

## Digitalno arhiviranje i ontološko modeliranje književnog festivala kao nematerijalne baštine: na primjeru 8. izdanja *Bookstana*

Digital archiving and ontological modeling of a literary festival as intangible cultural heritage: a case study of the 8<sup>th</sup> edition of *Bookstan*

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### Sažetak / Abstract

**Cilj:** Cilj rada jest razvoj ontološkog modela za 8. izdanje međunarodnog književnog festivala *Bookstan* (2023). Model je izrađen radi digitalnog mapiranja i arhiviranja, za tim olakšavanja pristupa podacima te obezbjeđivanja semantičke interoperabilnosti, čime se doprinosi očuvanju ovog festivala kao nematerijalne kulturne baštine.

**Pristup/metodologija/dizajn:** Primijenjene su kvalitativne metode (eksperimentalna i deskriptivna analiza), a ontologija je razvijena u softveru *Protégé*. Podaci su prikupljeni iz službenih festivalskih dokumenata i drugih izvora. Pri modeliranju su korišteni principi iz priručnika Noy i McGuinness te standard *Schema.org*, uz prilagođene objektivne relacije.

**Rezultati:** Model sadrži 15 klasa, 36 objektnih relacija, 5 podatkovnih atributa i 237 instanci. Omogućava strukturirano predstavljanje događaja, učesnika/ca i lokacija. Upiti *SPARQL* omogućili su efikasno pretraživanje podataka, dok je *OntoGraf* pomogao u vizualizaciji strukture. Model je objavljen na platformi *GitHub*.

**Ograničenja:** Model obuhvata isključivo 8. izdanje festivala i ne prikazuje prethodna niti buduća izdanja.

**Diskusija:** Primjena standarda *Schema.org* olakšala je semantičku interoperabilnost, dok su prilagođene relacije omogućile detaljnije mapiranje složenih odnosa među učesnicima/ama i programima. Model jasno pokazuje potencijal za standardizaciju arhiviranja sličnih kulturnih događaja u budućnosti.

**Originalnost/vrijednost:** Ovo istraživanje predstavlja prvi pokušaj ontološkog modeliranja jednog bosanskohercegovačkog kulturnog događaja, odnosno nematerijalne kulturne baštine, koji ne samo da doprinosi njenom očuvanju već otvara prostor za nove metode istraživanja i promociju festivala kroz semantičke mreže.

**Goal:** This paper presents the development of an ontological model for the 8th edition of the international literary festival *Bookstan* (2023). The model was designed to enable digital mapping and archiving, to facilitate data accessibility, and to ensure semantic interoperability, thereby contributing to the preservation of the festival as intangible cultural heritage.

**Design/methodology/approach:** A qualitative approach was adopted, combining experimental and descriptive methods. The ontology was developed in *Protégé*, with data drawn from official festival documents and complementary sources. The modeling process followed the principles outlined by Noy and McGuinness, alongside the *Schema.org* standard, enriched with tailored object relations.

**Results:** The resulting model comprises 15 classes, 36 object properties, 5 data properties, and 237 instances. It provides a structured representation of events, participants, and venues. *SPARQL* queries demonstrated efficient data retrieval, while *OntoGraf* supported structural visualization. The model has been published openly on the *GitHub* platform.

**Research limitations/implications:** The scope of the model is limited to the 8th edition of the festival, without coverage of previous or subsequent editions.

**Discussion:** Employing the *Schema.org* standard enhanced semantic interoperability, while customized relations allowed for the nuanced mapping of complex interactions between participants and programmes. The model illustrates the potential for standardizing the digital archiving of similar cultural events.

**Originality/value:** This study constitutes the first attempt to apply ontological modeling to a cultural event in Bosnia and Herzegovina, framing it as intangible cultural heritage. Beyond supporting its preservation, the work opens new avenues for research and facilitates the promotion of the festival through semantic networks.

## 1. Uvod

Ovaj se rad fokusira na digitalno arhiviranje i ontološko modeliranje 8. izdanja (2023. godina) *Bookstana*, međunarodnog književnog festivala koji se održava u Sarajevu od 2016. godine, a koji je već prerastao u značajan književni događaj koji okuplja istaknute ličnosti iz domaćih i međunarodnih književnih i kulturnih krugova te ljubitelje/ice književnosti iz cijelog svijeta. Festival služi kao platforma za razmjenu ideja i književnih dostignuća, što ga čini neprocjenjivim kulturnim blagom. Međutim, kao i mnogi kulturni događaji, efemerna priroda njegovih aktivnosti predstavlja izazov za dugoročno očuvanje i dostupnost.

Digitalno arhiviranje, u kombinaciji s ontološkim modeliranjem, nudi rješenje za ove izazove stvaranjem strukturiranih, interoperabilnih skupova podataka kojima se može lako pristupiti i koji se mogu analizirati, čime bi se istraživačima/icama olakšao pristup informacijama o ovome događaju, a ujedno i doprinijelo očuvanju književnog i kulturnog sadržaja festivala, te posljedično i kulturne baštine zemlje.

Prema definiciji *The Convention for the Safeguarding of the Intangible Cultural Heritage* UNESCO-a, nematerijalna kulturna baština obuhvata prakse, prikaze, izraze, znanja i vještine – kao i s njima povezane predmete i prostore – koje zajednice, grupe i pojedinci prepoznaju kao dio svoje kulturne baštine; ona se prenosi s generacije na generaciju, neprestano obnavlja i pruža zajednicama osjećaj identiteta i kontinuiteta (UNESCO, 2003). Imajući to u vidu, iako se festival *Bookstan* održava tek desetak godina i ima međunarodni karakter, njegova kontinuirana prisutnost u Sarajevu, kao i njegova uloga u njegovanju književnih praksi, slobode izražavanja i kulturnog dijaloga, pozicioniraju ga kao važan segment lokalne kulturne scene. Festival, između ostalog, okuplja i domaće autore/ice, promoviše lokalne književne i govorne forme te doprinosi kulturnom identitetu Sarajeva i Bosne i Hercegovine.

Budući da festival ima značajnu ulogu u kulturnom životu zajednice, okuplja i čuva važne književne prakse na lokalnom i državnom nivou, te što postoji jasna namjera njegove dugoročne održivosti i generacijskog kontinuiteta, može se smatrati oblikom nematerijalne kulturne baštine na lokalnom i državnom nivou. Rano digitalno arhiviranje omogućava očuvanje podataka o učesnicima/ama, programima i

## 1. Introduction

This paper focuses on the digital archiving and ontological modelling of the 8th edition (2023) of *Bookstan*, an international literary festival held in Sarajevo since 2016. Over the years, the festival has grown into a significant literary event, bringing together prominent figures from national and international literary and cultural circles, as well as literature enthusiasts from around the world. *Bookstan* serves as a platform for the exchange of ideas and literary achievements, making it an invaluable cultural asset. However, like many cultural events, the ephemeral nature of its activities poses challenges for long-term preservation and accessibility.

Digital archiving, combined with ontological modelling, offers a solution to these challenges by creating structured, interoperable datasets that are both easily accessible and suitable for analysis. This facilitates researchers' access to information about the festival, while simultaneously contributing to the preservation of its literary and cultural content and, consequently, to the safeguarding of the country's cultural heritage.

According to UNESCO's *Convention for the Safeguarding of the Intangible Cultural Heritage*, intangible cultural heritage encompasses practices, representations, expressions, knowledge, and skills—as well as the instruments, objects, and spaces associated with them—that communities, groups, and individuals recognize as part of their cultural heritage. This heritage is transmitted from generation to generation, constantly recreated, and provides communities with a sense of identity and continuity (UNESCO, 2003). In this light, although *Bookstan* has been organized for just a decade and has an international dimension, its consistent presence in Sarajevo, as well as its role in fostering literary practices, freedom of expression, and cultural dialogue, position it as an important segment of the local cultural landscape. The festival also showcases local authors, promotes national literary and oral forms, and contributes to the cultural identity of Sarajevo and Bosnia and Herzegovina.

Given its significant role in community cultural life, its contribution to the preservation of literary practices at both local and national levels, and the organizers' clear intent to ensure its long-term sustainability and intergenerational continuity, the festival

događajima, olakšava pretragu i analizu informacija te podržava dugoročno čuvanje kulturnog pamćenja.

Ovo istraživanje nudi ontološki model, istovremeno i prvi te vrste za jedan bh. kulturni događaj, ali i književni festival uopšte, razvijen u softveru *Protégé* koji obuhvata ključne elemente festivala za 2023. godinu poput programa, naziva predavanja i radionica, učesnike/ce, autore/ice, moderatore/ice, kao i datume i lokacije na kojima se održavao. Podaci su prikupljeni ručno, iz *Narativnog izvještaja* festivala (Bookstan, 2023a) i *Press-clippinga* (Bookstan, 2023b) za 2023. godinu koji su ljubazno ustupljeni na korištenje od strane organizatora/ica i izvršne direktorice festivala Lamije Milišić, a po potrebi i drugih izvora. Model je objavljen u formatu RDF/XML na platformi *GitHub* (Mirović, 2025). Ova platforma je odabrana jer omogućava otvoren i dugoročno dostupan pristup manjim i srednjim ontologijama. Također, objavljivanjem na *GitHub*-u prati se princip otvorene nauke, potiče dalja upotreba i omogućava lakša integracija u druge projekte iz oblasti semantičkog weba i digitalnog očuvanja kulturne baštine.

Kroz razvijen model, u poglavlju *Diskusija*, ovaj će rad ponuditi odgovore na sljedeća istraživačka pitanja:

- IP1: Koje su ključne komponente i entiteti koji bi trebali biti uključeni u ontološki model za digitalno arhiviranje *Bookstana*?
- IP2: Kako ontološko modeliranje u *Protégéu* može poboljšati organizaciju, pretraživanje i dostupnost digitalnih resursa vezanih za ovaj festival?
- IP3: Koji su izazovi i potencijalna rješenja u integraciji ontoloških okvira s postojećim praksama digitalnog arhiviranja kulturnih festivala?
- IP4: Kakav uticaj može imati razvijeni ontološki model na očuvanje i promociju kulturne baštine kakva je *Bookstan*?
- IP5: Kako ontološki model može pružiti podršku interdisciplinarnim istraživanjima i podstaći saradnju između kulturoloških studija, digitalne humanistike i informacijskih nauka?

Rad je strukturiran tako da slijedi uobičajeni format IMRAD, što omogućava da bude jasno i logično prikazan. U poglavlju *Uvod* navedeni su osnovni koncepti, a dat je i pregled istraživanja. Poglavlje *Pregled literature* pruža teorijski okvir, fokusirajući se na ontologije kao sisteme za organizaciju znanja i ontološko modeliranje u kontekstu festivala. U *Metodologiji* se detaljno opisuje pristup korišten

may be considered a form of intangible cultural heritage at the local and national scale. Early digital archiving of its activities ensures the preservation of data on participants, programmes, and events, facilitates information retrieval and analysis, and supports the long-term safeguarding of cultural memory.

This study introduces an ontological model—the first of its kind for a Bosnian and Herzegovinian cultural event, and indeed for a literary festival in general—developed in *Protégé*. The model covers key elements of the 2023 edition, including programmes, lecture and workshop titles, participants, authors, moderators, as well as dates and venues. Data were manually collected from the *Narrative Report* (Bookstan, 2023a) and *Press Clipping* (Bookstan, 2023b) kindly provided by the festival organizers and its Executive Director, Lamija Milišić, alongside additional sources when needed. The model has been published in RDF/XML format on the *GitHub* platform (Mirović, 2025). This platform was chosen as it provides open and long-term access to small and medium-scale ontologies. By publishing on *GitHub*, the project follows the principles of open science, encourages reuse, and enables smoother integration into other semantic web and digital cultural heritage preservation initiatives.

Through the developed model, the *Discussion* section of this paper will address the following research questions:

- **RQ1:** What are the key components and entities that should be included in the ontological model for the digital archiving of *Bookstan*?
- **RQ2:** How can ontological modelling in *Protégé* enhance the organization, retrieval, and accessibility of digital resources related to this festival?
- **RQ3:** What are the challenges and potential solutions in integrating ontological frameworks with existing practices of digital archiving of cultural festivals?
- **RQ4:** What impact can the developed ontological model have on the preservation and promotion of cultural heritage such as *Bookstan*?
- **RQ5:** How can the ontological model support interdisciplinary research and foster collaboration between cultural studies, digital humanities, and information science?

The paper is structured according to the conventional IMRAD format, ensuring clarity and logical flow. The *Introduction* outlines the main concepts and provides an overview of the study, the *Literature*

u izradi ontologije festivala *Bookstan*, uključujući svaki korak od određivanja domena do kreiranja instanci. Poglavlje *Rezultati i analiza* pruža uvid u proces modeliranja, validacije i praktične primjene ontologije, s posebnim akcentom na vizualizaciju putem *OntoGrafa* i primjenu upita SPARQL. U poglavlju *Diskusija* analiziraju se rezultati i odgovora na istraživačka pitanja, dok se u *Zaključku* sumiraju ključni nalazi istraživanja i predlažu smjernice za buduća istraživanja.

## 2. Pregled literature

Ontologije su postale sistemi za organizaciju znanja “koji pružaju najviši stepen semantičkog bogatstva, jer omogućavaju uspostavljanje velikog broja odnosa između pojmova i nude attribute za svaku klasu” (Biagetti, 2021: 158) i stoga se mogu smatrati ključnom tehnologijom za organizaciju, integraciju i pretragu informacija unutar digitalnih arhiva i sistema kulturne baštine. Korištenjem ontologija, složeni skupovi podataka mogu se strukturirati na način koji omogućava semantičku interoperabilnost te pretragu i analizu podataka na većem nivou. Ovaj pregled literature fokusira se na predstavljanje relevantnih radova o ontologijama, kao i na recentne istraživačke projekte koji su primijenili ontološko modeliranje u kontekstu kulturnih događaja i arhiviranja, s posebnim naglaskom na festivale i srodne događaje.

### 2.1. Ontologije kao sistemi za organizaciju znanja

Pionirski rad u ovoj oblasti, onaj koji je postavio temelje za izučavanje ontologija, jest članak T. Grubera iz 1993. godine pod nazivom “A Translation Approach to Portable Ontology Specifications”. Ovaj rad je jedan od prvih koji je definisao ontologije u kontekstu informatike i umjetne inteligencije, opisujući ih kao “eksplicitne specifikacije konceptualizacije” (Gruber, 1993: 2). Gruber je naglasio važnost ontologija za standardizaciju pojmova i odnosa unutar određenih domena, čime se omogućava dijeljenje i ponovno korištenje znanja između različitih aplikacija i korisnika/ca. Ovaj članak se često navodi kao osnovni tekst za razvoj ontologija kao ključnog koncepta u semantičkom webu, umjetnoj inteligenciji i sistemima za organizaciju znanja. Još jedan značajan rad za ovu oblast jeste rad G. Hodgea iz 2000. godine, koji ontologije definira kao ne-tradicionalne sisteme za organizaciju znanja kojima se mogu predstaviti kompleksni odnosi među objektima, kao i dodavati pravila i aksiomi (Hodge, 2000). Ovo ih čini iznimno korisnima u područjima koja zahtijevaju duboko razumijevanje i pretragu

*Review* offers a theoretical framework, focusing on ontologies as systems of knowledge organization and on ontological modelling in the context of festivals, the *Methodology* section details the approach used in developing the *Bookstan* festival ontology, describing each step from defining the domain to creating the instances, *Results and Analysis* present insights into the modelling process, validation, and practical application of the ontology, with particular emphasis on visualization through *OntoGraf* and the use of SPARQL queries, the *Discussion* section analyzes the results in light of the research questions, while the *Conclusion* summarizes the key findings and proposes directions for future research.

## 2. Literature Review

Ontologies have emerged as systems of knowledge organization “that present the highest degree of semantic richness, as they allow to establish a great number of relations between terms and provide attributes for each class.” (Biagetti, 2021: 158). As such, they can be considered a key technology for the organization, integration, and retrieval of information within digital archives and cultural heritage systems. By employing ontologies, complex datasets can be structured in ways that enable semantic interoperability, as well as advanced search and analysis of data. This literature review focuses on presenting relevant scholarship on ontologies, as well as recent research projects that have applied ontological modelling in the context of cultural events and archiving, with a particular emphasis on festivals and related cultural manifestations.

### 2.1. Ontologies as Systems of Knowledge Organization

The pioneering work that laid the foundations for the study of ontologies is Gruber’s 1993 article “A Translation Approach to Portable Ontology Specifications”. This was among the first contributions to define ontologies within the context of computer science and artificial intelligence, describing them as “explicit specifications of a conceptualization” (Gruber, 1993: 2). Gruber emphasized the importance of ontologies in standardizing concepts and relationships within specific domains, thereby enabling the sharing and reuse of knowledge across different applications and users. This article is frequently cited as the cornerstone text for the development of ontologies as a key concept in the Semantic Web, artificial intelligence, and systems of knowledge organization. Another significant contribution is Hodge’s 2000 work, which defined ontologies as non-traditional knowl-

složenih informacija, poput znanstvenih istraživanja, izučavanja kulturne baštine i u projektima digitalne humanistike.

Prema N. F. Noy i D. L. McGuinness, “ontologija definira zajednički vokabular za istraživače koji trebaju razmjenjivati informacije u [određenoj] domeni. Obuhvata mašinski interpretirane definicije osnovnih pojmova u domeni i odnose među njima” (Noy & McGuinness, 2001: 1). U svom članku iz 2001. godine “Ontology Development 101: A Guide to Creating Your First Ontology” ove su autorice ponudile metodologiju modeliranja ontologija koja je korištena i u ovom istraživanju. Taj članak predstavlja jedan od najvažnijih vodiča za početnike/ce u oblasti razvoja ontologija. Pored tih, jedna od najrelevantnijih knjiga svakako je *Semantic Web for the Working Ontologist* autora D. Allemanga i J. Hendlera iz 2008. godine koja je također važan vodič za praktičnu primjenu ontologija u semantičkom webu. Za potrebe ovog rada korišteno je drugo izdanje u kojem su objašnjene osnove RDF-a, OWL-a i SPARQL-a, te kako te tehnologije koristiti za modeliranje ontologija (Allemang & Hendler, 2011). Također, značajan je i rad “Ontologies as Knowledge Organization Systems” autorice M. T. Biagetti, koji se bavi ulogom ontologija kao naprednih sistema za organizaciju znanja (KOS). Biagetti u svom radu daje prikaz korištenja ontologija u okruženju digitalnih biblioteka, gdje su zamijenili tezauruse u pretraživanju, kao i njihove uloge u semantičkom webu i semantičkoj interoperabilnosti (Biagetti, 2021).

Ipak, u razvoju ontologija, posebno na spoju filozofije i informacijskih nauka, ključnu su ulogu imali B. Smith i N. Guarino. Barry Smith, filozof po obrazovanju, značajno je doprinio ontološkim temeljima formalnog modeliranja stvarnosti, naročito kroz razvoj *Basic Formal Ontology* (BFO), jedne od najpoznatijih i najkorištenijih *gornjih* ontologija (*upper ontologies*). Njegova djela, poput *Ontology and Information Systems* (Smith, 2003) i *Building Ontologies with Basic Formal Ontology* (Arp et al., 2015), postavila su temelje razumijevanja ontologije kao rigorozne i primjenjive discipline, s fokusom na jasno definisane kategorije i odnose. S druge strane, Nicola Guarino je kroz svoje radove poput *Formal ontology, conceptual analysis and knowledge representation* (Guarino, 1995) i *Formal Ontology and Information Systems* (Guarino, 1998) naglasio važnost konceptualne jasnoće u dizajnu ontologija i uveo principe upotrebe formalnih metoda u organizaciji znanja. Guarino je bio i ključni pokretač razvoja DOLCE-a (*Descriptive Ontology for Linguistic and Cognitive Engineering*) – onto-

edge organization systems capable of representing complex relationships among objects, as well as of incorporating rules and axioms (Hodge, 2000). This makes them particularly valuable in domains that require deep understanding and advanced retrieval of complex information, such as scientific research, cultural heritage studies, and digital humanities projects.

According to Noy and McGuinness, “an ontology defines a common vocabulary for researchers who need to share information in a domain. It includes machine-interpretable definitions of basic concepts in the domain and relations among them.” (Noy & McGuinness: 2001). In their seminal article “Ontology Development 101: A Guide to Creating Your First Ontology”, the authors offered a modeling methodology that has also been applied in this research. This guide remains one of the most influential introductions for beginners in ontology development. In addition, one of the most relevant reference works in the field is *Semantic Web for the Working Ontologist* by Allemang and Hendler (2008). For the purposes of this study, the second edition was consulted, which explains the fundamentals of RDF, OWL, and SPARQL, as well as how these technologies can be used for ontology modeling (Allemang & Hendler, 2011). Equally important is Biagetti’s article “Ontologies as Knowledge Organization Systems”, which examines the role of ontologies as advanced KOS. Biagetti discusses their application in digital library environments, where they have been used to replace thesauri in search, as well as their broader role in the Semantic Web and in supporting semantic interoperability (Biagetti, 2021).

Nevertheless, in the development of ontologies—particularly at the intersection of philosophy and information science—two figures have played a crucial role: Barry Smith and Nicola Guarino. Smith, a philosopher by training, made significant contributions to the ontological foundations of formal reality modeling, most notably through the development of the *Basic Formal Ontology* (BFO), one of the most widely known and applied upper ontologies. His works, such as *Ontology and Information Systems* (Smith, 2003) and *Building Ontologies with Basic Formal Ontology* (Arp et al., 2015), established the foundations for understanding ontology as a rigorous and applicable discipline, with an emphasis on clearly defined categories and relations. Guarino, on the other hand, has underscored the importance of conceptual clarity in ontology design through his influential works such as *Formal Ontology, Conceptual Analysis and Knowledge Representation* (Guarino, 1995) and *Formal Ontology and Informa-*

loškog modela orijentisanog na ljudsku percepciju i jezik. Doprinosi B. Smitha i N. Guarina značajno su oblikovali savremene pristupe razvoju ontologija, uspješno spajajući filozofsku temeljitost sa zahtjevima praktične primjene.

## 2.2. Ontološko modeliranje u kontekstu festivala

Iako ontološko modeliranje postaje sve popularniji sistem za organizaciju znanja, nije se mnogo pisalo o modeliranju festivala. Jedan od pionirskih radova u ovoj oblasti je projekat Ontofest, predstavljen u radu A. Cosentino et al. iz 2024. godine (Cosentino et al., 2024), koji istražuje transformaciju arhiva *Locarno Film Festivala* u dinamičan, međusobno povezan resurs znanja o festivalu. Ontofest je razvijen s ciljem olakšavanja pristupa informacijama vezanim za ovaj festival, poboljšanja njihove pretraživosti i omogućavanja korisnicima i korisnicama da lakše istražuju i čuvaju filmsku baštinu. Autori su koristili metodologiju Ontology Development 101 za izradu ontologije koja obuhvata različite aspekte festivala, uključujući prikazivanje filmova, događaje na festivalu, režisere/ice, glumce/ice i kritičke recenzije. Nadalje, istraživanje V. Carreiro et al. iz 2019. godine (Carreiro et al., 2019) nudi obrazac za ontološko modeliranje događaja koji se ponavljaju (*recurrent events*), što je od posebnog značaja za festivale i druge kulturne manifestacije koje se redovno održavaju. U oblasti istraživanja ontološkog modeliranja festivala također je značajan rad N. Chau et al. iz 2022. godine, koji se fokusirao na važnost zaštite nematerijalne kulturne baštine kroz razvoj aplikacije za očuvanje vijetnamskih festivala putem ontologija (Chau et al., 2022).

Nastavak razvoja i primjene ontoloških modela u kontekstu kulturnih festivala i drugih sličnih događaja može značajno unaprijediti načine na koje se ovi važni kulturni resursi arhiviraju i koriste. Činjenica da su festivali tako rijetko ontološki modelirani – a književni nikako – prilika je za znanstvenike/ce iz računarskih i informacijskih znanosti da tu oblast bolje istraže.

## 3. Metodologija

Istraživanje kombinuje kvalitativni pristup s eksploratornom i deskriptivnom metodom i usmjereno je ka razumijevanju, organizovanju i vizualizaciji podataka o kulturnom događaju. Cilj istraživanja bio je razviti ontologiju koja omogućava bolje očuvanje i pristup informacijama o festivalu.

1. *Prikupljanje podataka*: podaci su prikupljeni ručno iz službenih dokumenata festivala,

*tion Systems* (Guarino, 1998). He also introduced the systematic use of formal methods in knowledge organization. Guarino was a key driving force behind the development of *DOLCE* (Descriptive Ontology for Linguistic and Cognitive Engineering), an ontological model oriented toward human perception and language. The contributions of Smith and Guarino have profoundly shaped contemporary approaches to ontology development, successfully bridging philosophical rigor with the requirements of practical application.

## 2.2. Ontological Modeling in the Context of Festivals

Although ontological modeling is becoming an increasingly popular system for knowledge organization, little has been written about modeling festivals. One of the pioneering projects in this field is *OntoFest*, presented in Cosentino et al. (2024), which explores the transformation of the *Locarno Film Festival* archive into a dynamic, interconnected knowledge resource about the festival. *OntoFest* was developed to facilitate access to information related to the festival, improve searchability, and enable users to more easily explore and preserve film heritage. The authors employed the *Ontology Development 101* methodology to design an ontology encompassing various aspects of the festival, including film screenings, festival events, directors, actors, and critical reviews. Furthermore, research by Carreiro et al. (2019) offers a pattern for ontological modeling of recurrent events, which is of particular relevance for festivals and other cultural manifestations that take place on a regular basis. In addition, a significant contribution comes from Chau et al. (2022), who emphasized the importance of safeguarding intangible cultural heritage through the development of an ontology-based application for the preservation of Vietnamese festivals.

The continued development and application of ontological models in the context of cultural festivals and similar events can substantially enhance the ways in which these important cultural resources are archived and used. The fact that festivals have so rarely been ontologically modeled—and that literary festivals have not been modeled at all—represents an opportunity for scholars in computer and information science to further explore this domain.

## 3. Methodology

This research combines a qualitative approach with exploratory and descriptive methods, aimed at understanding, organizing, and visualizing data about

kao i iz drugih relevantnih izvora, uključujući medijske članke. Prikupljeni podaci uključuju informacije o događajima, učesnicima i učesnicama, lokacijama i ostalim ključnim elementima festivala;

2. *Odabir modela, konvencija i standarda te izrada ontologije*: za izradu ontologije odabran je standard *Schema.org* kao osnovni model zbog svoje jednostavnosti i pogodnosti za modeliranje samo jednog izdanja festivala. Klase, potklase, objektno-relacijske i podatkovne atributi definirani su prema ovom standardu, uz dodatak prilagođenih objektno-relacijskih kako bi se u potpunosti predstavila složenost festivala. Ontologija je dalje modelirana prema modelu koji su predložile N. F. Noy i D. L. McGuinness (Noy & McGuinness, 2001). Pored toga, korištena je ISO 8601 konvencija za formatiranje datuma i vremena, npr. "2023-07-07T12:00:00". Također, za davanje naziva instancama i prilagođenim relacijama korištena je konvencija *CamelCase*, što je uobičajena praksa u ontologijama kako bi se osigurao konzistentan i lako čitljiv format – instance su pisane tako da se prva riječ u nazivu piše malim, a svaka sljedeća velikim slovom, npr. *radionicaKakoČitatiIPisatiOpasno* ili *oljaSavičevićIvančević*. Radi lokalizacije ontologije korišten je bosanski jezik pri davanju imena; festival jeste međunarodnog karaktera, no naslovi promovisanih knjiga i programi su predstavljeni na bosanskom jeziku, te je odlučeno da se za imenovanje entiteta koristi bosanski jezik, osim u slučajevima gdje se koriste standardni *Schema.org* atributi;
3. *Implementacija u Protégéu*: ontologija je izrađena korištenjem softvera *Protégé*. U početku su definisane klase koje predstavljaju ključne entitete festivala, zatim su dodane instance u sve klase, koje predstavljaju konkretne događaje, učesnike/ice i lokacije. Nakon toga, uspostavljeni su odnosi između instanci koristeći objektno-relacijske, čime je omogućeno semantičko povezivanje podataka;
4. *Validacija ontologije*: za validaciju ontologije korišten je reasoner *Pellet*, koji je osigurao da model bude konzistentan i da definisani odnosi budu ispravni;
5. *Praktična primjena i evaluacija*: ontologija je primijenjena u organizaciji i pretraživanju podataka o festivalu. Praktična primjena uključivala je korištenje upita SPARQL za dobivanje konkretnih informacija o događajima, učesni-

a cultural event. The main goal was to develop an ontology that supports both the preservation of and access to information about the festival.

1. *Data collection*: Data were collected manually from the official festival documents, as well as from other relevant sources, including media articles. The dataset included information about events, participants, venues, and other key elements of the festival.
2. *Model selection, conventions, and standards; ontology construction*: The *Schema.org* standard was chosen as the base model because of its simplicity and suitability for modelling a single edition of the festival. Classes, subclasses, object properties, and data properties were defined in line with this standard, with the addition of customized object properties to represent the full complexity of the festival. The modelling approach followed the methodology proposed by Noy and McGuinness (2001). In addition, ISO 8601 conventions were used for formatting dates and times (e.g., "2023-07-07T12:00:00"). A *CamelCase* convention was applied for naming instances and customized relations, which is common practice in ontology development to ensure consistency and readability—for example, *radionicaKakoČitatiIPisatiOpasno* or *oljaSavičevićIvančević*. To ensure localization, Bosnian was used as the language of naming; although the festival has an international character, book titles and programmes were presented in Bosnian, so it was decided that entities would be named in Bosnian, except where standard *Schema.org* attributes were used.
3. *Implementation in Protégé*: The ontology was developed using *Protégé* software. Initially, classes representing key festival entities were defined. Instances representing specific events, participants, and venues were then created. Relationships between these instances were established through object properties, enabling semantic interconnection of the data.
4. *Ontology validation*: The *Pellet* reasoner was used to validate the ontology, ensuring consistency of the model and correctness of the defined relationships.
5. *Practical application and evaluation*: The ontology was applied to the organization and retrieval of festival data. Practical application included the use of SPARQL queries to extract specific information about events, participants, and venues, as well as the visualization

cima i učesnicama, kao i vizualizaciju odnosa među entitetima uz pomoć *OntoGrafa*. Rezultati ovih upita i vizualizacija korišteni su za evaluaciju ontologije i njenu prilagodbu za buduće primjene;

6. *Objavlivanje ontologije na platformi GitHub*: na kraju, ontologija je u slobodnom pristupu objavljena na platformi *GitHuba*, čime je dat doprinos digitalnom arhiviranju festivala i obezbjeđivanju dugoročne dostupnosti modela istraživačima/cama i široj javnosti.

#### 4. Rezultati i analiza

##### 4.1. Modeliranje ontologije

N. F. Noy i D. L. McGuinness nude detaljan vodič za proces izrade ontologije, koji se sastoji od nekoliko ključnih koraka (Noy & McGuinness, 2001). Ta je metodologija je postala osnovni referentni okvir za istraživače/ice i praktičare/ice koji se bave ontološkim modeliranjem, omogućava sistematičan pristup u razvoju ontologija te je stoga korištena i u ovom radu.

##### 4.1.1. Određivanje domena i obuhvata ontologije

Prvi korak u razvoju ontologije jeste definisanje domena i obuhvata ontologije. Ovaj korak uključuje odlučivanje o tome koje su ključne oblasti znanja koje će ontologija pokrivati te koji su specifični ciljevi ontologije. N. F. Noy i D. L. McGuinness preporučuju da se, u ovoj fazi, jasno odgovori na pitanja poput: *Na koja pitanja ontologija treba dati odgovor?* i *Kome je namijenjena ontologija?* Ovaj korak postavlja temelje za sve buduće faze razvoja ontologije, pa je važno napomenuti da ontologija treba da odgovori na pitanja koji su ključni događaji i aktivnosti festivala, dakle da da detaljan pregled svih događaja koji su se odvijali tokom festivala, uključujući promocije knjiga, radionice, izložbe i specijalne programe. Svaki događaj treba biti povezan s informacijama o učesnicima/ama, vremenu i mjestu održavanja, kao i sa sadržajem koji je predstavljen. Također, ontologija treba pružiti informacije o učesnicima i učesnicama festivala i njihovim ulogama (autor/ica, predavač/ica, moderator/ica), zatim koje su knjige i drugi radovi predstavljeni na festivalu te koje su bile lokacije održavanja festivala. Što se tiče pitanja kome je ontologija namijenjena, ona je prije svega namijenjena istraživačima/icama koji se bave kulturalnim studijama, književnošću, informacijskim naukama i digitalnom humanistikom. Također, korisna je za bibliotekare/ke, arhiviste i arhivistkinje te kustose/ice koji rade na očuvanju i promovisanju kulturne baštine. Osim toga, ontologija može

of entity relationships with *OntoGraf*. The results of these queries and visualizations were used to evaluate the ontology and adapt it for potential future applications.

6. *Publication of the ontology on GitHub*: Finally, the ontology was made openly accessible by being published on the *GitHub* platform, thereby contributing to the digital archiving of the festival and ensuring long-term availability of the model to both researchers and the wider public.

#### 4. Results and Analysis

##### 4.1. Ontology Modelling

Noy and McGuinness provide a detailed guide for the ontology development process, consisting of several key steps (Noy & McGuinness, 2001). Their methodology has become a primary reference framework for researchers and practitioners engaged in ontology modelling, offering a systematic approach to ontology development. For this reason, it was also adopted in this study.

##### 4.1.1. Defining the Domain and Scope of the Ontology

The first step in ontology development is to define the domain and scope of the ontology. This involves deciding which key areas of knowledge the ontology will cover, as well as its specific objectives. Noy and McGuinness recommend that, at this stage, researchers clearly answer questions such as: *What questions should the ontology be able to answer?* and *Who are the intended users of the ontology?* This step establishes the foundation for all subsequent phases of ontology development. In this case, the ontology was designed to address questions regarding the key events and activities of the festival. It therefore provides a detailed overview of all events that took place during the festival, including book promotions, workshops, exhibitions, and special programmes. Each event is linked to information about participants, time and venue, as well as the content that was presented. The ontology also provides information about the festival's participants and their roles (e.g., author, lecturer, moderator), the books and other works presented at the festival, and the locations at which events were held. As for the intended audience, the ontology is primarily aimed at researchers in cultural studies, literature, information science, and digital humanities. It is also useful for librarians, archivists, and curators engaged in the preservation and promotion of cultural heritage. In addition, the ontology can also serve festival organizers in future editions as a tool for planning and analyzing past events, as well as for establishing connections with

poslužiti i organizatorima za buduća izdanja festivala kao alat za planiranje i analizu prošlih događaja te za povezivanje s drugim kulturnim inicijativama. Kroz digitalno arhiviranje i strukturiranje predstavljanje podataka, ontologija *Bookstana* omogućava dugoročno očuvanje informacija o festivalu, čineći ih dostupnim i upotrebljivim za buduće generacije istraživača/ica i kulturnih radnika/ca.

Kako bi se što bolje odgovorilo na zadatke koje postavljaju naredni koraci u izradi ontologije, važno je izvršiti i analizu domene, tj. upoznati se sa samim festivalom te njegovim 8. izdanjem koje je predmet istraživanja. *Bookstan* je prvi međunarodni književni festival u Bosni i Hercegovini, a održava se u Sarajevu od 2016. godine. Njegov osnivač je izdavačka kuća *Buybook*, odnosno pisci, izdavači i ostale ličnosti s bh. književne i izdavačke scene (Bookstan, 2025). Tokom godina, festival je prerašao u jedan od najznačajnijih kulturnih događaja u regiji, koji okuplja domaće, regionalne i međunarodne autore/ice, izdavače, prevodioce i prevoditeljice i druge kulturne radnike/ce. Kako je navedeno na zvaničnoj web-stranici festivala, cilj mu je promovisanje književnog stvaralaštva vodećih imena iz međunarodne, regionalne i bh. književnosti te podizanje “svijesti o značaju razvoja književne riječi u našoj sredini” (Bookstan, 2025). Kroz niz panel diskusija, promocija knjiga i radionica, ovaj festival pruža platformu za razmjenu ideja i književnih dostignuća, istovremeno se baveći temama koje odražavaju aktuelne društvene i kulturne izazove.

U proteklim izdanjima festivala, *Bookstan* je ugostio brojne renomirane autore/ice iz Bosne i Hercegovine i regije, uključujući Dubravku Ugrešić, Faruka Šehića i Andreja Nikolaidisa, kao i međunarodne goste i gošće poput Hanifa Kureishija, Orhana Pamuka i Rabiha Alameddinea. Protekla su izdanja propitivala teme poput granica i ograničenja, pripadanja (ni) Istoku (ni) Zapadu, pitanja građanina/ki svijeta i pitanja stanja opsade. Festival se održava svake godine početkom jula, s izuzetkom 5. izdanja (2020. godina) koje održano u oktobru zbog COVID-a, i uglavnom se sastoji od glavnog programa te dječijeg i specijalnih programa, a važan dio festivala predstavlja i radionica za mlade književne kritičare/ke u toku koje učesnici/e pišu osvrte na knjige koje su promovisane na festivalu i za njih mogu osvojiti nagrade. Svi ovi programi uglavnom podrazumijevaju promociju knjiga i razgovore sa njihovim autorima/cama, a u kontekstu teme koja je aktuelna u tom izdanju festivala. Izdanje iz 2023. godine, pod sloganom *Imaginarni Balkan*, također se sastojalo od glavnog programa, a uključivalo je

other cultural initiatives. Through digital archiving and the structured representation of data, the *Bookstan* ontology ensures the long-term preservation of festival information, making it accessible and useful for future generations of researchers and cultural professionals.

To better address the tasks required by the following steps in ontology development, it was important to conduct a domain analysis—that is, to become familiar with the festival itself and with its 8th edition, which is the subject of this research. *Bookstan* is the first international literary festival in Bosnia and Herzegovina and has been held annually in Sarajevo since 2016. It was founded by the publishing house *Buybook*, in collaboration with writers, publishers, and other figures from the Bosnian literary and publishing scene (Bookstan, 2025). Over the years, the festival has evolved into one of the most significant cultural events in the region, gathering local, regional, and international authors, publishers, translators, and other cultural workers. As stated on the official festival website, its mission is to promote the literary achievements of leading voices from international, regional, and Bosnian literature and to raise “awareness about the importance of developing the written word in our society” (Bookstan, 2025). Through panel discussions, book launches, and workshops, the festival provides a platform for the exchange of ideas and literary accomplishments, while simultaneously addressing themes that reflect contemporary social and cultural challenges.

In past editions, *Bookstan* has hosted numerous renowned authors from Bosnia and Herzegovina and the region, such as Dubravka Ugrešić, Faruk Šehić, and Andrej Nikolaidis, as well as international guests including Hanif Kureishi, Orhan Pamuk, and Rabih Alameddine. Previous themes have explored issues such as borders and limitations, belonging to (neither) East (nor) West, global citizenship, and the conditions of siege. The festival is usually held each year in early July, with the exception of the 5th edition (2020), which took place in October due to COVID-19. The programme typically consists of the main festival programme, a children’s programme, and a set of special events. A key element of the festival is also the workshop for young literary critics, during which participants write reviews of books promoted at the festival and compete for awards. All of these programs mainly involve the promotion of books and conversations with their authors, in the context of a topic that is current in that edition of the festival. The 2023 edition, held under the slogan *Imaginary Balkans*, also included several new special programmes such as *Youth Corner* (focusing on children’s and young adult literature, organized

i nekoliko novih specijalnih programa, kao što su *Mladi kutak*, posvećen književnosti za djecu i mlade koji je organizovan u saradnji s *Američkim kutkom Sarajevo* (*Biblioteka Sarajevo*), i *Bookstan Distrikt*, jednodnevni dječiji program u Brčkom koji se organizovao u saradnji s *Američkim kutkom Brčko* (*Biblioteka-knjižnica Brčko distrikta BiH*). Specijalno gostovanje uključivalo je segment *Doručak s autorom*, koji se održavalo u saradnji s pulskim sajmom knjiga *Sa(n)jam knjige u Istri* i autorima Borisom Dežulovićem i Darkom Cvijetićem kao gostima.

Također, u okviru festivala je održana i radionica za mlade književne kritičare/ke pod nazivom *Opasno čitanje*, koju je vodila prof. dr. Selma Raljević uz podršku sedam drugih predavača/ica. Svaki od polaznika/ca radionice imao je zadatak da napiše kritiku/osvrt na jednu od knjiga promovisanih na festivalu, a najuspješnijim su dodijeljene nagrade. U okviru 8. izdanja održana je i izložba *Naslovnice koje nisu postale naslovnice* koja “prati nit (be)sudbinstva naslovnica podređenih potrebama tržišta, ali istovremeno ističe njihovu ulogu u stvaranju knjige kao umjetničkog predmeta” (Bookstan, 2023a). Pored ovoga, u sklopu festivala je održan koncert, odnosno izvedba pjesama s albuma *Sin pustinje*, autora i izvođača Ahmeda Burića i Damira Imamovića, kao drugi dio manifestacije otvaranja festivala, a također je odigrana jedna predstava – *Kuća u ulici Mango*, kao dio promocije istoimene knjige. Specijalna gošća festivala je bila čuvena bugarska historičarka Marija Todorova, a u toku festivala je promovisano i *Buybookovo* izdanje njene knjige *Imaginarni Balkan* po kojoj je slogan ovog izdanja dobio ime.

Bookstan 2023. imao je oko 100 učesnika/ca (autora/ica, organizatora/ica, moderatora/ica, predavača/ica), u sklopu njega je promovisano oko 40 knjiga i održano oko 40 događaja na 8 lokacija.

#### 4.1.2. Razmatranje postojećih ontologija

Drugi korak u razvoju ontologije uključuje razmatranje mogućnosti korištenja postojećih ontologija. Prema N. F. Noy i D. L. McGuinness, vrlo je važno istražiti već postojeće ontologije koje bi mogle biti relevantne za određeni domen te ih, ako je moguće, uključiti u novi ontološki model (Noy & McGuinness, 2001). Ova praksa ne samo da može uštedjeti vrijeme i resurse nego i osigurava da se ontologija temelji na već verificiranim konceptima i strukturama i da bude interoperabilna. Interoperabilnost će biti postignuta korištenjem standarda *Schema.org*, no ona se mogla pospješiti i integriranjem s ontologijama poput FOAF-a (*Friend of a Friend*), BIBO-a

in cooperation with the *American Corner Sarajevo* (*Sarajevo Public Library*), and *Bookstan District*, a one-day children’s programme in Brčko, in cooperation with the *American Corner Brčko* (*Brčko District Public Library*). One of the special features was the *Breakfast with an Author* segment, held in collaboration with the *Sa(n)jam knjige u Istri* book fair in Pula, with Boris Dežulović and Darko Cvijetić as guest authors.

Additionally, the festival included the *Dangerous Reading* workshop for young critics, led by professor Selma Raljević, PhD, with the support of seven other lecturers. Each participant was tasked with writing a review of one of the books promoted at the festival, with prizes awarded to the most successful contributions. The 8th edition also featured the exhibition *Covers That Did Not Become Covers*, which “traces the thread of (un)destiny of book covers subordinated to market demands, while at the same time highlighting their role in shaping the book as an artistic object” (Bookstan, 2023a). As part of the festival’s opening, a concert was held—*Sin pustinje*, a performance by authors and musicians Ahmed Burić and Damir Imamović—as well as a theatre play, *The House on Mango Street*, staged as part of the promotion of the book of the same name. The special guest of the festival was the renowned Bulgarian historian Maria Todorova, whose book *Imaginary Balkans* (*Buybook* edition) inspired the festival’s 2023 slogan.

Bookstan 2023 gathered around 100 participants (authors, organizers, moderators, lecturers), featured the promotion of approximately 40 books, and hosted around 40 events across 8 venues.

#### 4.1.2. Reviewing Existing Ontologies

The second step in ontology development involves considering the potential use of existing ontologies. According to Noy and McGuinness, it is crucial to explore ontologies that may already be relevant to the given domain and, where possible, incorporate them into the new model (Noy & McGuinness, 2001). This practice not only saves time and resources but also ensures that the ontology is grounded in already validated concepts and structures, while at the same time enhancing interoperability. In this study, interoperability was achieved through the application of the *Schema.org* standard. However, it could be further strengthened by integrating additional ontologies such as FOAF (*Friend of a Friend*), BIBO (*Bibliographic Ontology*), or standards such as Dublin Core. Such extensions would significantly enrich the semantic capacity of

(*Bibliographic Ontology*), ali i standardima poput *Dublin Corea*, što bi značajno doprinijelo semantičkom obogaćivanju neke buduće sveobuhvatne ontologije, odnosno ontologije svih izdanja *Bookstana*. Ova proširenja bi značajno unaprijedila kapacitet ontologije za povezivanje sa širokim spektrom podataka i aplikacija.

#### 4.1.3. Imenovanje važnijih pojmova u ontologiji

Sljedeći korak je imenovanje svih važnijih pojmova koji će biti obuhvaćeni ontologijom. Ovaj korak uključuje identifikaciju ključnih termina i relacija unutar definisanog domena. Ovi termini će kasnije biti organizovani unutar hijerarhije klasa i definisani u kontekstu ontologije. Ova faza je vrlo značajna jer postavlja osnovu za strukturu ontologije. Što se *Bookstana* tiče, ti su važniji termini uključivali osnovne entitete kao što su *Person* (osoba), *Event* (događaj), *Book* (knjiga), *author* (pisac/spisateljica), *EventVenue* (mjesto održavanja) i mnogi drugi koji su ključni za strukturirano predstavljanje informacija o festivalu. Identifikacija ovih termina bila je ključna za postavljanje osnove za daljnje faze razvoja ontologije, kao što su definisanje klasa i atributa, te u kasnijoj praktičnoj primjeni ontologije kroz upite SPARQL i vizualizaciju u *OntoGrafu*.

#### 4.1.4. Definisanje klasa i hijerarhije klasa

Jedan od najvažnijih koraka u razvoju ontologije je definisanje klasa i njihove hijerarhije. N. F. Noy i D. L. McGuinness objašnjavaju da se klase mogu definisati kroz pristup *top-down* (odozgo ka dolje) i *bottom-up* (odozdo ka gore), ili kroz kombinaciju oba (Noy & McGuinness, 2001). U pristupu *top-down* najprije se definišu opšte klase koje se zatim dijele na specifičnije potklase. Nasuprot tome, pristup *bottom-up* počinje s definisanjem specifičnih klasa, koje se zatim grupišu u opšte kategorije. Kombinovani pristup uključuje korištenje oba pristupa, gdje se počinje s nekoliko opštih i specifičnih klasa, a zatim se hijerarhija razvija postepeno. Izuzetno je važno pažljivo dizajnirati hijerarhije klasa jer one igraju ključnu ulogu u organizaciji ontologije. Prema definiciji koju koriste ove autorice, klase opisuju koncepte i predstavljaju skupove individua/instanci koje dijele zajedničke osobine (Noy & McGuinness, 2001). Na primjer, klasa *CreativeWork* u ovoj ontologiji obuhvata sve knjige, članke, muzičke albume, odnosno sva kreativna djela koja su s njom povezana. Potklase su specifičnije kategorije unutar klase i nasljeđuju osobine svojih natklasa, ali mogu imati i vlastita specifična svojstva. I klase ove ontologije su organizovane hijerarhijski kako bi

any future comprehensive ontology—namely, one that would cover all editions of *Bookstan*. These integrations would substantially improve the ontology's ability to connect with a wider spectrum of datasets and applications.

#### 4.1.3. Naming the Key Concepts in the Ontology

The next step is to name all the key concepts to be included in the ontology. This step involves identifying the central terms and relations within the defined domain. These terms are later organized into a class hierarchy and defined within the context of the ontology. This stage is highly significant as it lays the groundwork for the structure of the ontology. In the case of *Bookstan*, these key terms included fundamental entities such as *Person*, *Event*, *Book*, *Author*, *EventVenue*, and many others that are essential for the structured representation of festival information. Identifying these terms was crucial for establishing the foundation for subsequent phases of ontology development, such as defining classes and attributes, as well as for the later practical application of the ontology through SPARQL queries and visualization with *OntoGraf*.

#### 4.1.4. Defining Classes and Class Hierarchies

One of the most important steps in ontology development is defining the classes and their hierarchy. Noy and McGuinness explain that classes can be defined using a top-down approach, a bottom-up approach, or a combination of the two (Noy & McGuinness, 2001). In the top-down approach, general classes are first defined and then divided into more specific subclasses. In contrast, the bottom-up approach begins with specific classes, which are then grouped into broader categories. The combined approach uses both strategies, starting with a few general and specific classes, with the hierarchy gradually developed. Careful design of class hierarchies is essential, as they play a key role in the overall organization of the ontology. According to Noy and McGuinness, classes describe concepts and represent sets of individuals/instances that share common characteristics (Noy & McGuinness, 2001). For example, in this ontology, the *CreativeWork* class includes all books, articles, and music albums—that is, all creative works associated with the festival. Subclasses are more specific categories within a class; they inherit the properties of their superclasses but may also include additional characteristics of their own. In this ontology, classes are organized hierarchically to ensure a clearer logical structure. *Schema.org* was used as the foundation, allowing

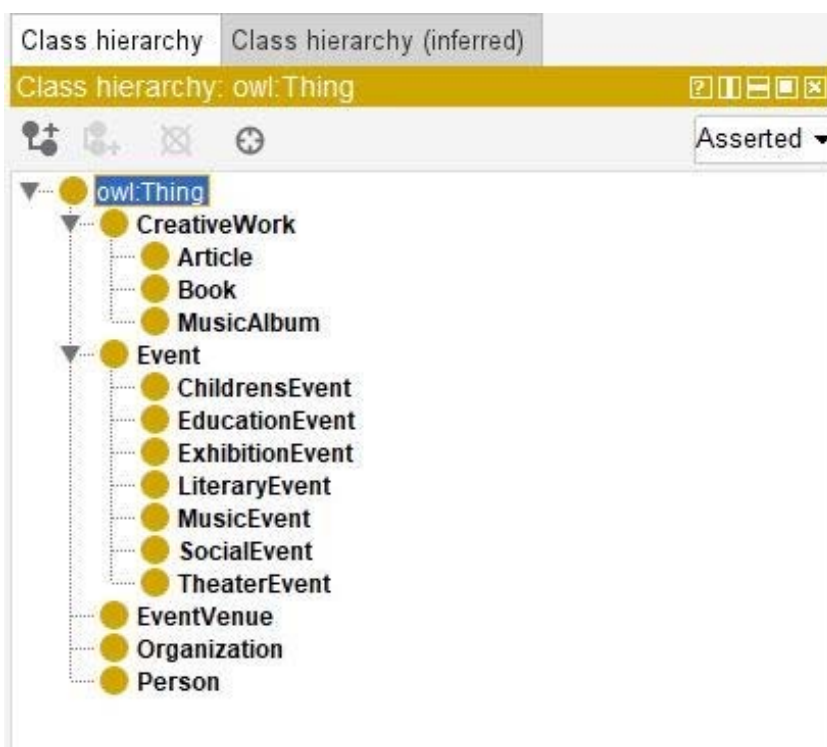
se obezbijedila bolja logička struktura, uz korištenje *Schema.org* kao osnove, što će ovoj ontologiji omogućiti semantičku interoperabilnost s drugim ontologijama i sistemima koji koriste ovaj standard. Klase su kreirane kako bi reprezentovale osnovne entitete festivala; ukupno je definisano 5 klasa i 10 potklasa, dakle ukupno njih 15:

- *CreativeWork*: klasa koja obuhvata sva kreativna djela predstavljena na festivalu, a sadrži tri potklase: *Article*, *Book* i *MusicAlbum*. Svaka individua/instanca unutar ove klase nosi specifičan naziv knjige, kritike ili albuma, što omogućava preciznu identifikaciju i povezivanje s događajima na festivalu, npr. *vrataTajni*, *kritikaPedeset* ili *sinPustinje*;
- *Event*: ova klasa predstavlja sve događaje na festivalu. Kao natklasa, ona ima pet potklasa koje su specifične za tipove događaja na festivalu, a to su:
  - *ChildrensEvent*: ova potklasa fokusira se na događaje namijenjene djeci, s individuama koje predstavljaju specifične promocije i radionice za djecu, poput *promocijaDječakČakIEna* ili *promocijaMožeIDrugačije*;
  - *EducationEvent*: ova potklasa obuhvata predavanja u sklopu radionice, s individuama kao što su *radionicaAutofikcija* ili *radionicaCriticiZeMe*;
  - *ExhibitionEvent*: predstavlja izložbe, odnosno izložbu *izložbaNaslovnica*;
  - *LiteraryEvent*: predstavlja književne događaje kao što su promocije knjiga, gdje svaka individua predstavlja specifičnu promociju, npr. *promocijaCrniLeptiri* ili *promocijaNoviKraj*;
  - *MusicEvent*: predstavlja muzičke događaje i performanse, s individuama kao što su *koncertSinPustinje*;
  - *SocialEvent*: u ovu su klasu svrstani svi događaji koji ne pripadaju drugim kategorizacijama događaja, a po svom karakteru su društveni, kao što su *otvorenjeBookstana*, *zatvaranjeBookstana*, *pressKonferencija* i *dodjelaNagradaRadionica*;
  - *TheaterEvent*: odnosi se na predstave, npr. *predstavaKućaUUliciMango*;
- *EventVenue*: ova klasa predstavlja lokacije na kojima se održavaju događaji, poput knjižara, galerija i drugih mjesta, npr. *američ-*

the ontology to achieve semantic interoperability with other ontologies and systems that follow this standard. Classes were designed to represent the main entities of the festival. In total, 5 classes and 10 subclasses were defined—15 in total:

- *CreativeWork*: a class that encompasses all creative works presented at the festival. It includes three subclasses: *Article*, *Book*, and *MusicAlbum*. Each individual/instance within this class has a specific name corresponding to a book, a critique, or an album, which allows precise identification and linking to festival events (e.g., *vrataTajni*, *kritikaPedeset*, *sinPustinje*).
- *Event*: this class represents all festival events. As a superclass, it includes five subclasses that correspond to specific event types at the festival, namely:
  - *ChildrensEvent*: this subclass focuses on events designed for children, with individuals representing specific promotions and workshops such as *promocijaDječakČakIEna* or *promocijaMožeIDrugačije*.
  - *EducationEvent*: this subclass encompasses lectures within workshops, with individuals such as *radionicaAutofikcija* or *radionicaCriticiZeMe*.
  - *ExhibitionEvent*: this subclass represents exhibitions, such as *izložbaNaslovnica*.
  - *LiteraryEvent*: this subclass represents literary events such as book promotions, where each individual corresponds to a specific promotion, e.g., *promocijaCrniLeptiri* or *promocijaNoviKraj*.
  - *MusicEvent*: this subclass represents musical events and performances, with individuals such as *koncertSinPustinje*.
  - *SocialEvent*: this subclass includes all events that do not fall into other categories but are social in character, such as *otvorenjeBookstana*, *zatvaranjeBookstana*, *pressKonferencija*, and *dodjelaNagradaRadionica*.
  - *TheaterEvent*: this subclass refers to theatre performances, such as *redstavaKućaUUliciMango*.
- *EventVenue*: this class represents the locations where events are held, including bookshops, galleries, and other venues,

- kiKutakSarajevo* i *goetheInstitutBiH*;
- Organization: predstavlja sve organizacije, preduzeća, udruženja, odnosno sva pravna lica na bilo koji način uključena u ontologiju, poput *izdavačBuybook*, *laguna* ili *sanjamKnjigeUIstri*;
  - Person: ova klasa obuhvata sve fizička lica, tj. sve osobe povezane s festivalom, uključujući autore/ice, moderatore/ice i učesnike/ce, poput *lamiyaMilišić*, *almirImširević* i *marijaTodorova*.
- e.g., *američkiKutakSarajevo* and *goetheInstitutBiH*.
- Organization: this class represents all organizations, companies, associations, i.e., all legal entities in any way involved in the ontology, such as *izdavačBuybook*, *laguna*, or *sanjamKnjigeUIstri*.
  - Person: this class encompasses all individuals connected with the festival, including authors, moderators, and participants, such as *lamiyaMilišić*, *almirImširević*, and *marijaTodorova*.



Slika 1. Klase i potklase ontologije 8. izdanja *Bookstana* definisane u Protégéu

Figure 1. Classes and subclasses of the ontology of the 8th edition of *Bookstan* defined in Protégé

#### 4.1.5. Definisanje svojstava klasa (slotova)

Nakon što su definisane klase, sljedeći korak je definiranje svojstava klasa, odnosno objektnih relacija (*object properties*) i podatkovnih atributa (*data properties*). Definisanje slotova pomaže u kreiranju detaljnije i preciznije ontologije, omogućavajući povezivanje klasa i dodavanje dodatnih informacija. Objektno relacije omogućavaju povezivanje instanci unutar ontologije, na primjer, relacija *author* može povezivati instancu osobe s instancom knjige, što implicira da je ta osoba autor te knjige. Ove su relacije pažljivo odabrane iz standarda *Schema.org*, a dodate su i prilagođene kako bi reflektovale kompleksne odnose između različitih entiteta na festivalu. Prilagođene relacije su, zapravo, inverzne relacije onih već postojećih u schemi, npr. *author*

#### 4.1.5. Defining Class Properties (Slots)

After defining the classes, the next step is to define their properties, i.e., object properties and data properties. Defining slots helps create a more detailed and precise ontology by enabling the linking of classes and the addition of further information. Object properties establish connections between instances within the ontology. For example, the property *author* can connect an instance of a person with an instance of a book, implying that the person is the author of that book. These properties were carefully selected from the *Schema.org* standard, with additional customized properties created to reflect the complex relationships between different festival entities. The customized relations are, in fact, inverses of existing *Schema.org* properties.

je objektna relacija iz standarda *Schema.org*, dok je *wasWrittenBy* prilagođena objektna relacija u inverzivnom odnosu s relacijom *author*. Kreirano je ukupno 36 objektnih relacija:

- *author* i *wasWrittenBy* povezuju instance djela (*CreativeWork*) s njihovim autorima;
- *contributor* i *wasContributedBy* povezuju instance organizacija (*Organization*) i osoba (*Person*) s događajima (*Event*) kojima su doprinijeli;
- *director* i *wasDirectedBy* povezuju instance predstava (*TheaterEvent*) s režiserima i režiserkama u klasi osoba (*Person*);
- *editor* i *wasEditedBy* povezuju instance publikacija (*CreativeWork*) s urednicima i urednicama;
- *employee* i *hasEmployee* povezuju instance organizacija (*Organization*) s njihovim zaposlenima;
- *illustrator* i *wasIllustratedBy* povezuju instance knjiga (*Book*) s ilustratorima;
- *instructor* i *wasInstructedBy* povezuju instance radionice (*EducationEvent*) s njenim predavačima/cama;
- *location* i *hostedEvent* povezuju instance događaja (*Event*) s lokacijama na kojima se održavaju (*EventVenue*);
- *performer* i *wasPerformedBy* povezuju instance predstava (*TheaterEvent*) s izvođačima;
- *producer* i *wasProducedBy* povezuju instance predstava (*TheaterEvent*) s njihovim producentima;
- *publisher* i *wasPublishedBy* povezuju instance publikacija (*CreativeWork*) s izdavačima;
- *review* i *isReviewOf* povezuju instance kritika (*Article*) s knjigama koje kritikuju (*Book*);
- *speaker* i *hasSpoken* povezuju instance moderatora/ica s događajima koje su moderirali (*Event*);
- *translator* i *wasTranslatedBy* povezuju instance prevedenih knjiga (*Book*) s prevodiocima i prevoditeljicama;
- *subEvent* i *superEvent* su obje *Schema.org* relacije i povezuju nadređene događaje s pripadajućim podređenim događajima (*Event*);
- *participant* i *hasParticipated* povezuju instance događaja (*Event*) s učesnicima/ama;

For instance, *author* is an object property from the *Schema.org* standard, while *wasWrittenBy* is a customized property that serves as its inverse. In total, 36 object properties were created:

- *author* and *wasWrittenBy* connect instances of works (*CreativeWork*) with their authors.
- *contributor* and *wasContributedBy* connect instances of organizations (*Organization*) and persons (*Person*) with the events (*Event*) to which they contributed.
- *director* and *wasDirectedBy* connect instances of theatre performances (*TheaterEvent*) with their directors (*Person*).
- *editor* and *wasEditedBy* connect instances of publications (*CreativeWork*) with their editors.
- *employee* and *hasEmployee* connect instances of organizations (*Organization*) with their employees.
- *illustrator* and *wasIllustratedBy* connect instances of books (*Book*) with their illustrators.
- *instructor* and *wasInstructedBy* connect instances of workshops (*EducationEvent*) with their instructors.
- *location* and *hostedEvent* connect instances of events (*Event*) with the venues where they are held (*EventVenue*).
- *performer* and *wasPerformedBy* connect instances of theatre performances (*TheaterEvent*) with their performers.
- *producer* and *wasProducedBy* connect instances of theatre performances (*TheaterEvent*) with their producers.
- *publisher* and *wasPublishedBy* connect instances of publications (*CreativeWork*) with their publishers.
- *review* and *isReviewOf* connect instances of critiques (*Article*) with the books they critique (*Book*).
- *speaker* and *hasSpoken* connect instances of moderators with the events (*Event*) they moderated.
- *translator* and *wasTranslatedBy* connect instances of translated books (*Book*) with their translators.
- *subEvent* and *superEvent* (*Schema.org* properties) connect parent events with their related sub-events (*Event*).
- *participant* and *hasParticipated* connect instances of events (*Event*) with their participants.

- `workPresented` i `wasPresentedAt` povezuju instance knjiga (*Book*) s događajima na kojima su predstavljene (*Event*).

Podatkovni atributi služe za povezivanje instanci klasa s konkretnim vrijednostima podataka. Oni omogućavaju da se entitetima u ontologiji dodijele specifične karakteristike koje su izražene kao podaci, a ne kao veze s drugim entitetima. Na primjer, atribut `dateTime` sadrži podatak o datumu i vremenu održavanja događaja. Kreirano je ukupno 5 podatkovnih atributa:

- `name`: koristi se za imenovanje entiteta kao što su osobe, lokacije i događaji;
- `dateTime`: koristi se za specificiranje datuma i vremena događaja u ISO 8601 formatu, npr. “2023-07-07T12:00:00”.
- `award`: koristi se za označavanje nagrada koje su osobe osvojile tokom festivala;
- `addressCountry`: koristi se za označavanje države iz koje neko dolazi;
- `eventType`: koristi se da označi tip događaja, odnosno program festivala: *Glavni program*, *Specijalni program*, *Specijalno gostovanje*, *Bookstan distrikt*, *Mladi kutak*.

#### 4.1.6. Definisanje aspekata slotova

Nakon definisanja slotova, sljedeći korak je definisanje njihovih aspekata, kao što su kardinalnost, domet i raspon. Kardinalnost određuje broj instanci koje mogu biti povezane s određenim slotom, dok domet i raspon određuju tipove podataka ili klasa koje se mogu povezati s određenim slotom. Ovi aspekti pomažu u definisanju pravila i ograničenja unutar ontologije, osiguravajući konzistentnost i tačnost modela. Ipak, unutar ove ontologije samo su definisane vrijednosti (*value*) podatkovnih atributa, što je dovoljno za jednostavnije ontologije (*string* za tekstualne podatke i slično).

#### 4.1.7. Kreiranje instanci

Posljednji korak u razvoju ontologije jest kreiranje instanci. Instance su konkretne individue unutar klasa u ontologiji. U ovoj ontologiji ih ima ukupno 237 i svaka od njih predstavlja stvarni entitet unutar konteksta 8. izdanja festivala *Bookstan* iz 2023. godine, na primjer *amraMutapčićČengiĆ* ili *izdavačBuybook*.

- `workPresented` and `wasPresentedAt` connect instances of books (*Book*) with the events (*Event*) at which they were presented.

Data properties are used to connect class instances with specific data values. They allow entities in the ontology to be assigned particular characteristics expressed as data rather than as links to other entities. For example, the property `dateTime` stores the date and time of an event. A total of five data properties were created:

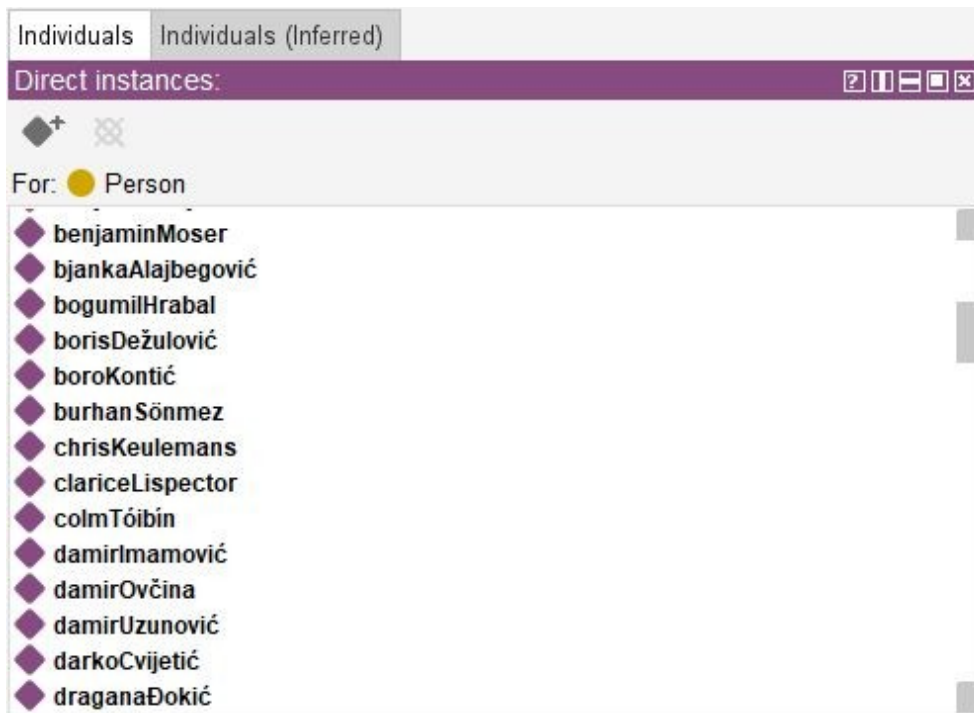
- `name`: used for naming entities such as persons, locations, and events;
- `dateTime`: used for specifying the date and time of events in ISO 8601 format, e.g., 2023-07-07T12:00:00;
- `award`: used to indicate awards won by individuals during the festival;
- `addressCountry`: used to denote the country of origin of a person;
- `eventType`: used to specify the type of event or programme within the festival, such as *Main Programme*, *Special Programme*, *Special Guest Appearance*, *Bookstan District*, or *Youth Corner*.

#### 4.1.6. Defining Slot Aspects

After defining the slots, the next step is to specify their aspects, such as cardinality, domain, and range. Cardinality determines the number of instances that can be connected to a given slot, while domain and range define the types of data or classes that may be linked through the slot. These aspects help establish rules and constraints within the ontology, ensuring consistency and accuracy of the model. However, in this ontology only the *values* of data properties were defined, which is sufficient for a simpler ontology. For example, string values were used for textual data and similar straightforward formats.

#### 4.1.7. Creating Instances

The final step in ontology development is the creation of instances. Instances are the concrete individuals within the classes of the ontology. In this ontology, a total of 237 instances were created, each representing a real entity within the context of the 8th edition of the *Bookstan* festival (2023). Examples include *amraMutapčićČengiĆ* or *izdavačBuybook*.



Slika 2. Instance klase Person  
Figure 2. Instances of the Person class

#### 4.2. Validacija ontologije

Nakon što su klase, objektna relacije, podatkovni atributi i individue kreirani, ontologija je validirana koristeći *Pellet* reasoner u softveru *Protégé*. Validacija je uključivala provjeru konzistentnosti, pravilno definisanih relacija i instanci, kao i ispravnost svih definicija u skladu sa standardima OWL. Identifikovani su i ispravljani potencijalni problemi, poput nekompatibilnih vrijednosti atributa.

#### 4.3. Praktična primjena ontologije

U ovom će potpoglavlju model ontologije biti praktično primijenjen, s fokusom na dva ključna aspekta: vizualizaciju podataka i pretraživanje podataka. Ontologija nije samo teorijski model; ona je alat koji omogućava efikasnu organizaciju, pretraživanje i analizu podataka. Kroz primjenu vizualizacijskih alata poput *OntoGraf*, kao i upita pomoću SPARQL-a, možemo dobiti dublji uvid u strukturu, veze i interakcije unutar podataka festivala. U prvom dijelu ovog potpoglavlja, pod nazivom *Vizualizacija uz pomoć OntoGraf*, bit će prikazani primjeri vizualizacije ključnih elemenata ontologije, uključujući događaje, učesnike/ce i njihove međusobne odnose – ovi grafički prikazi omogućavaju intuitivno razumijevanje složenih struktura i olakšavaju identifikaciju obrazaca unutar podataka – dok će u drugom dijelu, pod nazivom *Upiti SPARQL*, fokus biti stavljen na upite koji omogućavaju efika-

#### 4.2. Ontology Validation

Once the classes, object properties, data properties, and individuals had been created, the ontology was validated using the *Pellet* reasoner in *Protégé*. Validation included checking for consistency, properly defined relations and instances, as well as compliance with OWL standards. Potential issues—such as incompatible attribute values—were identified and corrected.

#### 4.3. Practical Application of the Ontology

In this subsection, the ontology model is applied in practice, with a focus on two key aspects: data visualization and data retrieval. The ontology is not merely a theoretical model; it is a tool that enables efficient organization, search, and analysis of data. Through the use of visualization tools such as *OntoGraf*, as well as queries executed in SPARQL, it is possible to gain deeper insights into the structure, relationships, and interactions within the festival data. In the first part of this subsection, *Visualization Using OntoGraf*, examples of visualizations of key ontology elements will be presented, including events, participants, and their interrelationships. These graphical representations allow for an intuitive understanding of complex structures and facilitate the identification of patterns within the data. In the second part, *SPARQL Queries*, the focus will be on queries that enable efficient retrieval of data

sno pretraživanje podataka unutar ontologije. Upiti SPARQL omogućavaju selektivno izvlačenje informacija, što je ključno za analizu i daljnju praktičnu primjenu ontologije. Kombinacija ovih tehnika pruža sveobuhvatan pristup praktičnoj primjeni ontologije, demonstrirajući kako se teorijski modeli mogu koristiti za stvarne analize i rješenja.

#### 4.3.1. Vizualizacija uz pomoć OntoGrafa

*OntoGraf* je alat za vizualizaciju ontologija unutar softvera *Protégé*, koji omogućava korisnicima i korisnicama da pregledaju i analiziraju složene mreže odnosa između klasa, instanci i svojstava. Jedna od osnovnih prednosti *OntoGrafa* jeste njegova sposobnost da prikaže kako su pojedinačne instance povezane s različitim događajima, objektima i ulogama unutar ontologije. Kroz grafički prikaz, korisnici/e mogu brzo identifikovati koje su sve instance uključene u određene događaje, kako su povezane s drugim instancama i koje su njihove uloge u cjelokupnom modelu. Ovo je posebno korisno kada se radi o složenim ontologijama koje uključuju veliki broj povezanih elemenata, kao što su kulturni, filmski ili književni festivali, gdje ima mnogo događaja, učesnika/ca i aktivnosti. U kontekstu ontologije razvijene za festival *Bookstan*, *OntoGraf* je korišten za jasnije i vizualno privlačnije razumijevanje kompleksnih interakcija unutar festivala. U nastavku su prikazani primjeri korištenja *OntoGrafa* za vizualizaciju ključnih elemenata ove ontologije.

##### 4.3.1.1. Primjer: instanca *marijaTodorova*

Na donjem dijagramu je prikazana instanca *marijaTodorova*; stvarna osoba, bugarska historičarka Marija Todorova predstavljena je kao instanca klase *Person*, što znači da je ona fizičko lice koje je učestvovalo na festivalu. Dijagram jasno prikazuje sve njene uloge i doprinose u različitim događajima na festivalu, kao i veze s njenim radovima i izdavačima.

Instanca *imaginarniBalkan* predstavlja knjigu koju je napisala Marija Todorova, koja je povezana s izdavačem *izdavačBuybook*, što je dodatno prikazano u dijagramu. Marija je bila učesnica nekoliko događaja tokom festivala, što je prikazano kroz veze s različitim instancama, poput *specijalAktuelniIzazoviBalkanskogEntiteta* i *otvorenjeBookstana*. Ove veze jasno pokazuju u kojim je sve aktivnostima i diskusijama Marija Todorova učestvovala, što omogućava dublje razumijevanje njenog doprinosa festivalu.

within the ontology. SPARQL queries allow for selective extraction of information, which is crucial for analysis and further practical application of the ontology. The combination of these techniques offers a comprehensive approach to the practical application of the ontology, demonstrating how theoretical models can be used to produce real-world analyses and solutions.

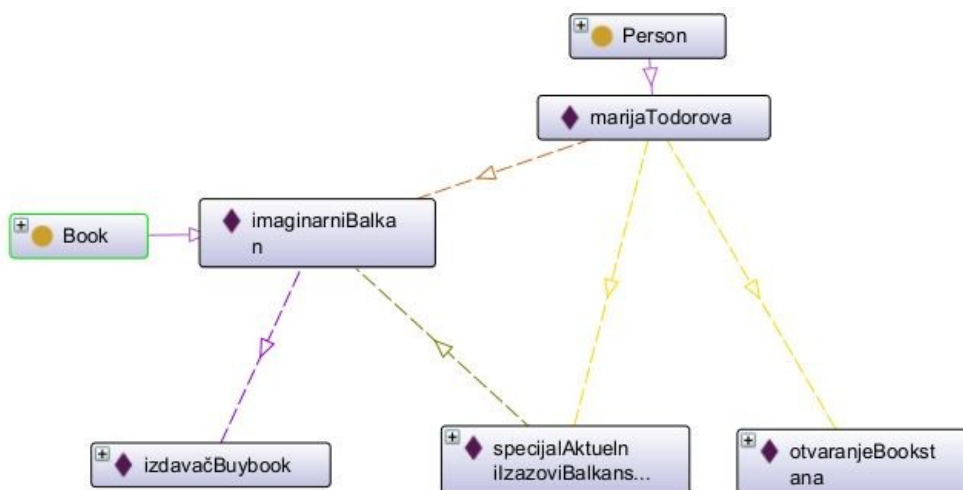
#### 4.3.1. Visualization with OntoGraf

*OntoGraf* is a visualization tool within *Protégé* that allows users to view and analyze complex networks of relationships between classes, instances, and properties. One of the main advantages of *OntoGraf* is its ability to display how individual instances are connected to various events, objects, and roles within the ontology. Through graphical representation, users can quickly identify which instances are involved in specific events, how they are linked to other instances, and what their roles are within the overall model. This feature is particularly useful when dealing with complex ontologies that involve a large number of interconnected elements, such as cultural, film, or literary festivals, which typically encompass many events, participants, and activities. In the context of the *Bookstan festival ontology*, *OntoGraf* was used to provide a clearer and more visually engaging understanding of the complex interactions within the festival. The following examples illustrate how *OntoGraf* was employed to visualize key elements of this ontology.

##### 4.3.1.1. Example: the instance *marijaTodorova*

The diagram below illustrates the instance *marijaTodorova*. The real person, Bulgarian historian Maria Todorova, is represented as an instance of the *Person* class, which means she is modelled as an individual who participated in the festival. The diagram clearly shows all her roles and contributions across different festival events, as well as her connections to her works and publishers.

The instance *imaginarniBalkan* represents the book written by Maria Todorova, which is linked to the publisher *izdavačBuybook*, also displayed in the diagram. Maria participated in several events during the festival, represented by links to instances such as *specijalAktuelniIzazoviBalkanskogEntiteta* and *otvorenjeBookstana*. These connections make it possible to see which activities and discussions Maria Todorova took part in, offering deeper insight into her contribution to the festival.



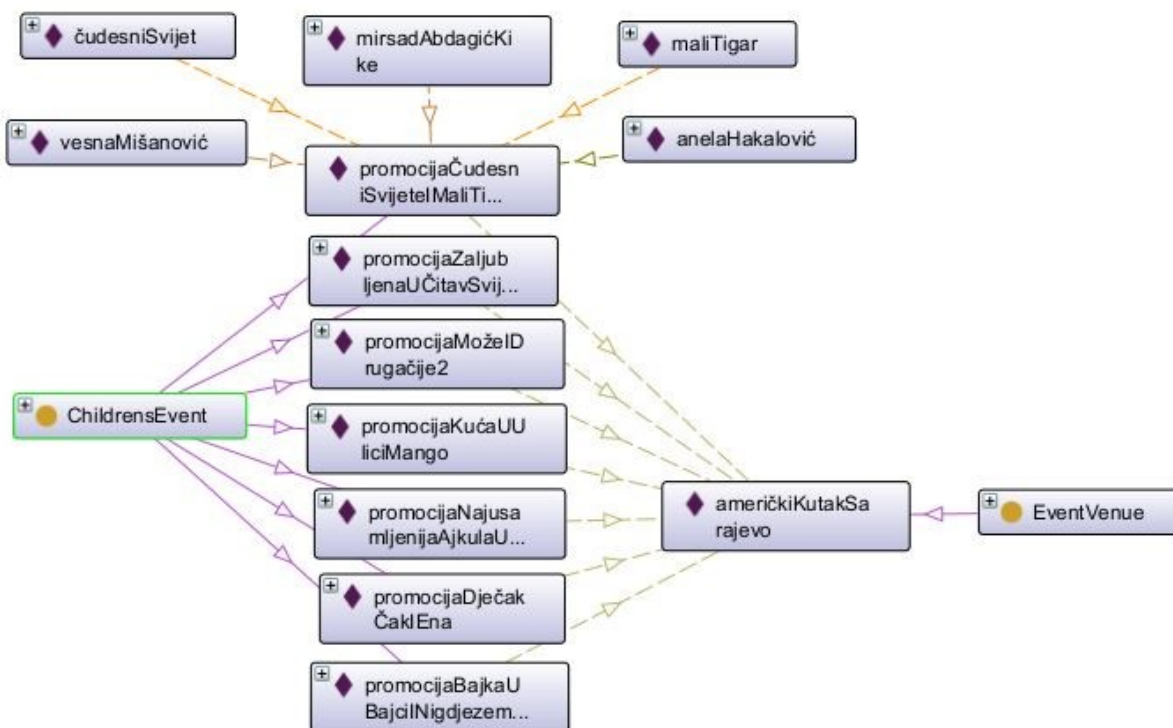
**Slika 3.** Dijagram koji predstavlja instancu marijaTodorova  
**Figure 3.** Diagram representing the instance marijaTodorova

4.3.1.2. Primjer: instanca američkiKutakSarajevo

Na sljedećem dijagramu je prikazana instanca američkiKutakSarajevo; instanca klase EventVenue koja u ontologiji predstavlja lokaciju održavanja različitih aktivnosti i događaja unutar festivala. Na ovom prikazu jasno su vidljive veze između ove lokacije i konkretnih promocija knjiga koje su tamo održane, uključuje i druge instance koje su povezane s tim promocijama.

4.3.1.2. Example: the instance američkiKutakSarajevo

On the following diagram, the instance američkiKutakSarajevo is shown; an instance of the EventVenue class, which in the ontology represents a location where various activities and events of the festival took place. In this visualization, the connections between this venue and the specific book promotions held there are clearly visible, as well as other instances associated with those promotions.



**Slika 4.** Dijagram koji predstavlja instancu američkiKutakSarajevo  
**Figure 4.** Diagram representing the instance američkiKutakSarajevo

Na dijagramu se vidi i primjer jedne od promocija: promocija *čudesniSvijetIMaliTigar*, koji je dodatno razrađen i pokazuje veze s autoricom (*vesnaMišanović*), moderatoricom (*anelaHakalović*), učesnikom (*mirsadAbdagićKike*), kao i knjigama (*čudesniSvijet*; *maliTigar*) koje su promovisane tokom ovog događaja. Ove veze omogućavaju sveobuhvatan uvid u to ko je učestvovao u promociji, koje su knjige bile u fokusu, kao i druge ključne informacije vezane za ovaj događaj. Ovaj vizualni prikaz pokazuje kako ontologija ne samo da organizuje podatke već ih i povezuje na način koji omogućava složenije pretrage i analize. Na primjer, lako je vidjeti sve događaje održane na lokaciji *američkiKutakSarajevo* i povezane entitete, poput knjiga i učesnika/ca, što olakšava praćenje i istraživanje kompleksnih odnosa unutar festivala.

#### 4.3.1.3. Primjer: instanca

predstavaKućaUuliciMango

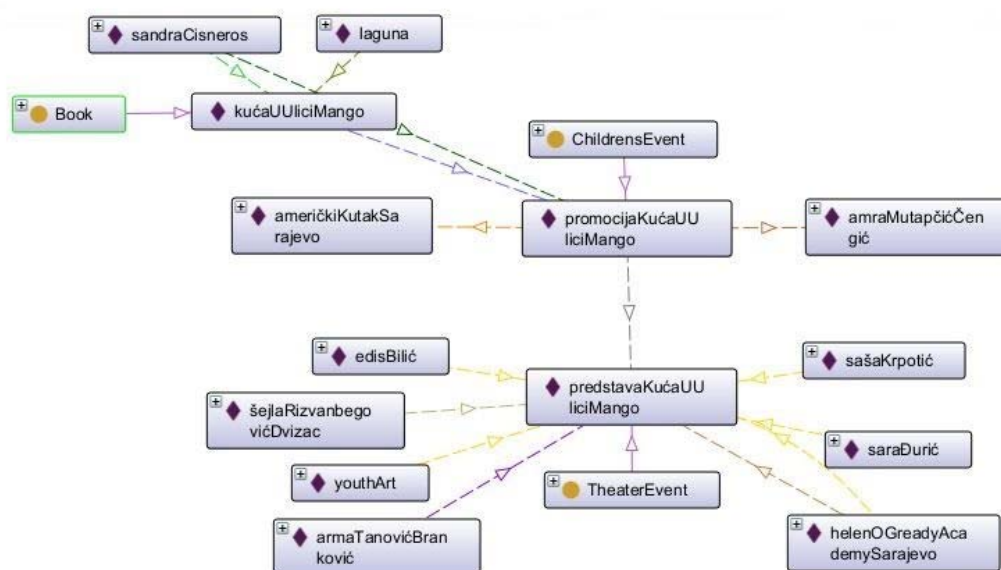
Na narednom dijagramu je prikazana instanca *predstavaKućaUuliciMango*; ona predstavlja konkretan, podređeni događaj (*subEvent*) unutar većeg događaja (*superEvent*) *promocijaKućaUuliciMango*, gdje je u fokusu bila knjiga *kućaUuliciMango*. Kroz ovaj dijagram jasno se mogu vidjeti sve ključne komponente povezane s ovom promocijom, uključujući mjesto održavanja, učesnike/ce, kao i uloge različitih osoba u okviru događaja.

On the diagram, one of the book promotions is also shown: *promocijačudesniSvijetIMaliTigar*, which is further elaborated to display its connections with the author (*vesnaMišanović*), the moderator (*anelaHakalović*), the participant (*mirsadAbdagićKike*), as well as the books (*čudesniSvijet*; *maliTigar*) that were promoted during this event. These links provide a comprehensive insight into who participated in the promotion, which books were in focus, and other key information related to this event. This visual representation demonstrates how the ontology not only organizes data but also connects it in ways that enable more complex searches and analyses. For instance, it becomes easy to view all events held at the *američkiKutakSarajevo* venue and the related entities, such as books and participants, thereby facilitating the tracking and exploration of the festival's complex relationships.

#### 4.3.1.3. Example: the instance

predstavaKućaUuliciMango

The following diagram illustrates the instance *predstavaKućaUuliciMango*, which represents a specific sub-event (*subEvent*) within the broader event (*superEvent*) *promocijaKućaUuliciMango*, centered on the book *kućaUuliciMango*. Through this diagram, all key components associated with this promotion are clearly visible, including the venue, the participants, and the roles of different individuals within the event.



**Slika 5.** Dijagram koji predstavlja instancu *predstavaKućaUuliciMango*  
**Figure 5.** Diagram representing the instance *predstavaKućaUuliciMango*

Individualna predstava *Kuća u Ulici Mango* je instanca potklase *TheaterEvent* i odnosi se na dramske adaptacije i izvedbu knjige *Kuća u Ulici Mango* (*kućaUuliciMango*) autorice Sandre Cisneros (*sandraCisneros*), u okviru promocije knjige *promocijaKućaUuliciMango*, koju je moderirala Amra Mutapčić Čengić (*amraMutapčićČengić*). Svoj doprinos predstavi su dali Edis Bilić (*edisBilić*), Sara Đurić (*saraĐurić*), Saša Krpotić (*sašaKrpotic*), Youth Art (*youthArt*), Helen O'Grady Academy Sarajevo (*helenOGreadyAcademySarajevo*) te Arma Tanović Branković (*armaTanovićBranković*) kao režiserka i Šejla Rizvanbegović Dvizac (*šejlaRizvanbegovićDvizac*) kao producentica. Ovaj dijagram na jednostavan i intuitivan način prikazuje složene odnose među entitetima te kako se jedan kulturni događaj može razgranati na više povezanih poddogađaja s različitim učesnicima/ama i komponentama.

#### 4.3.2. SPARQL upiti

SPARQL (*SPARQL Protocol and RDF Query Language*) je standardizovani jezik za formulisanje upita za podatke predstavljen u formatu RDF (*Resource Description Framework*) (DuCharme, 2013). B. DuCharme navodi da ovaj jezik omogućava korisnicima/ama da postavljaju upite na sličan način kao što SQL funkcioniše za relacione baze podataka, ali s fokusom na semantičke podatke organizovane u *tripleove*: subjekat, predikat, objekat (DuCharme, 2013). Koristeći SPARQL, moguće je lako pretraživati povezane podatke u ontologijama, a zbog svoje fleksibilnosti, postao je ključni alat u domenima kao što su semantički web, digitalna humanistika i ontološko modeliranje. On se sastoji od nekoliko komponenti, uključujući klauzulu *SELECT*, koja specificira varijable koje će biti odabrane, i klauzulu *WHERE*, koja definiše uslove koje podaci moraju ispuniti da bi bili preuzeti (DuCharme, 2013). Za potrebe ovog istraživanja, upiti SPARQL su formulisani kako bi se došlo do specifičnih informacija o autorima/cama, knjigama i nagradama. Ovi upiti omogućili su efikasno pretraživanje i organizaciju podataka unutar ontologije, pružajući jasan uvid u ključne aspekte festivala.

Sljedeći primjeri prikazuju kako je SPARQL korišten za identifikaciju knjiga koje su promovisane na festivalu, zajedno s datumom, vremenom i mjestom održavanja, zatim za izlistavanje autora/ica po državi iz kojih dolaze te za pronalaženje polaznika/ca radionice koji su osvojili nagrade.

The individual *predstavaKućaUuliciMango* is an instance of the subclass *TheaterEvent* and refers to the dramatic adaptation and performance of the book *Kuća u Ulici Mango* (*kućaUuliciMango*), authored by Sandra Cisneros (*sandraCisneros*), within the framework of the book promotion *promocijaKućaUuliciMango*, moderated by Amra Mutapčić Čengić (*amraMutapčićČengić*). Contributors to the play included Edis Bilić (*edisBilić*), Sara Đurić (*saraĐurić*), Saša Krpotić (*sašaKrpotic*), Youth Art (*youthArt*), Helen O'Grady Academy Sarajevo (*helenOGreadyAcademySarajevo*), as well as Arma Tanović Branković (*armaTanovićBranković*) as the director, and Šejla Rizvanbegović Dvizac (*šejlaRizvanbegovićDvizac*) as the producer. This diagram clearly and intuitively illustrates the complex relationships among entities, demonstrating how a single cultural event can branch out into multiple interconnected sub-events involving diverse participants and components.

#### 4.3.2. SPARQL Queries

SPARQL (*SPARQL Protocol and RDF Query Language*) is a standardized language for querying data represented in the RDF (*Resource Description Framework*) format (DuCharme, 2013). As DuCharme notes, this language allows users to formulate queries in a manner similar to SQL for relational databases, but with a focus on semantic data organized in triples: subject, predicate, object (DuCharme, 2013). By using SPARQL, it becomes possible to easily search linked data within ontologies. Due to its flexibility, SPARQL has become a key tool in domains such as the Semantic Web, digital humanities, and ontology modelling. It consists of several components, including the *SELECT* clause, which specifies the variables to be retrieved, and the *WHERE* clause, which defines the conditions the data must satisfy in order to be returned (DuCharme, 2013). For the purposes of this research, SPARQL queries were formulated to extract specific information about authors, books, and awards. These queries enabled efficient searching and organization of data within the ontology, providing clear insight into key aspects of the festival.

The following examples demonstrate how SPARQL was used to identify books promoted at the festival—together with the date, time, and location of their promotion events—to list authors by their country of origin, and to find workshop participants who received awards.

#### 4.3.2.1. Primjer: upit da se prikažu sve promocije knjiga, zajedno s datumom, vremenom i mjestom održavanja

Ovaj SPARQL upit je formulisan da pretraži sve instance promocija knjiga unutar ontologije *Bookstana* za 2023. godinu. Upit se fokusira na pronalaženje svih knjiga koje su bile predstavljene/promovisane na događajima festivala, uključujući podatke o mjestu, datumu i vremenu tih promocija:

```
PREFIX : <http://www.semanticweb.org/Bookstan2023#>
```

```
SELECT ?book ?event ?eventVenue ?dateTime
WHERE {
  ?book :wasPresentedAt ?event .
  ?event :location ?eventVenue .
  ?event :dateTime ?dateTime . }
```

book	event	eventVenue	dateTime
škriptajlKože	promocijaŠkriptajlKože	akademijaLikovnihUmjetnosti	""2023-07-06T17:30:00""
nigdjezemska	promocijaBajkaUBajciliNigdjezemska	američkiKutakSarajevo	""2023-07-06T12:00:00""
pedeset	promocijaPedeset	knjižaraBuybook	""2023-07-08T16:00:00""
evolucijaJedneKratkovidostiDrugePriče	promocijaEvolucijaJedneKratkovidostiDrugePriče	knjižaraBuybook	""2023-07-06T13:00:00""
kućaUiliciMango	promocijaKućaUiliciMango	američkiKutakSarajevo	""2023-07-07T12:00:00""
dječakČak	promocijaDječakČakIEna	američkiKutakSarajevo	""2023-07-06T13:00:00""
kamenlSjenka	promocijaKamenlSjenka	knjižaraBuybook	""2023-07-07T20:30:00""
čarobnjak	zastaranjeBookstana	knjižaraBuybook	""2023-07-08T20:30:00""
versschmuggeIKrijumčarenjeStihova	promocijaVersschmuggeIKrijumčarenjeStihova	knjižaraBuybook	""2023-07-06T11:00:00""
smirnaGora	promocijaSmirnaGora	knjižaraBuybook	""2023-07-07T13:00:00""
plastelinci	promocijaPlastelinci	historijskIMuzejBiH	""2023-07-07T12:00:00""
polaroidKauboј	promocijaPolaroidKauboј	knjižaraBuybook	""2023-07-08T12:00:00""

**Slika 6.** Promocije knjiga po događajima na kojima su predstavljene, mjestu te datumu i vremenu održavanja  
**Figure 6.** Book promotions by events in which they were presented, including venue, date, and time

#### 4.3.2.2. Primjer: upit da se prikažu svi autori/ice i države iz kojih dolaze

U ovom SPARQL upitu cilj je bio da se identifikuju svi autori/ce povezani s festivalom *Bookstan*, zajedno s državama njihovog porijekla. Upitom su tražene sve instance koje imaju *addressCountry* kao podatkovni atribut. Rezultati ovog upita omogućavaju pretragu svih autora/ica u ontologiji i njihovih država, što može biti korisno za analizu jednog festivala koji ima međunarodni karakter. Sortiranjem rezultata po državama, upit nudi pregled organizovan po geografskom porijeklu učesnika/ca te se tako može otkriti iz kojih država je učestvovalo najviše autora/ica:

#### 4.3.2.1. Example: Query to Display All Book Promotions Together with Their Date, Time, and Venue

This SPARQL query was formulated to search all instances of book promotion events within the *Bookstan 2023* ontology. The query focuses on retrieving all books that were presented/promoted at festival events, including details of the venue, date, and time of these promotions:

#### 4.3.2.2. Example: Query to Display All Authors and Their Countries of Origin

The aim of this SPARQL query was to identify all authors associated with the *Bookstan* festival, along with their countries of origin. The query searches for all instances that have *addressCountry* as a data property. The results provide an overview of all authors in the ontology and their respective countries, which is especially useful for analyzing a festival with an international character. By sorting the results by country, the query offers a geographically organized overview of participants, making it possible to identify from which countries the largest number of authors came:

```
PREFIX : <http://www.semanticweb.org/Bookstan2023#>
```

```
SELECT ?author ?country
WHERE { ?author :addressCountry ?country . }
ORDER BY ?country
```

SPARQL query:

```
PREFIX : <http://www.semanticweb.org/Bookstan2023#>
SELECT ?author ?country
WHERE { ?author :addressCountry ?country . }
ORDER BY ?country
```

author	
colmTóibín	"Irska"
guidoSnel	"Nizozemska"
johnFreeman	"SAD"
sandraCisneros	"SAD"
mirjanaDrljević	"Srbija"
markoVidojković	"Srbija"
burhanSönmez	"Turska"
ahmetÜmit	"Turska"
asliTohumcu	"Turska"
priscillaMorris	"Velika Britanija"
bogumilHrabal	"Češka"
saschaGarzetti	"Švicarska"

**Slika 7.** Autori/ce po državama  
**Figure 7.** Authors by country

#### 4.3.2.3. Primjer: upit za prikaz učesnika/ca radionice koji su osvojili nagrade

Treći SPARQL upit je fokusiran na identifikaciju svih instanci unutar ontologije koje su dobile nagrade tokom festivala. Upit traži sve instance koje imaju podatkovni atribut *award*, a zatim prikazuje te instance zajedno s vrijednostima tog atributa.

Ovaj upit omogućava pregled svih nagrađenih entiteta u okviru festivala, što može uključivati autore, knjige, ili čak specifične događaje, no kako su nagrade dodjeljivane samo polaznicima/ama radionice, prikazane su samo te instance:

#### 4.3.2.3. Example: Query to Display Workshop Participants Who Received Awards

The third SPARQL query focuses on identifying all instances within the ontology that received awards during the festival. The query searches for all instances that have the *award* data property and then displays those instances together with the values of that property.

This query provides an overview of all awarded entities within the festival, which could theoretically include authors, books, or even specific events. However, since awards were only given to workshop participants, only those instances are displayed:

```
PREFIX : <http://www.semanticweb.org/Bookstan2023#>
```

```
SELECT ?instance ?awardValue
WHERE { ?instance :award ?awardValue }
```

SPARQL query:	
PREFIX : <http://www.semanticweb.org/Bookstan2023#>	
SELECT ?instance ?awardValue	
WHERE {?instance :award ?awardValue}	
instance	
pabloSrdanović	"2. nagrada"
emilijaVučićević	"Specijalna nagrada"
stanislavaPaunović	"1. nagrada"
zejnebaHajdarević	"3. nagrada"

Slika 8. SPARQL upit za definisanje dobitnika/ca nagrada  
 Figure 8. SPARQL query for defining award recipients

## 5. Diskusija

Digitalno arhiviranje i ontološko modeliranje 8. izdanja *Bookstan* festivala predstavlja značajan korak k očuvanju književne kulturne baštine Sarajeva i Bosne i Hercegovine, a i među prvim je radovima koji ontološki modelira jedan književni festival. Ova studija pokazuje važnost integracije semantičkih tehnologija u kulturni sektor, što omogućava dugoročno očuvanje i poboljšan pristup kulturnim resursima. Nakon što su u prethodnim poglavljima predstavljeni metodologija, rezultati i analiza ovog istraživanja, u ovome je moguće dati odgovore na istraživačka pitanja postavljena u *Uvodu*:

**IP1: Koje su ključne komponente i entiteti koji bi trebali biti uključeni u ontološki model za digitalno arhiviranje Bookstana?**

Ključne komponente ontološkog modela za digitalno arhiviranje 8. izdanja festivala *Bookstan* uključuju događaje (*Event*), djela (*CreativeWork*), osobe (*Person*), organizacije (*Organization*) i lokacije (*EventVenue*). Događaji su kategorizirani prema tipu (npr. književni događaji, muzički događaji), dok kreativna djela obuhvataju knjige, kritike/članke i muzičke albume predstavljene na festivalu. Osobe uključuju autore/ice, predavače/ice, moderatore/ice i učesnike/ice raznih događaja, dok su lokacije prostori gdje su događaji održani;

**IP2: Kako ontološko modeliranje u Protégé-u može poboljšati organizaciju, pretraživanje i dostupnost digitalnih resursa vezanih za ovaj festival?**

Ontološko modeliranje u *Protégé*-u omogućava preciznu organizaciju i pretraživanje podataka kroz korištenje upita SPARQL. Semantička interoperabilnost, postignuta kroz korištenje standarda *Schema*.

## 5. Discussion

The digital archiving and ontological modelling of the 8th edition of the *Bookstan* festival represents a significant step toward preserving the literary cultural heritage of Sarajevo and Bosnia and Herzegovina, and it is also among the first works to ontologically model a literary festival. This study demonstrates the importance of integrating semantic technologies into the cultural sector, enabling long-term preservation and improved access to cultural resources. After presenting the methodology, results, and analysis in the previous chapters, this section provides answers to the research questions posed in the Introduction:

**RQ1: What are the key components and entities that should be included in the ontological model for the digital archiving of Bookstan?**

The key components of the ontological model for the digital archiving of the 8th edition of the *Bookstan* festival include categories such as *Event*, *CreativeWork*, *Person*, *Organization*, and *EventVenue*. Events are categorized by type (e.g., literary events, music events), while creative works cover books, critiques/articles, and music albums presented at the festival. Persons include authors, lecturers, moderators, and participants in various events, whereas event venues represent the spaces where the events took place.

**RQ2: How can ontological modeling in Protégé improve the organization, retrieval, and accessibility of digital resources related to this festival?**

Ontological modelling in *Protégé* enables precise organization and retrieval of data through the use of SPARQL queries. Semantic interoperability,

org, dodatno omogućava da se podaci u ontologiji lako integrišu i razmjenjuju s drugim sistemima i platformama. Vizualizacija podataka putem *OntoGrafa* pruža intuitivno razumijevanje veza između različitih entiteta, olakšavajući istraživačima pristup i analizu podataka. Također, mogućnost integracije s postojećim ontologijama kao što su FOAF i BIBO dodatno poboljšava dostupnost i organizaciju digitalnih resursa;

**IP3: *Koji su izazovi i potencijalna rješenja u integraciji ontoloških okvira s postojećim praksama digitalnog arhiviranja kulturnih festivala?***

Jedan od glavnih izazova u integraciji ontoloških okvira s postojećim praksama digitalnog arhiviranja jest postizanje ravnoteže između složenosti modela i njegove praktične upotrebljivosti. CIDOC CRM, na primjer, pruža bogat okvir za modeliranje kulturnih podataka, ali njegova složenost može biti prekomjerna za specifične potrebe kao što je arhiviranje jednog izdanja festivala. S druge strane, *Schema.org* nudi jednostavniji i direktniji model koji je lakše implementirati i koristiti, ali može biti ograničen u nekim aspektima detaljnog modeliranja. Potencijalno rješenje leži u korištenju hibridnog modela koji kombinuje prednosti oba pristupa—korištenje jednostavnijih schema za osnovne informacije i proširenje sa specifičnim elementima iz složenijih modela kada je to potrebno;

**IP4: *Kakav uticaj može imati razvijeni ontološki model na očuvanje i promociju kulturne baštine kakva je Bookstan?***

Razvijeni ontološki model ima značajan uticaj na očuvanje i promociju kulturne baštine; kroz strukturirano i interoperabilno predstavljanje podataka, ontologija omogućava dugoročno očuvanje informacija o festivalu i olakšava njihovo pretraživanje. To omogućava istraživačima/cama i organizatorima/cama bolji pristup arhiviranim podacima, čime se doprinosi kontinuiranoj promociji kulturne baštine. Model također omogućava bolju vidljivost festivala i njegovo povezivanje sa sličnim kulturnim inicijativama u regiji i šire;

**IP5: *Kako ontološki model može pružiti podršku interdisciplinarnim istraživanjima i podstaći saradnju između kulturoloških studija, digitalne humanistike i informacijskih nauka?***

Ontološki model 8. izdanja festivala *Bookstan* pruža okvir koji olakšava saradnju između različitih akademskih disciplina. U kulturalnim studijama, ovaj model omogućava istraživačima/cama da analiziraju kulturne i književne aspekte festivala kroz detaljno strukturirane podatke. U digitalnoj humanistici,

achieved through the application of the *Schema.org* standard, further allows the ontology's data to be easily integrated and exchanged with other systems and platforms. Visualization with *OntoGraf* provides an intuitive understanding of the relationships between different entities, making data access and analysis easier for researchers. In addition, the possibility of integrating existing ontologies such as FOAF and BIBO further enhances the accessibility and organization of digital resources.

**RQ3: *What are the challenges and potential solutions in integrating ontological frameworks with existing practices of digital archiving cultural festivals?***

One of the main challenges in integrating ontological frameworks with existing digital archiving practices is achieving a balance between model complexity and practical usability. CIDOC CRM, for example, provides a rich framework for modelling cultural data, but its complexity may be excessive for specific needs such as archiving a single edition of a festival. On the other hand, *Schema.org* offers a simpler and more straightforward model that is easier to implement and use, but it can be limited in certain aspects of detailed modelling. A potential solution lies in adopting a hybrid model that combines the advantages of both approaches—using simpler schemas for basic information and extending them with specific elements from more complex models when necessary.

**RQ4: *What impact can the developed ontological model have on the preservation and promotion of cultural heritage such as Bookstan?***

The developed ontological model has a significant impact on the preservation and promotion of cultural heritage. Through the structured and interoperable representation of data, the ontology ensures the long-term preservation of information about the festival and facilitates its retrieval. This enables researchers and organizers to access archived data more effectively, contributing to the continuous promotion of cultural heritage. The model also increases the visibility of the festival and supports its connection with similar cultural initiatives both within the region and internationally.

**RQ5: *How can the ontological model support interdisciplinary research and foster collaboration between cultural studies, digital humanities, and information science?***

The ontological model of the 8th edition of the *Bookstan* festival provides a framework that facilitates collaboration across academic disciplines. In

model može poslužiti kao primjer kako se digitalni alati mogu koristiti za očuvanje i analizu kulturne baštine. U informacijskim naukama, ontologija služi kao studija slučaja za primjenu semantičkog weba i ontoloških tehnologija u praksi. Kombinovanjem ovih različitih perspektiva, ontološki model podstiče interdisciplinarnu saradnju i inovacije, omogućavajući istraživačima i istraživačicama iz različitih oblasti da zajednički rade na projektima koji obuhvataju više aspekata kulturne baštine.

## 6. Zaključak

Ova ontologija pruža strukturu za očuvanje i pristup informacijama o 8. izdanju festivala *Bookstan*, omogućavajući budućim istraživačima/cama da istražuju bogatu kulturnu baštinu BiH na način koji ranije nije bio dostupan. Digitalno arhiviranje i ontološko modeliranje doprinose očuvanju kulturnih događaja i omogućavaju bolju povezanost i dostupnost informacija u digitalnom dobu. Ontologije su sama srž semantičkog weba (Biagetti, 2021), a kako navodi S. Dizdar, za njegove je potrebe važno razviti takve ontologije koje će opisati sisteme pojmova o svemu što je na webu predstavljeno te omogućiti računarima da prikupljaju informacije s različitih internetskih izvora, kako bi odgovorili na upite korisnika/ca (Dizdar, 2011). Kako semantički web dobiva na važnosti, dobivat će i ontologije kao njegova suština, pa je rad na razvijanju ontologija, ali i baza znanja (*Knowledge Base*) i grafova znanja (*Knowledge Graph*) od velike koristi za daljnji razvoj koncepta semantičkog weba.

Ovaj rad doprinosi upravo tom cilju, jer predstavlja početni korak k izgradnji sveobuhvatne baze znanja koja se odnosi na jedan sarajevski kulturni događaj, a također može poslužiti kao model ontologije za digitalno arhiviranje drugih kulturnih manifestacija, ne samo u Bosni i Hercegovini već i šire, pružajući okvir za standardizaciju pristupa podacima o književnom festivalu.

cultural studies, it enables researchers to analyze the cultural and literary aspects of the festival through detailed, structured data. In digital humanities, the model serves as an example of how digital tools can be applied to preserve and analyze cultural heritage. In information science, the ontology functions as a case study in the practical use of the Semantic Web and ontological technologies. By combining these different perspectives, the ontological model encourages interdisciplinary collaboration and innovation, allowing scholars from diverse fields to work together on projects that encompass multiple dimensions of cultural heritage.

## 6. Conclusion

This ontology provides a structure for preserving and accessing information about the 8th edition of the *Bookstan* festival, enabling future researchers to explore Bosnia and Herzegovina's rich cultural heritage in ways that were not previously possible. Digital archiving and ontological modelling contribute to the preservation of cultural events and allow for improved connectivity and accessibility of information in the digital age. Ontologies are at the very core of the Semantic Web (Biagetti, 2021). As Dizdar emphasizes, it is essential to develop ontologies that describe systems of concepts for everything represented on the web, enabling computers to collect information from different sources in order to respond to user queries (Dizdar, 2011). As the Semantic Web grows in importance, so too will ontologies as its essence. Work on developing ontologies, as well as knowledge bases and knowledge graphs, will therefore be of great value for the further advancement of the Semantic Web.

This study contributes directly to that goal by offering an initial step toward building a comprehensive knowledge base related to a Sarajevo cultural event. At the same time, it serves as a model ontology for the digital archiving of other cultural manifestations, not only in Bosnia and Herzegovina but also beyond, providing a framework for standardizing access to data about literary festivals.

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