IRSTI 18.49.01 **DOI 10.56032/2523-4684.2025.3.15.22**
UDC 793.31

T. I. Kazashka [1*]
[1] *Academy of Music, Dance and Visual Arts 'Professor Asen Diamandiev'*
ORCID ID: *0000-0002-0375-8891*
E-mail: *tsvetomira.ivanova@artacademyplovdiv.com*
(Plovdiv, Bulgaria)

V. V. Tabakova-Komsalova [2]
[2] *Paisii Hilendarski' University of Plovdiv*
ORCID ID: *0000-0002-0617-9844*
E-mail: *komsalova.veneta@gmail.com*
(Plovdiv, Bulgaria)

ONTOLOGY FOR DIGITAL TRANSFORMATION OF BULGARIAN DANCE FOLKLORE

Annotation

This paper presents an ontology describing Bulgarian dance folklore as part of Bulgaria's cultural and historical heritage. The study focuses on a specific dance piece – "Horo in Sofia", choreographed by Kiril Djenev. The ontology is developed in accordance with the CCO (Cataloging Cultural Objects) standard, which provides guidelines for data content standards. The created ontological structure serves as a knowledge base intended for use by intelligent agents. The application of standards significantly facilitates data dissemination, with CCO providing clear and precise definitions of the attributes an object should possess. The ontologies, developed in Protégé, are designed to meet the requirements of this standard. Five key characteristics were used to represent the dance: ethnographic area, artistic-social function, participant composition, number of participants, and musical accompaniment. Semantic modeling utilizes RDF, and the additional application of RDFS and OWL provides a powerful toolkit for modeling and creating ontologies. This work lays the foundation for the digital transformation of Bulgarian dance heritage and provides a valuable resource for researchers, teachers, and students. The development is part of a broader project focused on the digitization of cultural and historical heritage.

Key words

ontology, bulgarian folk dance, Cataloging Cultural Objects (CCO), Protégé.

Cite

Kazashka, T. I., Tabakova-Komsalova, V. V. 2025. Ontology for digital transformation of Bulgarian dance folklore. "Arts Academy" Scientific Journal, no. 3(15): 21–39.

ҒТАХР 18.49.01 **DOI 10.56032/2523-4684.2025.3.15.22**
ӘОЖ 793.31

Т.И. Казашка [1*]
[1] *Професор Асен Димандиев атындағы музыка, би және көркемөнер академиясы*
ORCID ID: *0000-0002-0375-8891*
E-mail: tsvetomira.ivanova@artacademyplovdiv.com
(Пловдив, Болгария)

В. В. Табакова-Комсалова [2]
[2] *Паисий Хилендарски атындағы Пловдив университеті*
ORCID ID: *0000-0002-0617-9844*
E-mail: komsalova.veneta@gmail.com
(Пловдив, Болгария)

БОЛГАРИЯ БИ ФОЛЬКЛОРЫН САНДЫҚ ТРАНСФОРМАЦИЯЛАУ ОНТОЛОГИЯСЫ

Аннотация

Бұл мақала Болгарияның мәдени-тарихи мұрасының бір бөлігі болып саналатын болгар би фольклорын сипаттайтын онтологияны ұсынады. Зерттеу Кирил Дженев қойған «Софиядағы Хоро» биіне баса назар аударады. Онтология деректер мазмұнын стандарттауға арналған нұсқауларды ұсынатын CCO (Cataloging Cultural Objects) стандартына сәйкес әзірленді. Әзірленген онтологиялық құрылым интеллектуалды агенттердің пайдалануына арналған білім базасы ретінде қызмет етеді. Стандарттарды қолдану деректерді таратуды айтарлықтай жеңілдетеді, ал CCO объектінің иеленуі тиіс атрибуттарға анық әрі дәл анықтамалар береді. Protégé бағдарламасында жасалған онтологиялар осы стандарттың талаптарына сай әзірленген. Биді сипаттау үшін бес негізгі көрсеткіш пайдаланылды: этнографиялық аймақ, көркем-әлеуметтік функция, қатысушылардың құрамы, қатысушылар саны және музыкалық сүйемелдеу. Семантикалық модельдеуде RDF қолданылады, ал RDFS пен OWL-ды қолдану модельдеу мен онтология құруға арналған қуатты құралдар жиынтығын ұсынады. Бұл зерттеу болгар би мұрасының цифрлық трансформациясына негіз қалайды және зерттеушілер, оқытушылар мен студенттер үшін құнды ресурс болып табылады. Аталған жұмыс мәдени-тарихи мұраны цифрлық форматқа көшіруге бағытталған кең ауқымды жобаның бір бөлігі болып табылады.

Түйінді сөздер

онтология, болгариялық халық биі, Cataloging Cultural Objects (CCO), Protégé.

Дәйексөз үшін

Казашка, Т.И., Табакова-Комсалова, В. В. 2025. Болгария би фольклорын сандық трансформациялау онтология. "Arts Academy" ғылыми журналы, № 3 (15): 21-39.

МРНТИ 18.49.01 **DOI 10.56032/2523-4684.2025.3.15.22**
УДК 793.31

Т. И. Казашка [1*]
[1] *Академия музыки, танца и изобразительных искусств имени профессора Асена Димандиева*
ORCID ID: *0000-0002-0375-8891*
E-mail: tsvetomira.ivanova@artacademyplovdiv.com
(Пловдив, Болгария)

В. В. Табакова-Комсалова [2]
[2] *Пловдивский университет имени Паисия Хилендарского*
ORCID ID: *0000-0002-0617-9844*
E-mail: komsalova.veneta@gmail.com
(Пловдив, Болгария)

ОНТОЛОГИЯ ДЛЯ ЦИФРОВОЙ ТРАНСФОРМАЦИИ БОЛГАРСКОГО ТАНЦЕВАЛЬНОГО ФОЛЬКЛОРА

Аннотация

В данной статье представлена онтология, описывающая болгарский танцевальный фольклор как часть культурно-исторического наследия Болгарии. Исследование сосредоточено на конкретном танце «Хоро в Софии», поставленном Кирилом Дженевым. Онтология разработана в соответствии со стандартом CCO (Cataloging Cultural Objects), который определяет руководящие принципы для стандартизации содержания данных. Разработанная онтологическая структура служит базой знаний, которую могут использовать интеллектуальные агенты. Использование стандартов существенно облегчает распространение данных, при этом CCO обеспечивает четкие и точные определения атрибутов, которыми должен обладать объект. Онтологии, созданные в Protégé, разработаны в соответствии с требованиями данного стандарта. Для представления танца использованы пять ключевых характеристик: этнографический регион, художественно-социальная функция, состав участников, количество участников и музыкальное сопровождение. Для семантического моделирования применяется RDF, а использование RDFS и OWL дополнительно предоставляет мощный инструментарий для моделирования и создания онтологий. Настоящее исследование закладывает основу для цифровой трансформации болгарского танцевального наследия и предоставляет ценный ресурс для исследователей, преподавателей и студентов. Данное исследование является частью более масштабного проекта, направленного на оцифровку культурно-исторического наследия.

Ключевые слова

онтология, болгарский народный танец, Cataloging Cultural Objects (CCO), Protégé.

Для цитирования

Казашка, Т. И., Табакова-Комсалова, В. В. 2025. Онтология цифровой трансформации болгарского танцевального фольклора. Научный журнал “Arts Academy”, № 3(15): 21-39.

Introduction. Cultural and creative industries are a highly innovative component, possessing significant potential for capital formation and the creation of new jobs through the generation and utilization of intellectual property (Kazashka, Ruseva, Stoyanova 2017).

The creation of an ontology for folk dances enables their systematization, classification, and presentation in a digital format, accessible for analysis in intelligent systems. The aim of this study is to develop an ontology-based model for the digital transformation of Bulgarian dance folklore using the CCO standard (Cataloging Cultural Objects). Ontologies facilitate knowledge exchange between different systems, improve automated search and information retrieval. They are useful for maintaining dependencies in databases and complex structures. In the academic environment, they facilitate access to library resources for students, faculty, and administrators. The standard emphasizes the principles of good cataloguing and documentation rather than rigid rules that would prevent informed judgments (Baca et al. 2006).

State of the art. The topic is relevant with new research from around the world that adds to the presented picture in 2024 (Kazashka et al. 2024) with new insights.

- The paper of Zhou, Wenjing, Chen, Weigen, China first introduces ontology construction, knowledge extraction, and graph databases in the process of constructing a knowledge graph based on folk dance (Zhou and Chen 2024).
- Kuketov, Shankibayeva, Kazakhstan designates the ontology-oriented approach as the most accurate method for studying traditional national dance, facilitating a comprehensive analysis of traditional Kazakh dance as a whole, through which Kazakh folk dance occupies its significant place in the traditional culture of the people (Kuketov and Shankibaeva 2025).
- Paul, Das, Rao, India - A literature review in the field of dance studies, which uses ontological artifacts to manage domain-specific knowledge (Paul, Das and Rao 2024).
- Leyva, USA - Defines dance as an overlooked art form and develops a metaphysical realistic ontological approach to dance and sport, based on embodiment (Leyva 2024).
- Ma, Benferhat, Bouraoui, Do, and Nguyen, Vietnam - Propose the initial steps for reconstructing a meaningful schema of Vietnamese traditional dances (VTD). They focus on analysing and collecting knowledge from dance experts at art schools in Vietnam to classify and define the key characteristics for preserving the VTD Ontology (Ma et. al. 2018).

Taken together, these studies demonstrate the growing academic interest in ontology-based approaches to preserving and analyzing national dance traditions. While the regional

focus and methodological frameworks differ, all authors emphasize the role of ontological modelling in structuring cultural knowledge and ensuring its digital accessibility. However, comparative studies across different cultural contexts remain limited, and the integration of artistic, semantic, and technological dimensions is still under development. Overall, the use of ontologies for dance folklore is a dynamically evolving research field that attracts scholars from various cultural and disciplinary backgrounds, creating a strong foundation for further interdisciplinary work and the addition of new and up-to-date studies.

Materials and Methods. The object of the study is the Bulgarian folk dance *"Horo in Sofia"* choreographed by Kiril Djenev, which is included among ten dances presented in the developed ontology. The research applies an ontology-based approach aimed at systematizing, classifying, and digitally representing folk dances. The ontology is developed according to the CCO (Cataloging Cultural Objects) standard, ensuring consistency in describing cultural objects. The modeling process was conducted using the *Protégé* software environment, which supports the RDF, RDFS, and OWL standards. These tools enable the semantic representation of data and the construction of hierarchical structures describing dance attributes. The methodological steps included the analysis of dance features, formalization of data, visualization of relationships, and validation of the ontology structure.

An Ontology of Bulgarian Dance Folklore - a presented example with the dance "Horo in Sofia" choreographed by Kiril Djenev. We specifically examine the dance "Horo in Sofia," one of a total of 10 dances presented in the developed ontology, which is part of dissertation titled "Creation of an Ontology of Bulgarian Dance Folklore" (Kazashka 2025). The choreography is by Kiril Djenev, and the music is by Kosta Kolev. The dance takes the form of a suite, filled with images and situations that blend smoothly and lead the action toward its climax and conclusion. It transports us to Sofia, where, at the Sunday horo, people from different regions come together – Shopi, soldiers, guards, and girls from various areas – including „Shopkincheta", „Samokovki", and „Vakarelski". The individual episodes intertwine and develop, with the choreographers and composers demonstrating how form, content, and vocabulary are created, while preserving the style and character of the dance, and ensuring all the main elements exist in a harmonious symbiosis (Djeneva 2015).

The ontology is not just a standard classification or hierarchical arrangement of concepts. In the context of web ontology (OWL), the ontology is based on de-scription logic (DLs) – a class of formal languages used to represent knowledge. The goal of using OWL is to provide the highest possible

expressiveness in logical descriptions. They include term dictionaries, as well as objects with their at-tributes. The model for semantic modelling uses RDF. The additional use of RDFS and OWL provides powerful tools for modelling and creating ontologies. To represent the dance "Horo in Sofia," five characteristics were used (Fig.1.)– ethnographic region, artistic-social function, composition of participants, number of participants, and accompaniment (Ivanova; Madanska; Stoyanov 2023).

The developed ontology not only systematizes dance characteristics but also reveals the internal logic and relationships between artistic, ethnographic, and musical elements of Bulgarian dance folklore. Through the combination of semantic modeling and standardized description (CCO and OWL), the model demonstrates how structural components—such as movement type, participant composition, and regional style—interact to form a unified cultural identity within the digital environment. This interconnection allows for comparative analysis between different folk dances and supports the integration of intangible cultural data into broader knowledge systems. The ontology thus serves both as a methodological framework for future research and as a practical tool for preserving and teaching traditional Bulgarian dances.

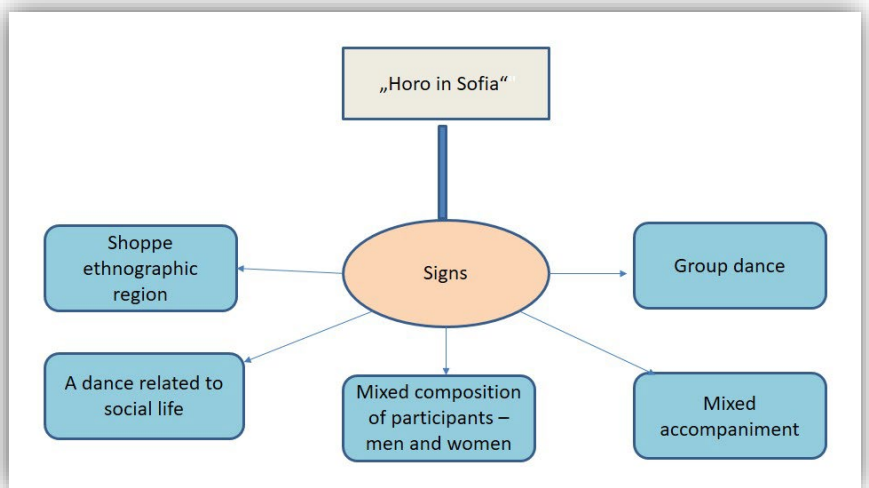

Fig. 1. *The dance "Horo in Sofia" with its five characteristics*

Dance characteristics and their taxonomic classification can be semantically represented by creating a class hierarchy and defining axioms through different types of properties – object properties, data properties, and

annotations (Fig. 2). The composed axioms for objects and their instances characterize the concepts with their general and specific traits. These can be used to track the sequence of data. Statements are presented such as: the class "Horo in Sofia" is a subclass of the class "Traditional Bulgarian Dance based on the works of Kiril Djenef." The classes are defined using the PascalCase approach, while the properties are defined using the camel Case approach.

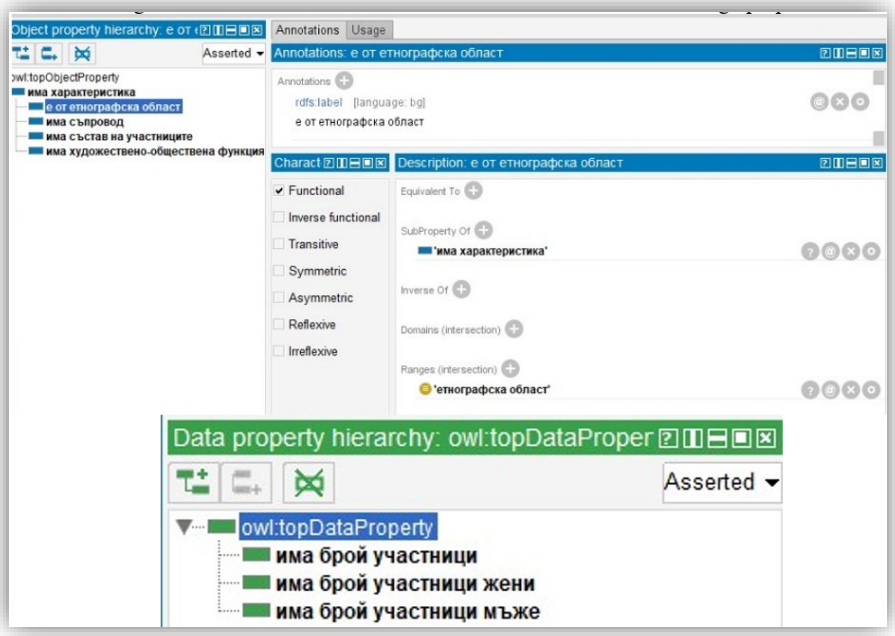

Fig. 2. Classes described with properties

In the next stage, annotations in the form of labels in both English and Bulgarian were created. Statements for the classes were defined through properties.

A large part of the classes is described with axioms (Fig. 3). For example, a chamber dance – it has a number of participants, an integer, less than or equal to five.

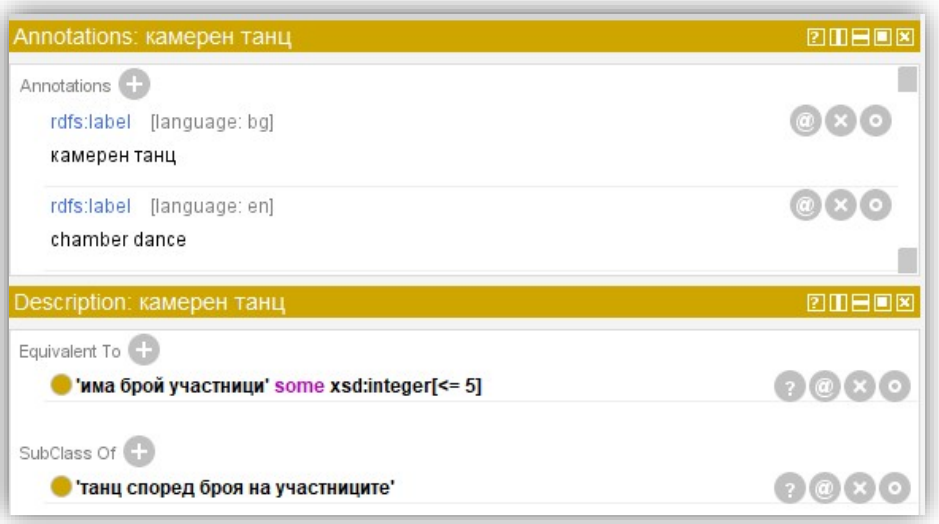

Fig. 3. Classes described with axioms

Similar to the Structured Query Language - SQL in relational databases, OWL ontologies also have a specified query language - SPARQL

Protocol and RDF Query Language - SPARQL (W3C 2013). A SPARQL query is a graph with variables instead of values. The data is represented by the familiar "triples", but the search is a variable(s), and the query results match the pattern. (Madanska 2022).

Discussion. The developed ontology contributes to the broader field of digital humanities by providing a structured model for the representation and preservation of intangible dance heritage. Its application demonstrates how cultural knowledge can be translated into a formalized digital environment without losing artistic and ethnographic depth. Compared with earlier ontology-based frameworks for dance (Leyva 2024; Ma et al. 2018), the presented model integrates artistic, social, and musical components into a coherent semantic system that reflects the multidimensional nature of Bulgarian folk choreography. This allows for a more holistic understanding of traditional dance as both a cultural artifact and a living practice.

Furthermore, the ontology establishes a methodological basis for comparative research across national traditions. By applying the same descriptive logic and data structure, it becomes possible to identify shared motifs, regional variations, and stylistic parallels between Bulgarian, Kazakh, Vietnamese, and other folk dances discussed in previous studies (Kuketov and Shankibaeva 2025; Zhou and Chen 2024). Such cross-cultural interoperability expands opportunities

for educational use, museum curation, and cultural policy development, reinforcing the value of ontology-driven approaches in the digital preservation of heritage.

Conclusion. The task of collecting and organizing knowledge about Bulgarian folk heritage into ontologies is quite challenging and requires time and resources. However, the developed ontology lays the foundation for digital transformation in this field through the development and implementation of an intelligent agent that serves the needs of teachers and students in the area of Bulgarian dance folklore. The model provides a unified semantic structure that enables interoperability of cultural data and facilitates its reuse in different digital platforms.

An extended team of researchers has been working for many years on the development of a computer system related to the cultural and historical field of interest. Initially, it was part of DeLC (Distributed e-Learning Center) (Trendafilova 2007) (Ganchev et al. 2008; Stoyanov et al. 2012; Stoyanov 2012), and later it evolved into an independent project – the Virtual-Physical Space "Bulgarian Cultural-Historical Heritage" at Plovdiv University (Stoyanov et al. 2021). The present research extends this work by introducing a methodological framework for describing intangible dance heritage through ontology-based modeling. The developed system demonstrates how artistic, ethnographic, and musical data can be represented in a logically consistent and machine-readable form. It also offers a transferable model that may be adapted to other national folklore systems, promoting comparative studies and cross-cultural dialogue. Future work will focus on expanding the ontology with additional categories and metadata, improving automated reasoning, and integrating the model into educational and museum applications.

Acknowledgements. The authors express their gratitude to the project "Transformation: A Network for a Sustainable Future through the Exchange of Experience and Knowledge" (Project No. KP-06-COST-7/2024), funded by the Bulgarian National Science Fund.

References:

1. Baca, M., P. Harpring, E. Lanzi, L. McRae, and A. Whiteside. 2006. *Cataloging Cultural Objects: A Guide to Describing Cultural Works and Their Images.* Chicago: American Library Association. https://vraweb.org/wp-content/uploads/2020/04/CatalogingCulturalObjectsFullv2.pdf

2. Djeneva, D. 2015. *Repertoarni Aktsenti pri Rezhisirane* [*Repertoire Accents in Staging*]. Plovdiv: Akademiya za muzikalno, tantsovo i izobrazitelno izkustvo.

3. Ganchev, I., S. Stojanov, M. O'Droma, and D. Meere. 2008. "InfoStation-Based Adaptable Provision of M-Learning Services: Main Scenarios." *International Journal of Information Technologies and Knowledge* 2 (5): 475–82. http://hdl.handle.net/10525/206

4. Ivanova, T., S. Madanska, and I. Stoyanov. 2023. "Formal Representation of Bulgarian Folk Dances." In *Proceedings of the International Scientific Conference Informatics, Mathematics, Education and Their Applications (IMEA'2023)*, 48–49. Pamporovo, Bulgaria: Plovdiv University Press. https://imea2023.fmi-plovdiv.org/wp-content/uploads/2023/11/4_9_Abstract_Ivanova_Madanska_IStoqnov_48_49-1.pdf

5. Kazashka, T., S. Madanska, V. Tabakova-Komsalova, D. Djeneva, and I. Nedelchev. 2024. "Development of an Ontology of Bulgarian Dance Folklore." *Digital Presentation and Preservation of Cultural and Scientific Heritage* 14: 265–72. https://doi.org/10.55630/dipp.2024.14.25

6. Kazashka, Ts. 2025. *Creation of an Ontology of Bulgarian Dance Folklore.* Plovdiv: Rakursi Publishing House, AMTII "Prof. Asen Diamandiev." ISBN 978-619-7682-52-6

7. Kuketov, B., and A. Shankibaeva. 2025. "An Ontology-Oriented Approach to Traditional Dance: On the Example of Kazakh Dance." *Central Asian Journal of Art Studies* 9 (4): 241–55. https://doi.org/10.47940/cajas.v9i4.956

8. Leyva, A. 2024. "Dancing in Movements, Movements in Sports: A Comparative Approach toward a Metaphysical Realist Ontology." *Sport, Ethics and Philosophy.* https://doi.org/10.1080/17511321.2024.xxxxxx

9. Madanska, S. 2022. "Semantic Modeling of the Bulgarian Revival Architecture for the Modern Forms of Alternative Tourism." *Cultural and Historical Heritage: Preservation, Presentation, Digitalization (KIN Journal)* 8 (1): 164–73. https://doi.org/10.55630/KINJ.2022.080114

10. Ma, T. T., S. Benferhat, Z. Bouraoui, T. N. Do, and H. H. Nguyen. 2018. "Developing Application Based upon an Ontology-Based Modelling of Vietnamese Traditional Dances." In *2018 3rd Digital Heritage International Congress (DigitalHERITAGE), Held Jointly with the 2018 24th International Conference on Virtual Systems & Multimedia (VSMM 2018)*, 1–7. IEEE. https://doi.org/10.1109/DigitalHeritage.2018.xxxxx

11. Paul, S., P. P. Das, and K. S. Rao. 2024. "Ontology in Dance Domain – A Survey." *ACM Journal on Computing and Cultural Heritage.* https://doi.org/10.1145/xxxxxxx

12. Stoyanov, S. 2012. "Context-Aware and Adaptable eLearning Systems." PhD diss., De Montfort University.

13. Stoyanov, S., T. Glushkova, A. Stoyanova-Doycheva, and I. Krasteva. 2021. "The Virtual Education Space: Concept, Architecture, Application." *Informatics and Education* 9: 47–54. https://doi.org/10.32517/0234-0453-2021-36-9-47-54

14. Trendafilova, M. 2007. "Development Environment for Building Common Catalogue for Representation of the Culture-Historical Heritage of Bulgaria." *Cybernetics and Information Technologies* 7 (1): 95–105. https://cit.iict.bas.bg/CIT_07/v7-1/95-105.pdf

15. Zhou, W., and W. Chen. 2024. "Role Analysis of the Construction and Application of Folk Dance Knowledge Graph in Cultural Transmission." *Applied Mathematics and Nonlinear Sciences* 9 (1). https://doi.org/10.2478/amns-2024-3055

Brief Information about the Author:

Tsvetomira Ivanova Kazashka
Head of the Library Academy of Music, Dance and Fine Arts
"Prof. Asen Diamandiev " Plovdiv
E-mail: tsvetomira.ivanova@artacademyplovdiv.com
Phone: +359 89 228 6913

Veneta Tabakova-Komsalova
Associate Professor Department "computer systems", Faculty of mathematics and informatics PU" Paisii Hilendarski", PlovdivPaisii Hilendarski" University of Plovdiv
E-mail: komsalova.veneta@gmail.com
Phone: +359 88 586 1386

Автор жайында қысқаша мағлұмат:

Цветомира Иванова Казашка
"Профессор Асен Диамандиев" атындағы Музыка, Би Және Бейнелеу Өнері Академиясының кітапхана жетекшісі, Пловдив
E-mail: tsvetomira.ivanova@artacademyplovdiv.com
Тел: +359 89 228 6913

Венета Табакова-Комсалова
"Компьютерлік жүйелер" кафедрасының доценті," Паисии Хилендарский " ПУ математика және информатика Факультеті, Пловдив Университеті, Пловдив Университеті.
E-mail: komsalova.veneta@gmail.com
Тел: +359 88 586 1386

Краткая информация об авторе:

Цветомира Иванова Казашка
Руководитель библиотеки Академии музыки, танца и изобразительных искусств "Профессор Асен Диамандиев " Пловдив
E-mail: tsvetomira.ivanova@artacademyplovdiv.com
Тел: +359 89 228 6913

Венета Табакова-Комсалова
Доцент кафедры "Компьютерные системы" факультета математики и информатики ПУ "Паисий Хилендарский", Пловдивпаисийский Хилендарский университет в Пловдиве
E-mail: komsalova.veneta@gmail.com
Тел: +359 88 586 1386