral candidate possesses profound theoretical knowledge in the field of Informatics and demonstrates the ability to conduct independent scientific research.

All of the above provides sufficient grounds for a positive evaluation of the dissertation. Therefore, ***I propose that the esteemed Scientific Jury award the educational and scientific degree Doctor (PhD) to Georgi Kostadinov Kostadinov in the field of higher education 4. Natural Sciences, Mathematics and Informatics, professional field 4.6 Informatics and Computer Science, doctoral programme Informatics.***

07.09.2026. г.

Member of the Scientific Jury:
(Prof. Daniela Orozova, DCs.)