

Library Modelling Report

by Maria Ingold

INTRODUCTION

Local Community-funded Library (LoCL) uses Civica's Spydus Library Management System (LMS) to manage adult and children's fiction and non-fiction books (Civica, N.D.). Due to efficiency concerns, LoCL is developing an Artificial Intelligence (AI)-powered search engine to better serve its patrons (Rout, 2018). This report presents LoCLont, a prototype ontology representing LoCL's book concepts and novel relationships to enable AI semantic search (Uschold & Grüninger, 1996).

The screenshot shows the 'Advanced search' page of the Spydus library catalogue. The breadcrumb trail at the top reads 'Home > Library catalogue - Advanced search'. On the left, a 'Library catalogue' menu is open, showing options like 'Quick search', 'Title', 'Author', 'Subject', 'Advanced' (selected), 'Issues', 'Articles', 'Events', 'Online resources', and 'External'. The main search area contains several input fields: 'Title' (God), 'Author' (Gaiman), 'Anywhere', and 'Dewey class'. Each field has a 'Keywords' dropdown and an 'AND' dropdown. Below these are fields for 'Year' (with an example 'e.g. 2007, > 2000, 1990-2005'), 'Added' (Anytime), 'Language' (English), 'Location' (Kentish Town Library), 'Collection' (Adult Fiction), and 'Material' (text). A 'Clear' button and a 'Search' button are at the bottom right. Below the search fields, there is an 'Options' section with 'Records per page' set to 20 and 'Sort by' set to Title.

FIGURE 1 | Spydus

BUSINESS CONTEXT

An Online Public Access Catalogue (OPAC), Spydus uses MACHine-Readable Cataloging (MARC) (*MARC Standards*, N.D.). MARC 21 provides bibliographic metadata structure, while OPAC searches author, title, subject, identifiers, and keywords with Boolean logic (Husain & Ansari, 2006).

OPACs require an exact match, resulting in low precision and recall (Rout, 2018).

For example, searching for 'God' and 'Gaiman' misses *American Gods*, and returns religious texts if only 'God' is searched (Figure 1).

'Genrefication', like Netflix's navigation, improves book discovery (Hider et al., 2021).

Coupling genre with audience-appropriate search empowers patrons to efficiently find books aligning with their interests and reading level (Moeller & Becnel, 2019; Journey to Kidlit, 2021).

APPROACH JUSTIFICATION

OPACs provide syntactic search—without context (Rout, 2018). Conversely, ontologies enable semantics—concepts and relationships—like in Grüniger and Fox's (1995) competency questions used in LoCLOnt's top-down deployment of Noy and McGuinness' (2001) seven-step methodology.

1: Determine Domain and Range

The domain, searching local library books, uses competency questions to informally define the library and patron's scope:

Which book titles...

- ...have 'Science Fiction' as their genre?
- ...are classified under both 'Historical' and 'Fantasy'?
- ...have 'God' in the title?
- ...are authored by 'Gaiman'?
- ...are suitable for Middle Grade children?
- ...are suitable for Middle Grade children who like Fantasy?
- ...were published after a date (new releases)?

Formally, in First Order Logic (FOL):

1. $\exists x, y, t (Book(x) \wedge ScienceFiction(y) \wedge HasGenre(x, y) \rightarrow Title(x, t))$
2. $\exists x, y_1, y_2, t (Book(x) \wedge Historical(y_1) \wedge Fantasy(y_2) \wedge HasGenre(x, y_1) \wedge HasGenre(x, y_2) \rightarrow Title(x, t))$
3. $\exists x, t (Book(x) \wedge Contains(Title(x), 'God') \rightarrow Title(x, t))$
4. $\exists x, t (Book(x) \wedge Author(x, 'Gaiman') \rightarrow Title(x, t))$
5. $\exists x, z, t (Book(x) \wedge MiddleGrade(z) \wedge IsSuitableFor(x, z) \rightarrow Title(x, t))$
6. $\exists x, y, z, t (Book(x) \wedge MiddleGrade(z) \wedge IsSuitableFor(x, z) \wedge Fantasy(y) \wedge HasGenre(x, y) \rightarrow Title(x, t))$
7. $\exists x, t (Book(x) \wedge PublishedAfter(x, 'date') \rightarrow Title(x, t))$

2: Consider Reusing Existing Ontologies

MARC21 is not an ontology, and Semantic Publishing and Referencing (SPAR)

Ontologies lack library concepts (Kruk et al., 2005; Peroni & Shotton, 2018).

Furthermore, fiction genre gaps in Dewey Decimal Classification and the Library of Congress Genre/Form Terms (LCGFT), mean Amazon and some libraries use Book Industry Standards And Communications (BISAC); unfortunately, 'juvenile' is broadly classed as ages 1 to 12 (Hider & Spiller, 2020). With no suitable ontologies, LoCLOnt reuses OPAC search types and BISAC genres.

ONTOLOGY DESIGN RATIONALE

LoCLOnt uses Protégé 5.5.0 Web Ontology Language (OWL) editor with SPARQL

Protocol and Resource Description Framework Query Language (SPARQL)

(DeBellis, 2021).

3: Enumerate Important Terms

Key distinct concepts include *book*, *audience*, *genre*, and *searchability*.

4: Define Classes and Hierarchy

'Book', 'BookAudience', 'BookGenre', 'Search' and 'SearchType' are disjoint top-level classes (Figure 2) (Uschold & Grüninger, 1996). While 'Book-' classes are static,

'Search' represents action using enumerated class 'SearchType' (Figure 3).

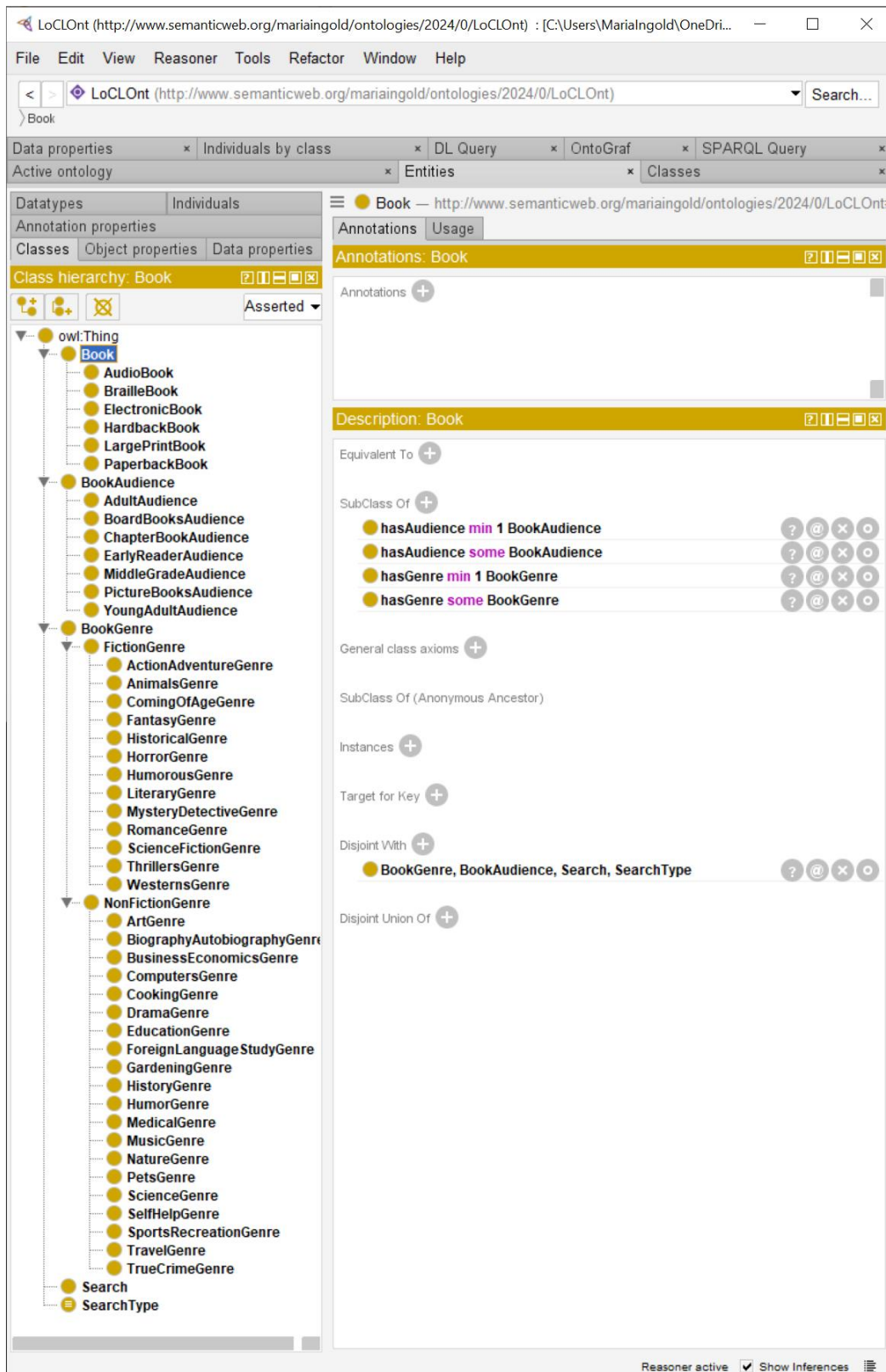


FIGURE 2 | Class hierarchy

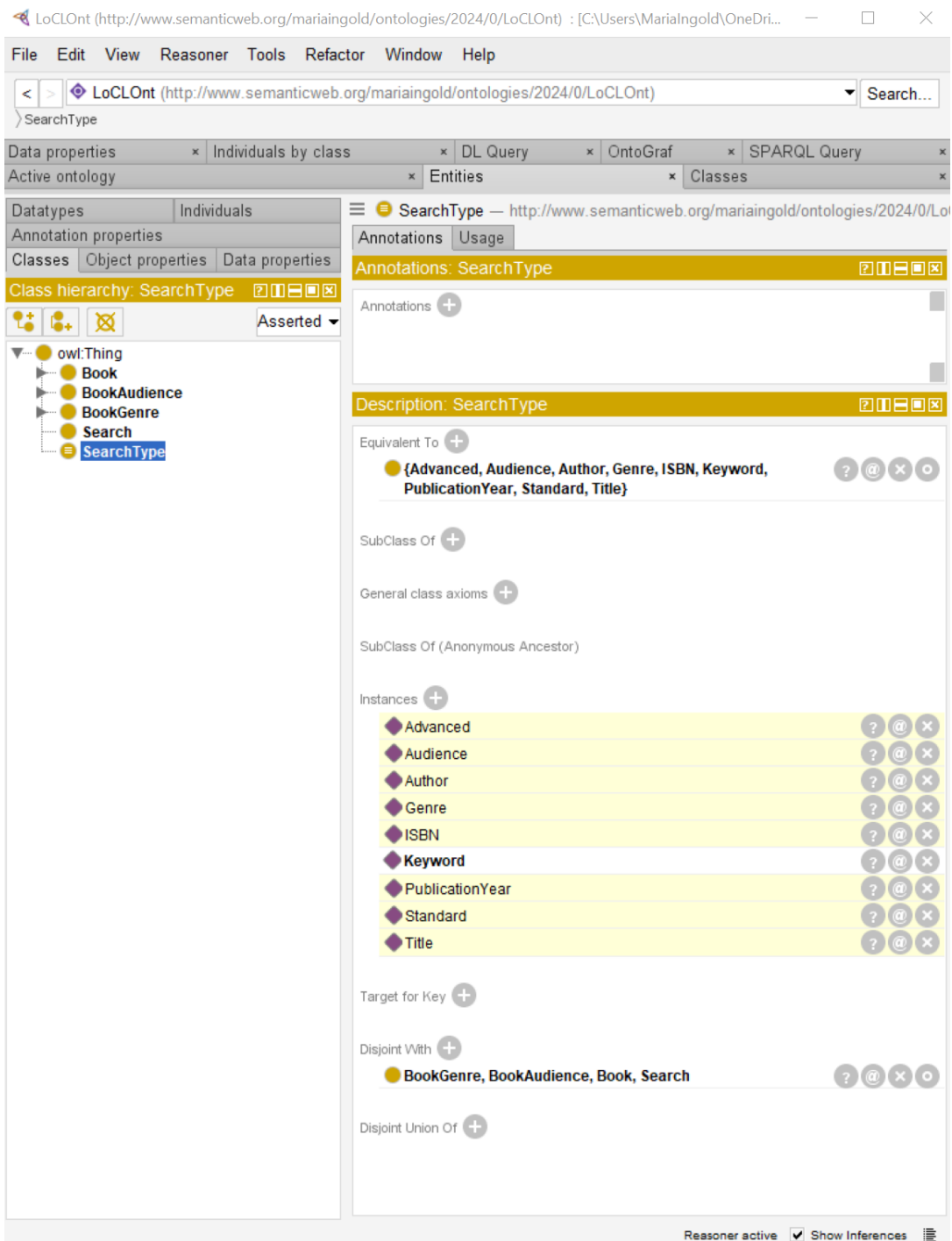


FIGURE 3 | Enumerated class (reasoner infers yellow)

5: Define Class Properties

Class properties denote relationships: Object (two instances), Data (instance and datatype), and Annotation (any entity) (DeBellis, 2021).

Book ‘has’ genre and audience Object Properties (Table 1, Figures 4, 5). No property characteristics apply (not Functional because a book can have more than one genre or audience). Enumerated type searchType is not Functional as the application layer combines.

TABLE 1 | Object properties

Object Property	Inverse	Domain	Range
hasGenre	isGenreOf	Book	BookGenre
hasAudience	isAudienceOf	Book	BookAudience
searchType	N/A	Search	SearchType

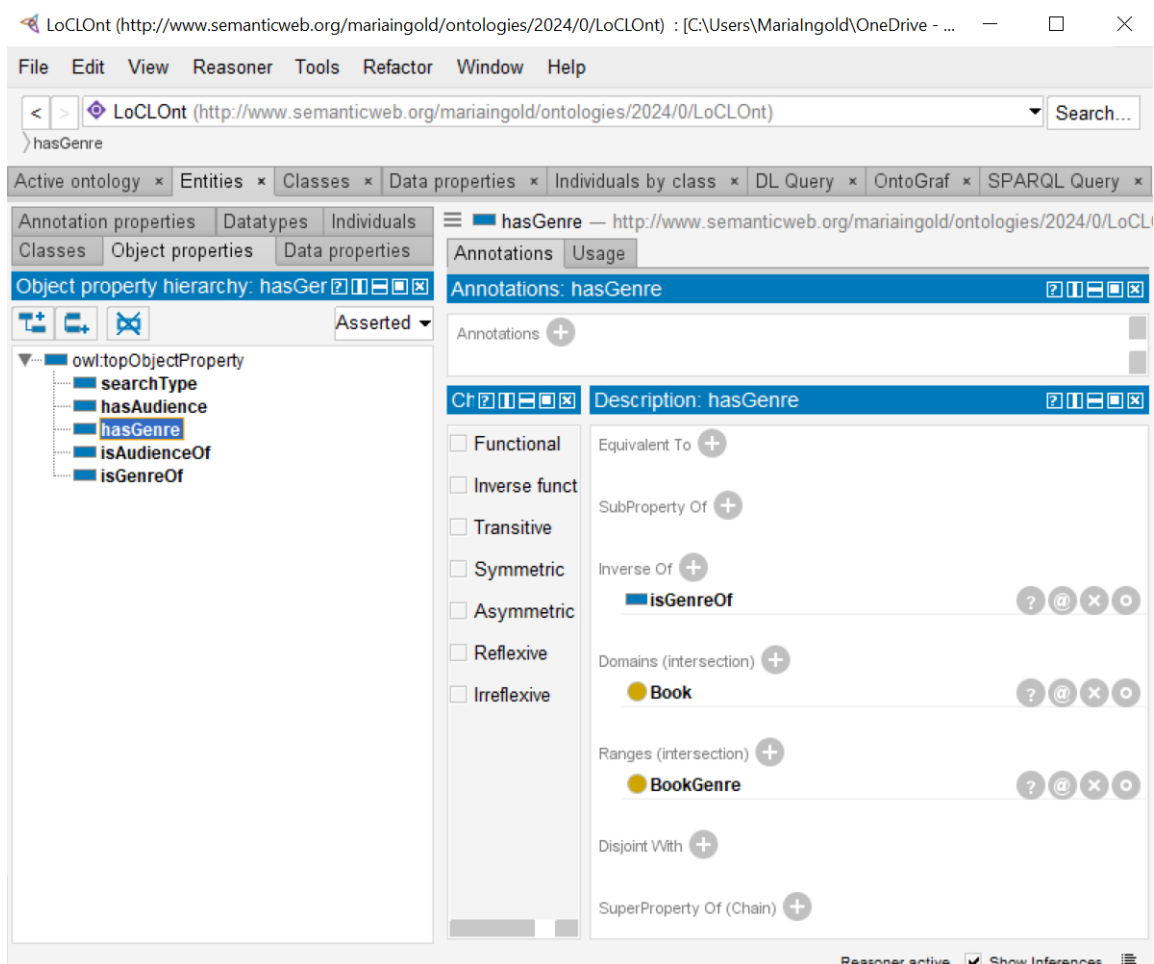


FIGURE 4 | Object properties

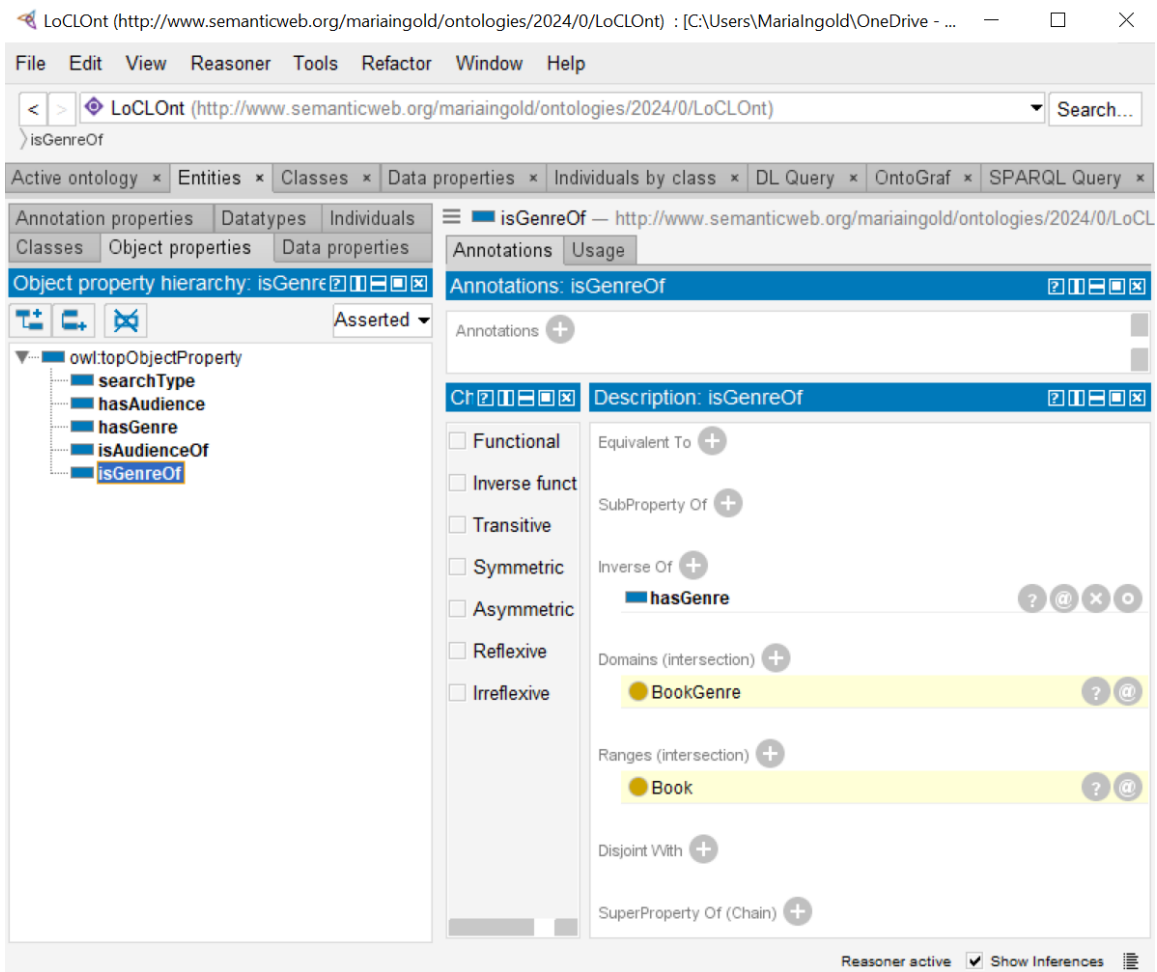


FIGURE 5 | Inverse

Given the simplicity required, author is a data property (Figure 6), whereas a BookAuthor class could have genres and audiences. Because formats are different instances, most properties are Functional, but multiple authors can exist (Table 2).

TABLE 2 | Data properties

Data Property	Functional	Domain	Range
title	Y	Book	xsd:string
author	N	Book	xsd:string
publicationYear	Y	Book	xsd.integer
isbn	Y	Book	xsd:string
searchDate	Y	Search	xsd.dateTime

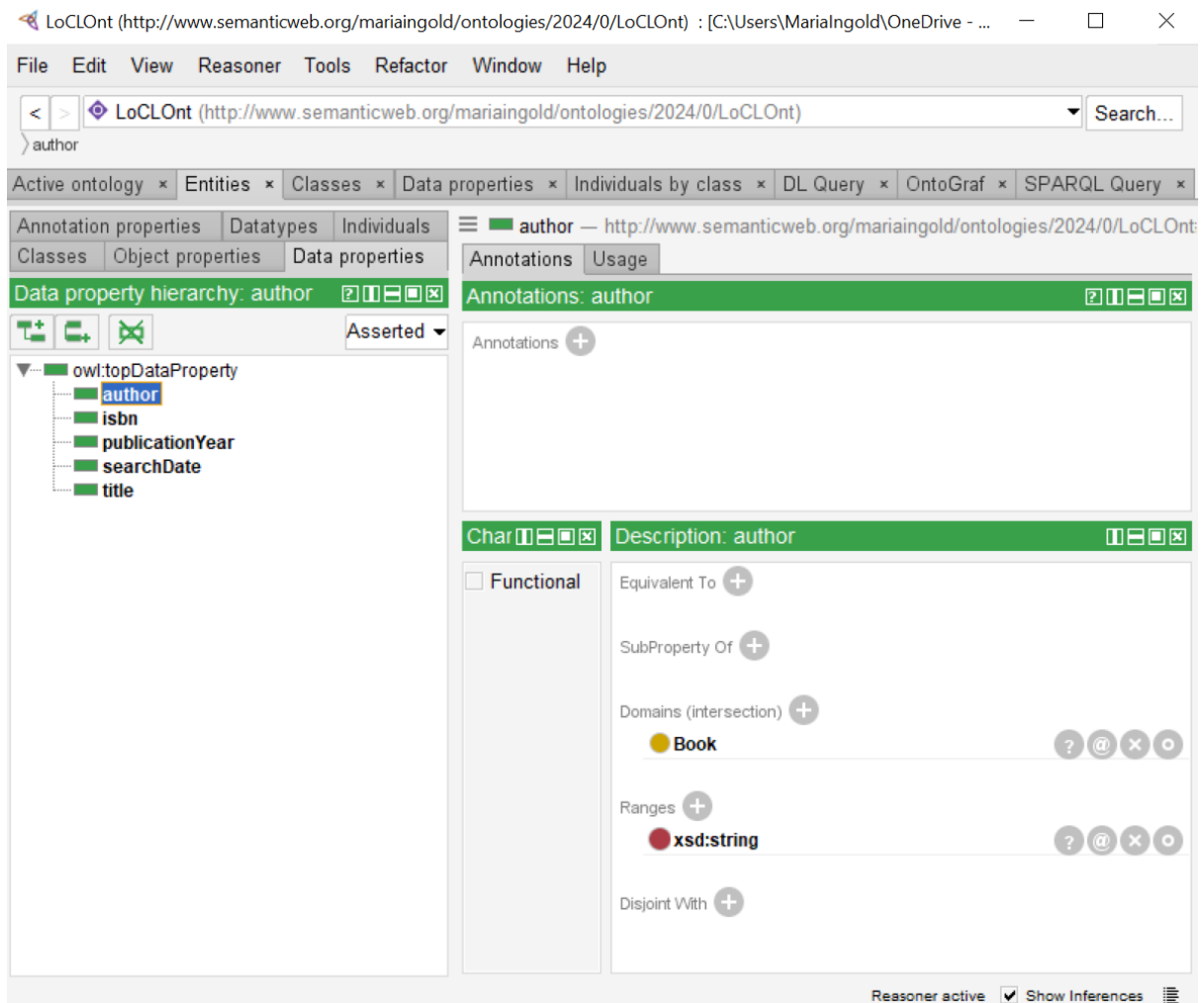


FIGURE 6 | Data properties

6: Define Property Restrictions

Class instance properties are restricted by quantifier (existential or universal), cardinality (number), or value (specific) (DeBellis, 2021). FOL \exists requires ‘Some (existential)’ quantifier, with cardinality ‘min 1’ ensuring books have at least one audience and genre. Universal is too restrictive and value is inapplicable.

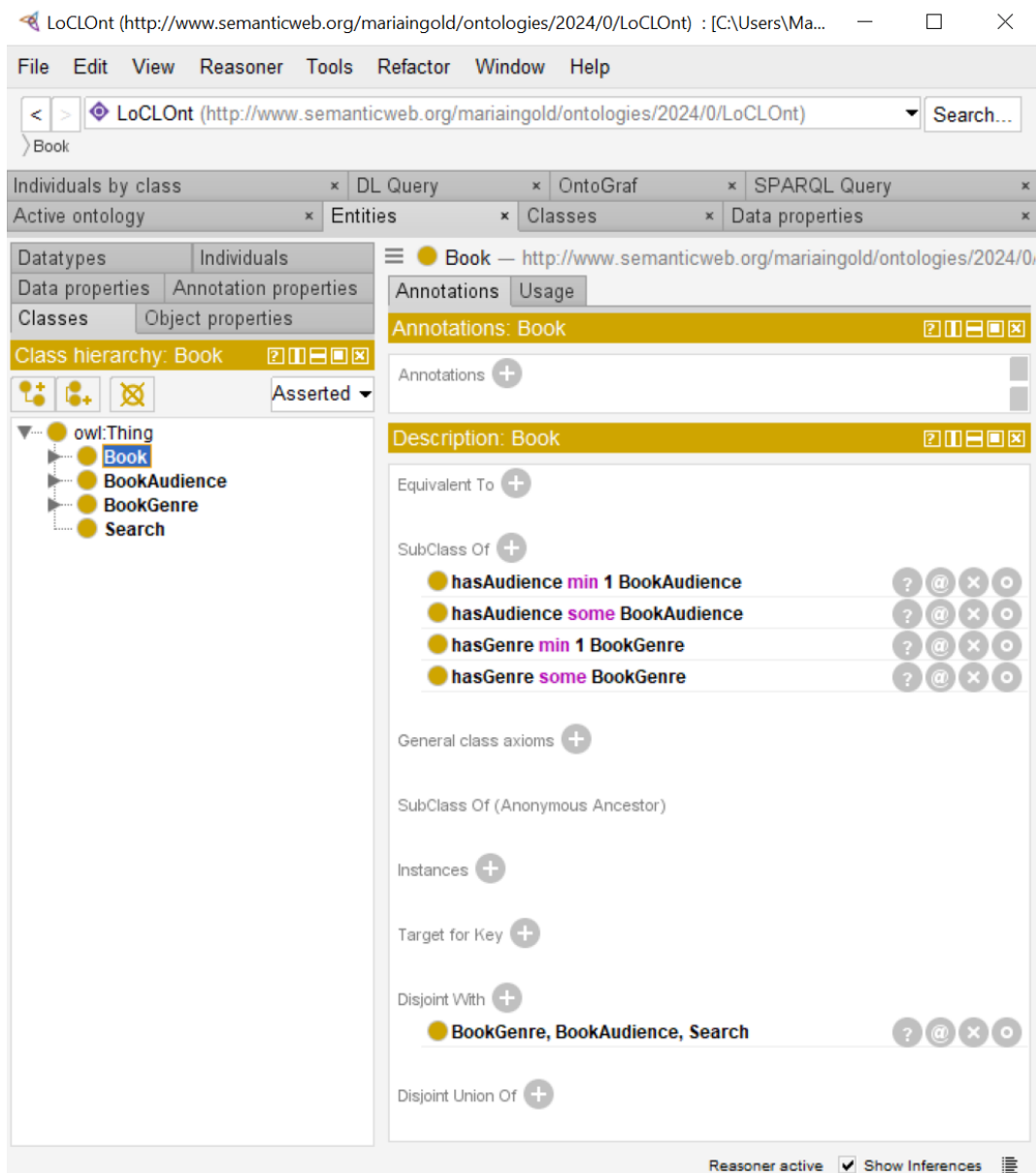


FIGURE 7 | Property restrictions

7: Create Instances

BookGenre and BookAudience instances were created and four PaperbackBook instances populated (Figures 8-11).

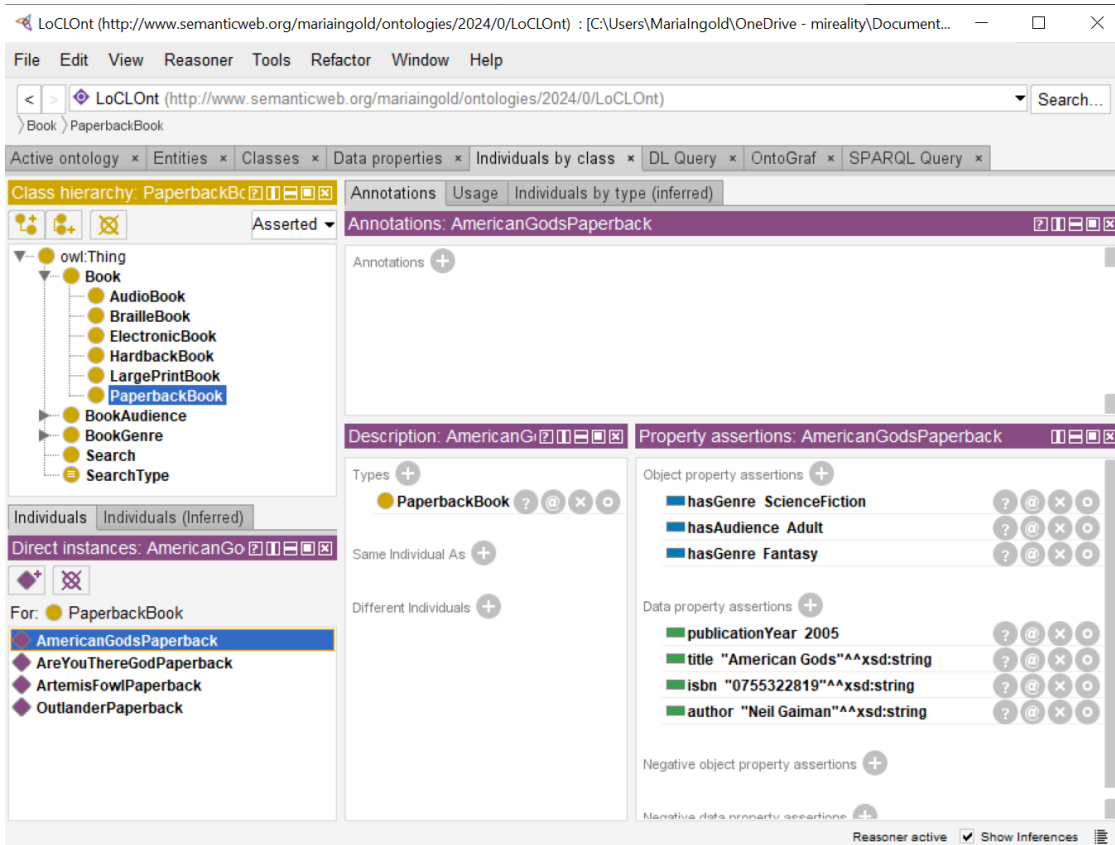


FIGURE 8 | AmericanGodsPaperback

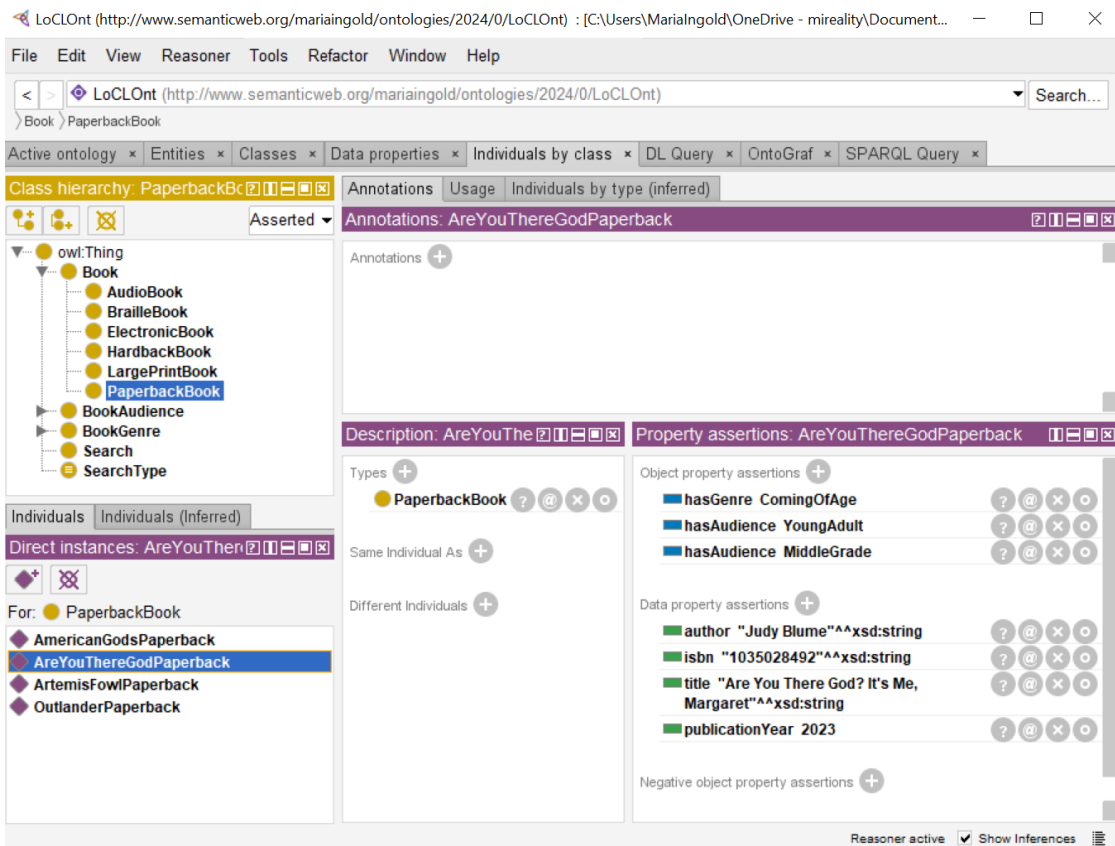


FIGURE 9 | AreYouThereGodPaperback

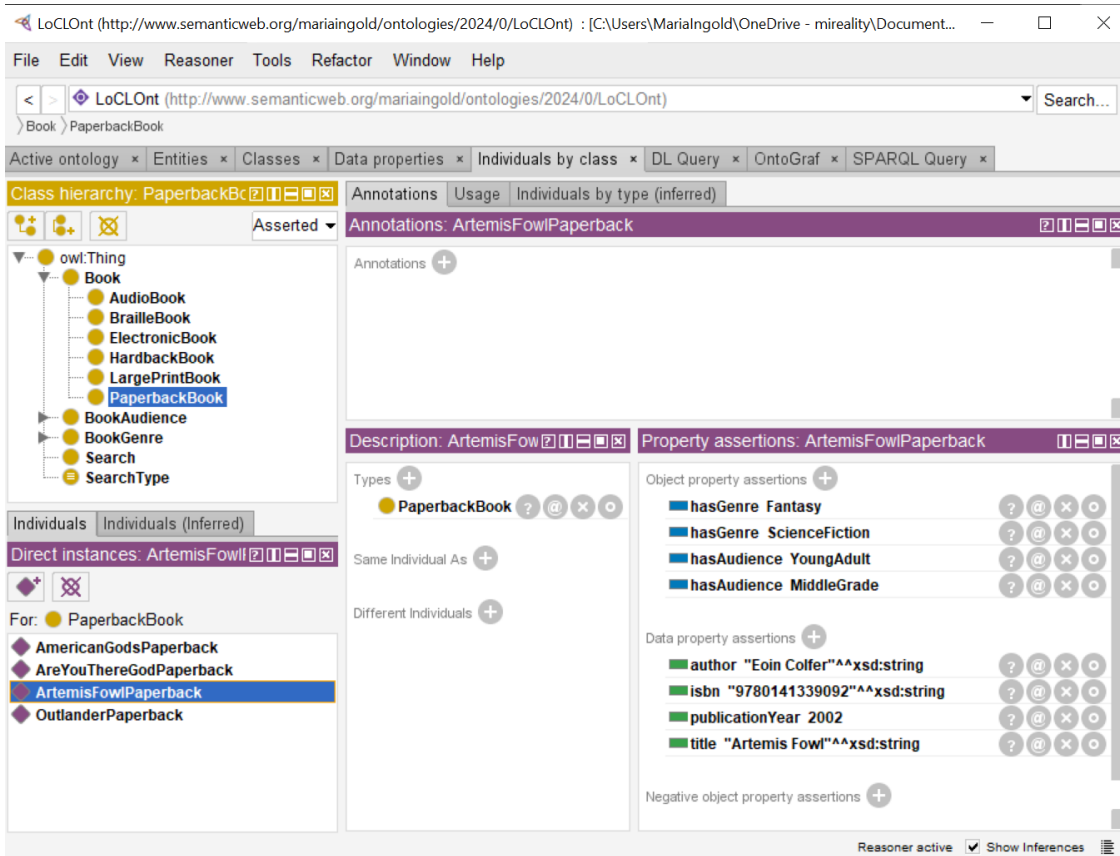


FIGURE 10 | ArtemisFowlPaperback

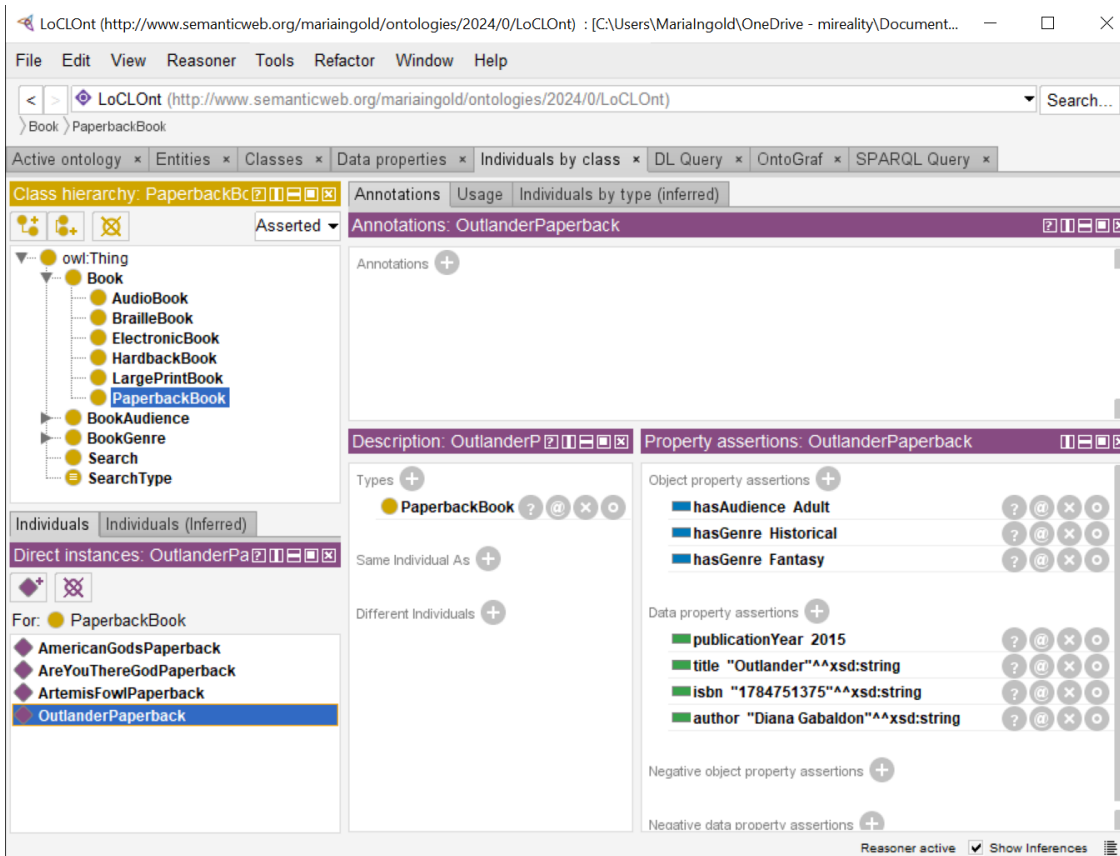


FIGURE 11 | OutlanderPaperback

OUTPUT ANALYSIS

The Pellet reasoner internally evaluated consistency, accuracy, and inferences.

SPARQL validated LoCLOnt's FOL-compliant competency questions, demonstrating effective simple and combined searches.

Title or Author Search (Figures 14,15)

Improving accuracy over Spydus, a regex search for 'God' returns 'American Gods' and 'Are You There God...'. Similarly, 'Gaiman' finds author 'Neil Gaiman'. To return titles, not word subsets, case insensitivity is not used. However, for production, case and exact matches should be addressed.

Genre Search (Figures 12, 13, 17)

Unavailable in Spydus, genrefication enables quickly finding books that match interests. Further genres can be added.

Audience and Genre Search (Figures 16, 17)

A reading-level audience combined with genre helps parents and children efficiently find interesting age-appropriate books.

New Releases (Figure 18)

Netflix-like new releases encourages discovery. While an integer year made search simple, a full date would enable more refinement.

Limitations

SPARQL Query does not support updates or now() so neither Search instance nor searchDate can be created. A fully scoped deliverable, testing, and validation trial must be completed prior to deployment.

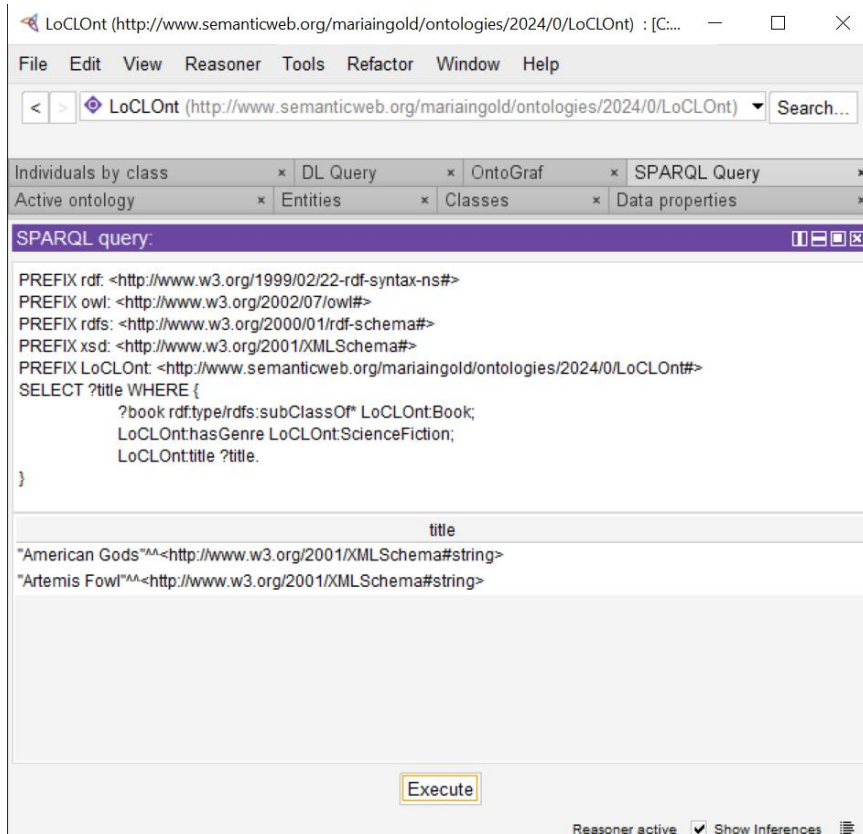


FIGURE 12 | 1

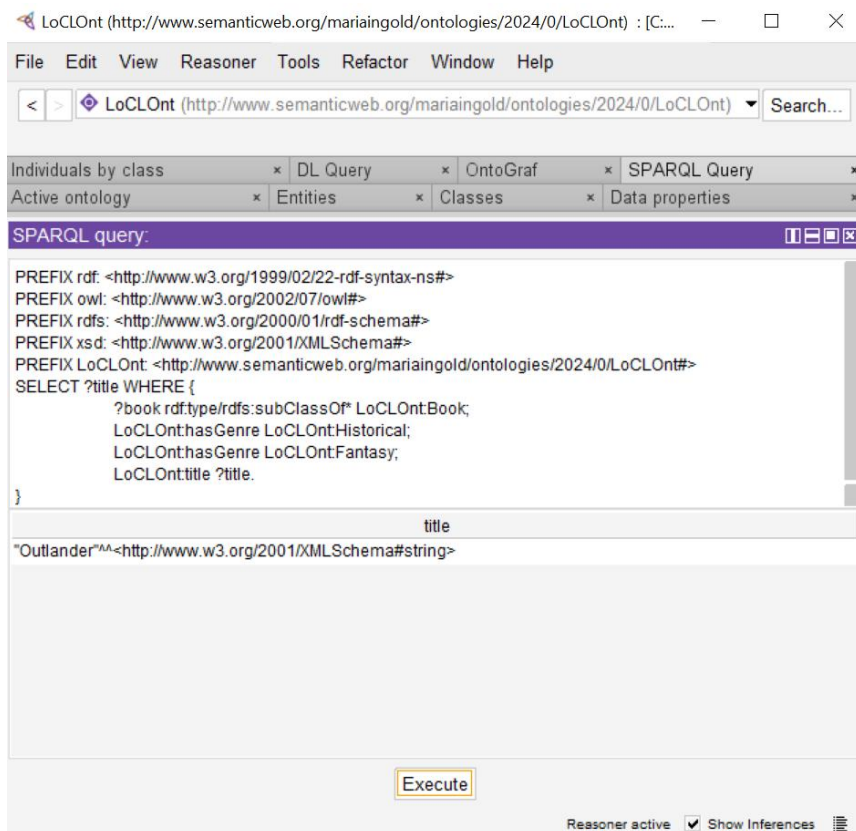


FIGURE 13 | 2

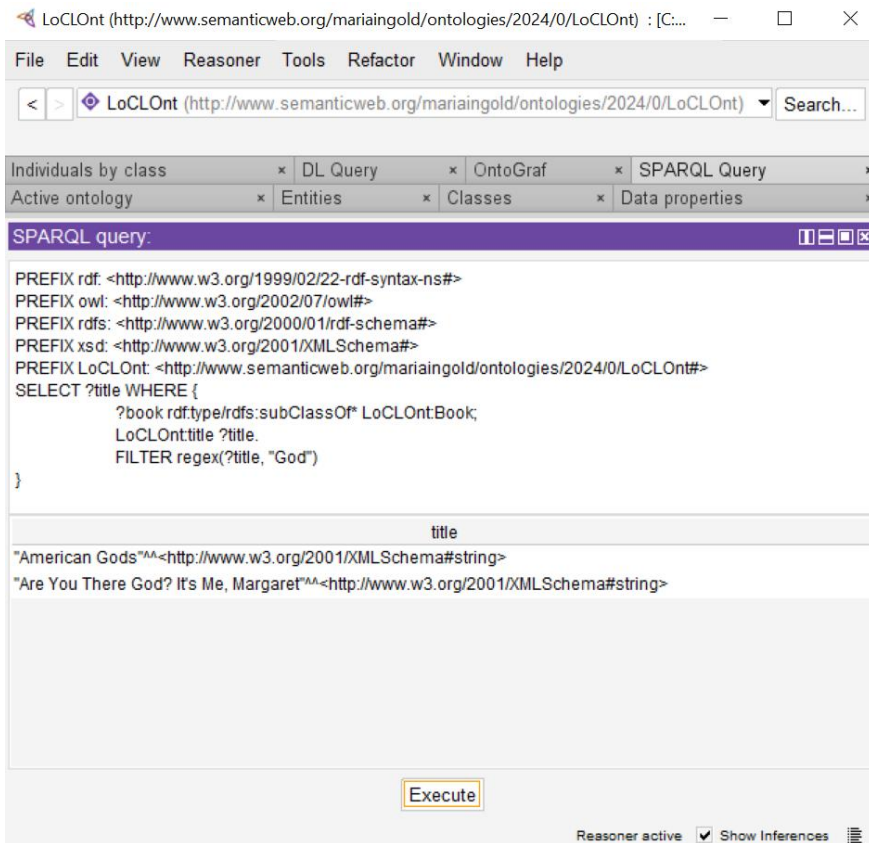


FIGURE 14 | 3

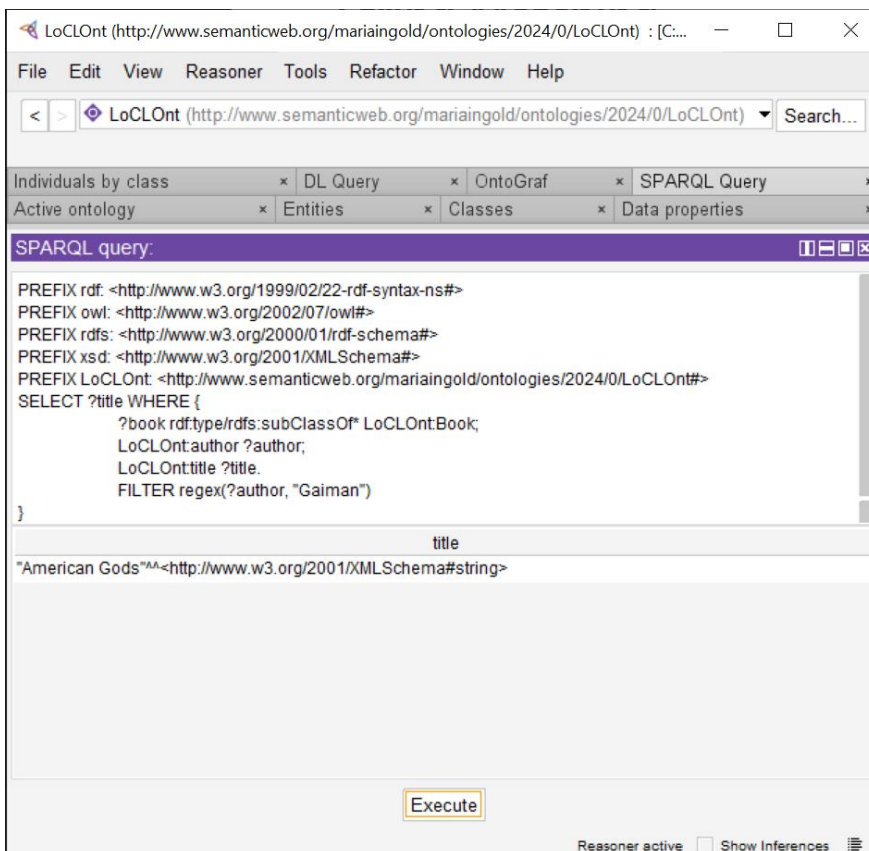


FIGURE 15 | 4

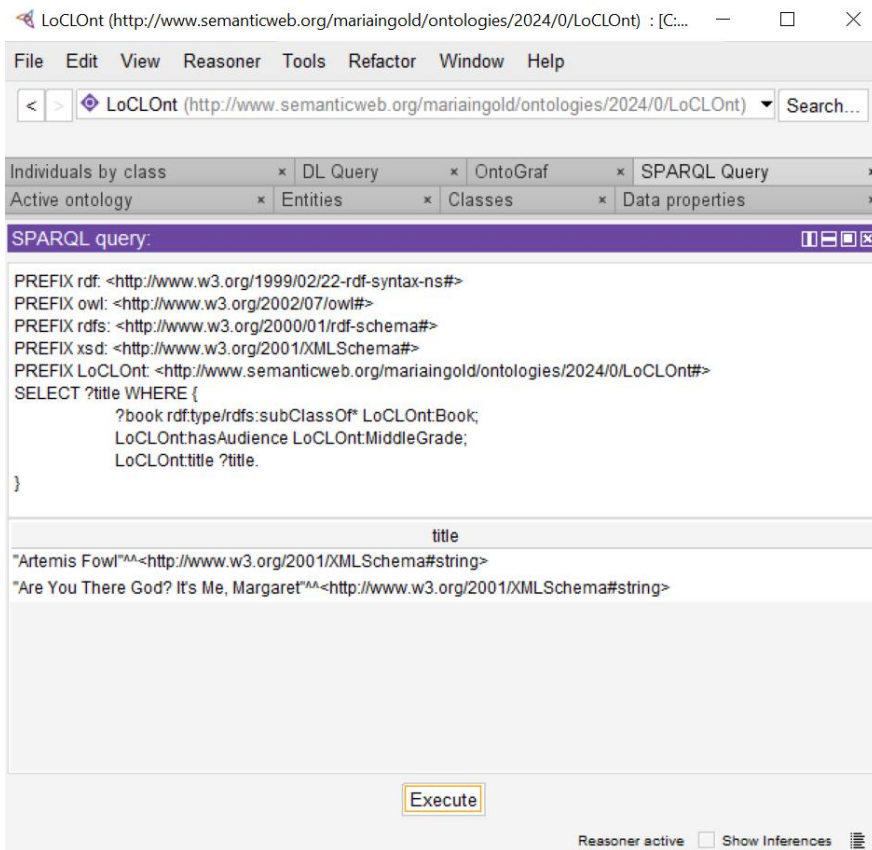


FIGURE 16 | 5

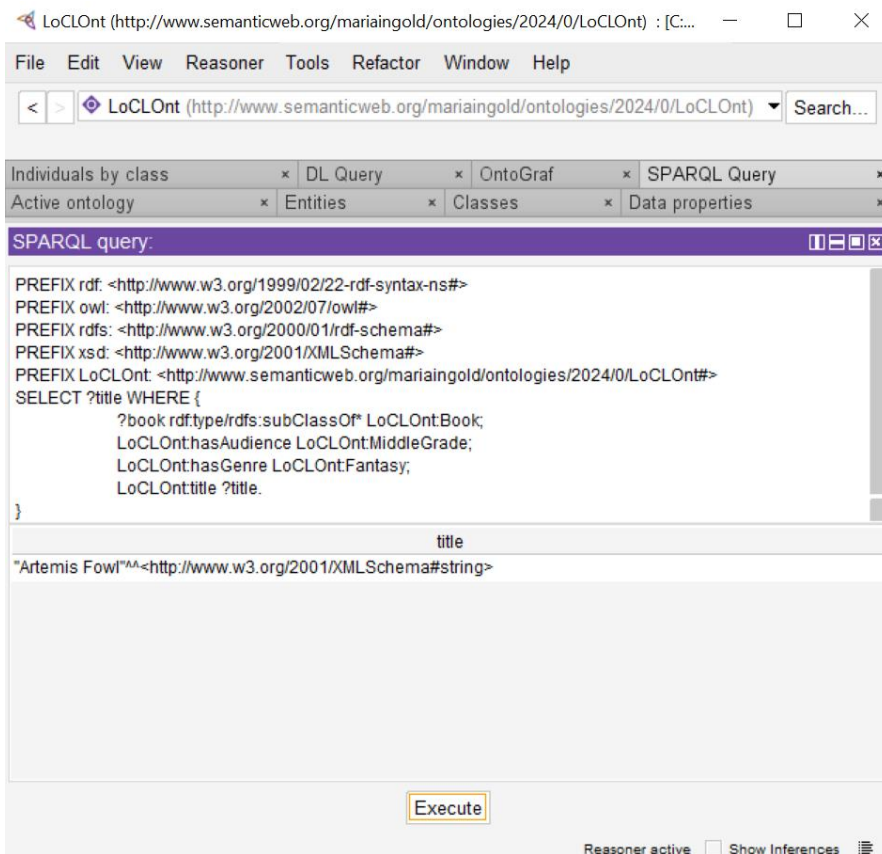


FIGURE 17 | 6

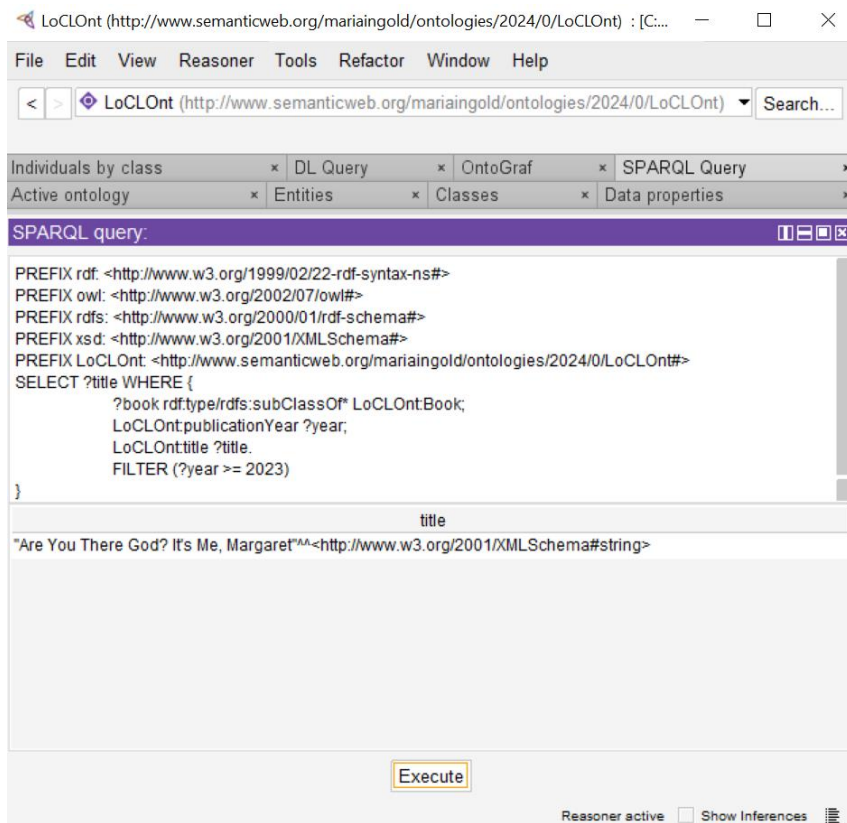


FIGURE 18 | 7

APPLICATION

Integration

LoCLOnt maps to Spydus' standard OPAC search types and can be easily extended.

Validation

While OPAC search format simplifies adoption, Netflix-style interfaces could improve efficiency. Output analysis demonstrates relevant simple or advanced searches with age-related interests and recency. Ultimately, validation by library management and patrons is required.

Considerations

LoCLOnt is reusable with OPAC, and prefixing 'Book-' establishes relationship and enables extension, such as a Film class using FilmRating not BookAudience.

Similarly, FilmGenre could include DocumentaryGenre not NonfictionGenre.

However, going global requires changes like searchTime using xsd:dateTimeStamp. Furthermore, simplifications, like ISBN, require addressing ISBN-10 and ISBN-13 and not mandating use for digital books.

Future

The ontology enables AI-driven expansion, like recommendations or personalisation.

CONCLUSION

Surpassing Spydus for precision and relevance, LoCLOnt uses semantic search to help patrons efficiently discover relevant books. Building on Spydus' OPAC structure, competency questions evaluated age-appropriate, genre, and date searches. LoCLOnt demonstrates effective knowledge representation and reasoning in improving patron services and enabling further AI-based search, like films or recommendations.

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<https://es.revistaespacios.com/a18v39n44/a18v39n44p15.pdf> [Accessed 29 January 2024]

Uschold, M. & Grüninger, M. (1996) Ontologies: Principles, methods and applications, *Knowledge Engineering Review* 11(2). DOI:
<https://doi.org/doi:10.1017/S0269888900007797>.

APPENDIX

The appendix includes additional research detail (via screenshots) that was compressed due to the limited wordcount. These screenshots demonstrate a portion of the research undertaken for this paper and exemplify pictorially what has been discussed. These are available at the links shown as of 10/02/2024, but are not all individually referenced and are purely supplementary information. However, this paper links to relevant references for the research area described by each appendix section.

Spydus: Camden Library Example

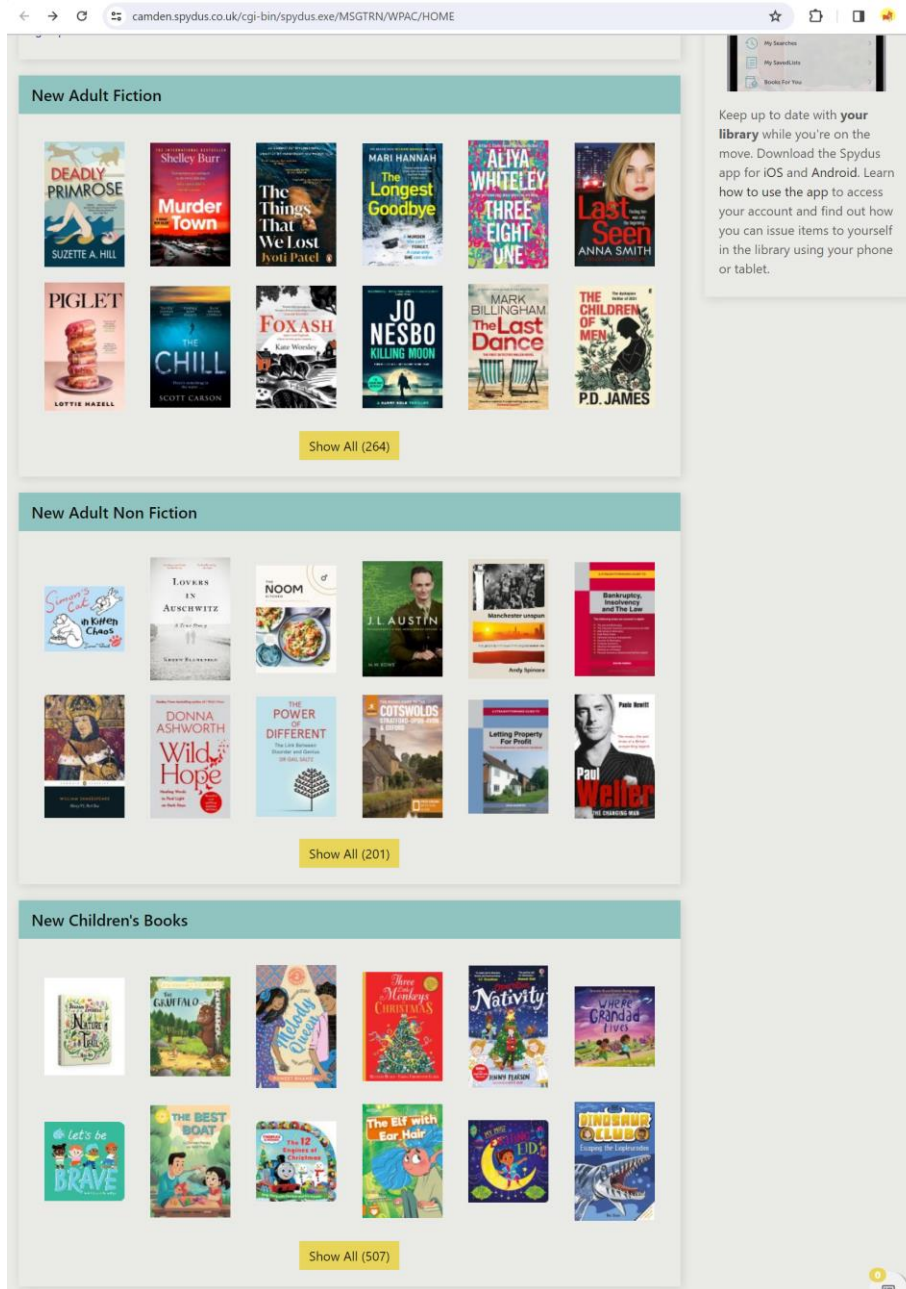


FIGURE 19 | [Camden Library. Not logged in](#). New releases. No genres. No age ranges for children.

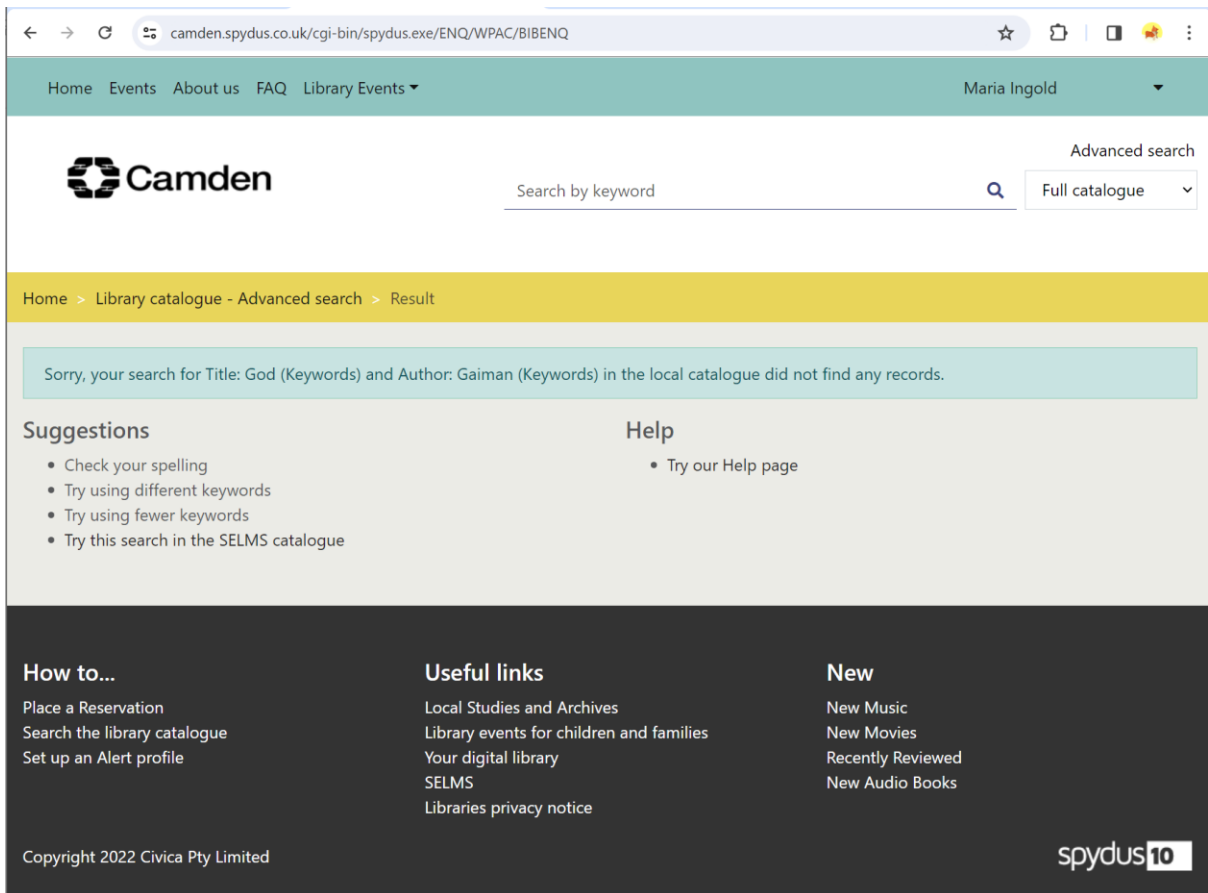


FIGURE 20 | [Search for 'God' and 'Gaiman' fails to find 'American Gods'](#)

camden.spydus.co.uk/cgi-bin/spydus.exe/ENQ/WPAC/BIBENQ

Home Events About us FAQ Library Events Maria Ingold

Camden Search by keyword Full catalogue

Advanced search

Home > Library catalogue - Advanced search > Search results

Title: Gods (Keywords) and Author: Gaiman (Keywords)
Try this search in the SELMS Catalogue >

Showing 1 - 2 of 2 < Previous Next >

Options Sort by Title

Filter results


And Not

Availability

- Titles with available items
- Titles available online

Added >

1.




American gods
Gaiman, Neil
2005
★★★★★
Books

After three years in prison, Shadow Moon is free to go home. But hours before his release, his beloved wife is killed in a freak accident. Numbly, he boards a plane where he meets an enigmatic stranger who seems to know Shadow and claims to be an ancient god - and king of America. Together the...

[View availability >](#) [3 copies]

[Place reservation](#)
[Add my tags](#)
[Add review](#)

2.



American gods
Gaiman, Neil
2017
★★★★★
Books

Two days before Shadow is released from prison, his wife, Laura, dies in a car crash. On his release he encounters Mr Wednesday, who claims to be a former god and king of America. Together they embark on a strange journey through the heart of the USA.

[View availability >](#) [1 copy]


[Place reservation](#)
[Add my tags](#)
[Add review](#)

Showing 1 - 2 of 2

FIGURE 21 | [Search for 'Gods' and 'Gaiman' returns 'American Gods' by 'Neil Gaiman'](#)

camden.spydus.co.uk/cgi-bin/spydus.exe/MSGTRN/WPAC/BSEARCH

Home Events About us FAQ Library Events Maria Ingold

 Search by keyword Full catalogue

Home > Library catalogue - Quick search

Library catalogue

- Quick search
- Title
- Author
- Subject
- Advanced
- Issues

Articles >
Events >
Online resources >
External >

Quick search

Anywhere

Keywords Phrase Exact match Fuzzy

Options

Records per page: 20
Sort by: Relevance

FIGURE 22 | [Types of Search](#)

camden.spydus.co.uk/cgi-bin/spydus.exe/TRN/WPAC/BIBENQ/668341/?SEL=73389345

Home > Library catalogue - Author search > Back to headings list > Search results

Author: Gaiman (Keywords)

Try this search in the SELMS Catalogue >

Showing 1 - 20 of 93 < Previous Next >

Options ▾ Sort by **Title** ▾

Filter results

And Not

Availability ▾

- Titles with available items
- Titles available online

Added >

Material type >

Content type >

Media type >

Carrier type >

Audience ▾

- Adult 41
- Youth 3
- Children 2

Fiction/Non-Fiction >

Language >

Biography >

Publication date >

Personal author >

Series >

Personal name >

Topic >

Geographic >

Time period >

Form/Genre ▾

- Graphic Novels 19
- Fantasy 9
- Fiction 9
- Audiobooks 4
- Juvenile fiction 4

1.

American gods
Gaiman, Neil
2005
★★★★★
Books

After three years in prison, Shadow Moon is free to go home. But hours before his release, his beloved wife is killed in a freak accident. Numbly, he boards a plane where he meets an enigmatic stranger who seems to know Shadow and claims to be an ancient god - and king of America. Together the...

View availability > [3 copies]

Place reservation
Add my tags
Add review

2.

American gods
Gaiman, Neil
2017
★★★★★
Books

Two days before Shadow is released from prison, his wife, Laura, dies in a car crash. On his release he encounters Mr Wednesday, who claims to be a former god and king of America. Together they embark on a strange journey through the heart of the USA.

View availability > [1 copy]

Place reservation
Add my tags
Add review

3.

Anansi boys
Gaiman, Neil
2006
Books

Fat Charlie Nancy is more than a little scared - right now his life is spinning out of control, and it is all his dad's fault. Charlie has realised that his dad was Anansi, the spider god. Now Fat Charlie's life is about to be turned upside down.

View availability > [3 copies]

Place reservation
Add my tags
Add review

4.

Anansi boys [sound recording]
Gaiman, Neil
2018
Audiobooks

Place reservation
Add my tags
Add review

FIGURE 23 | [Genre and audience only appears when search on author.](#) Can't search on Genre or Audience.



camden.spydus.co.uk/cgi-bin/spydus.exe/ENQ/WPAC/BIBENQ/669517?QRY=CTIBIB<%20IRN(30141970)&QRYTEXT=Are%20y...




Home Events About us FAQ Library Events Maria Ingold

Camden Search by keyword Full catalogue

Advanced search

Home > Library catalogue - Title search > Back to headings list > Search results

  **Are you there, God? It's me, Margaret**
Try this search in the SELMS Catalogue >


  

Filter results Showing 1 of 1 < Previous Next >

And Not


Options

Availability
Titles with available items
Titles available online
Added

1. 

Are you there, God? It's me, Margaret
Blume, Judy
1980
Books
View availability >

[1 copy, 1 reserve]



Showing 1 of 1

FIGURE 24 | [Books don't mention genre or audience](#)

camden.spydus.co.uk/cgi-bin/spydus.exe/FULL/WPAC/BIBENQ/669855/69735929,1

Home Events About us FAQ Library Events Maria Ingold

Camden Search by keyword Full catalogue

Home > Library catalogue - Title search > Search results > Full display

Are you there, God? It's me, Margaret

Blume, Judy
1980

Books

Find it!
Total copies: 1
Reservations: 1
Availability by location >
Place reservation
f t w s e

Record details

Main title: Are you there, God? It's me, Margaret
Author: Blume, Judy
Imprint: Macmillan, 1980.
Collation: Book.
ISBN: 0330398083
Language: English
BRN: 1442212
Bookmark link: https://camden.spydus.co.uk/cgi-bin/spydus.exe/ENQ/WPAC/BIBENQ?SETLVL=8&BRN=1442212
More Information: Limited preview in Google Book Search
View more information in LibraryThing - 7583 entries, 235 reviews ★★★★★

Tags

No tags available as yet

Add my tags

Reviews

No reviews available as yet

Add a review

People who borrowed this also borrowed

- Time travelling with a tortoise Welford, Ross 2024
- Chinese New Year Hargreaves, Adam 2024
- Breaking Twitter : Elon Mus... Mezrich, Ben, 1969- 2023
- Popo the emperor penguin Jatwani, Beverly 2023
- My first book of everything... 2023
- The gardening book Don, Monty 2023
- Cat Kid Club. Inf Pilkey, Da 2023

Show All (2975)

Titles by this author

- Are you there, God? It's me... Blume, Judy 1980
- Are you there God? It's me,... Blume, Judy 2023
- Blubber Blume, Judy 2016
- Blubber Blume, Judy 2006
- Cool zone Blume, Judy 2008
- Cool zone Blume, Judy 2009
- Deenie Blume, Ju 2015

Show All (22)

Previous record Next record

FIGURE 25 | [Books don't list genre or audience](#). 'People who borrowed...' is not age-appropriate.

Gen Z and Libraries

Books

'Reading is so sexy': gen Z turns to physical books and libraries

Book sales boom as readers escape the 'oversaturation and noise of the wild west digital landscape'



Chloe Mac Donnell

@tweetchloe
Fri 9 Feb 2024 12.48 GMT



The model Kaia Gerber has launched a book club, Library Science. Photograph: Instagram

They have killed skinny jeans and continue to shame millennials for having side partings in their hair. They think using the crying tears emoji to express laughter is embarrassing. But now comes a surprising gen Z plot twist. One habit that those born between 1997 and 2012 are keen to endorse is reading - and it's physical books rather than digital that they are thumbing.

This week the 22-year-old model Kaia Gerber launched her own book club, *Library Science*. Gerber, who this month appears on the cover of *British Vogue* alongside her supermodel mum, Cindy Crawford, describes it as "a platform for sharing books, featuring new writers, hosting conversations with artists we admire - and continuing to build a community of people who are as excited about literature as I am".



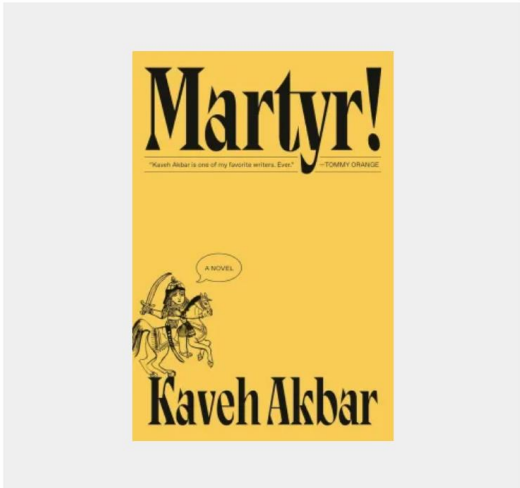
Ellen E Jones: Hollywood, race and the power of storytelling

Thursday 15 February, 8pm-9pm GMT

"Books have always been the great love of my life," she added. "Reading is so sexy."

Gerber isn't alone. Last year in the UK 669m physical books were sold, the highest overall level ever recorded. Research from Nielsen BookData highlights that it is print books that gen Z favour, accounting for 80% of purchases from November 2021 to 2022. Libraries are also reporting an uptick in gen Z users who favour their quiet over noisy coffee shops. In the UK in-person visits are up 71%.

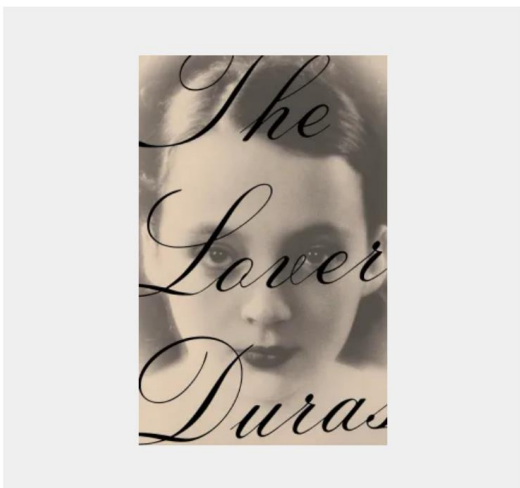
FIGURE 26 | [Gen Z is reading more, including at libraries](#)



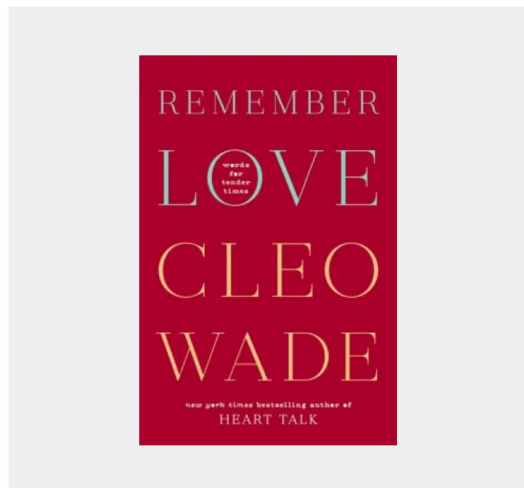
LS#044 Kaveh Akbar Martyr!



LS#043 Will Arbery Plano



LS#042 Marguerite Duras The Lover



LS#041 Cleo Wade Remember Love



FIGURE 27 | Gen Z's [Kaia Gerber's Library Science](#) looks more like Netflix than Spydus

Netflix

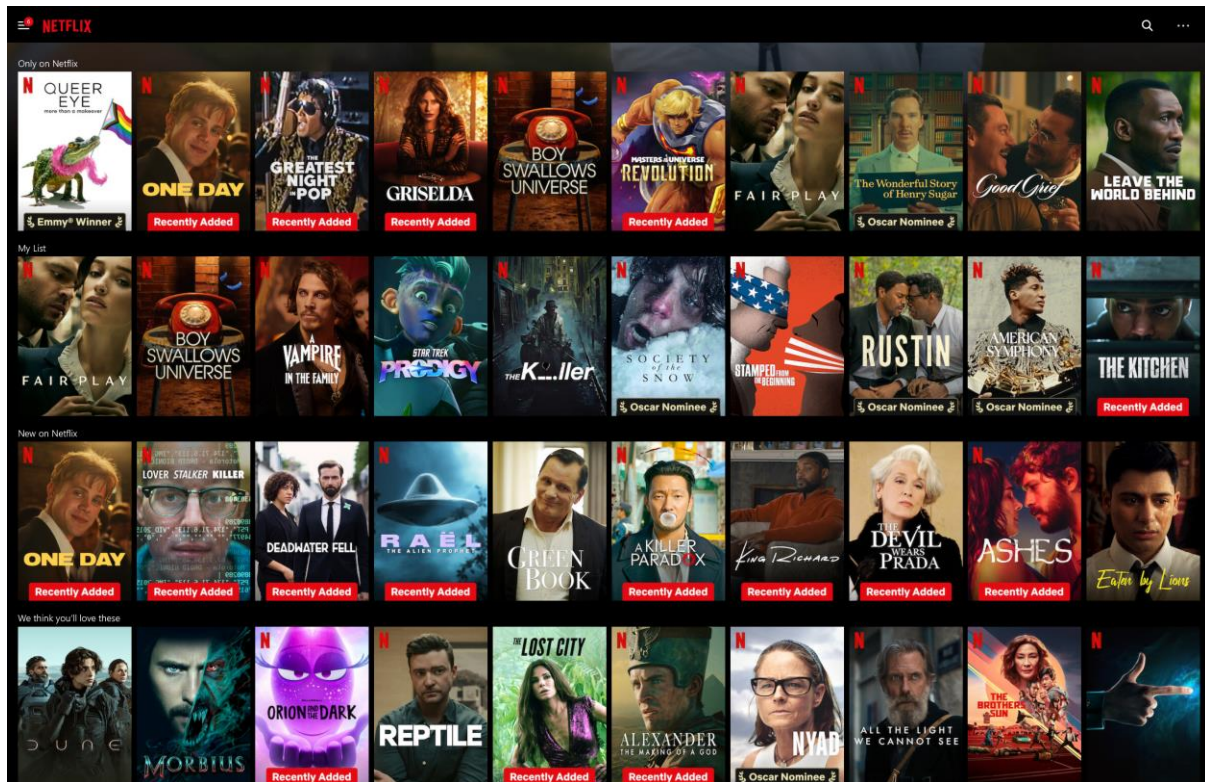


FIGURE 28 | [Netflix](#). With My List (explicitly added), New on Netflix, We think you'll love these (personalised recommendations).

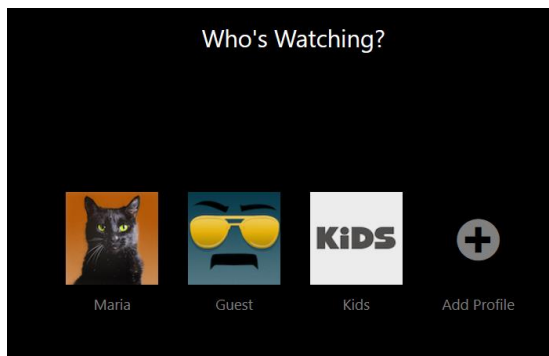



FIGURE 29 | [Netflix](#) sign in - still not fully age-appropriate

MARC 21

← → 🔍 loc.gov/marc/bibliographic/ ☆ 📄 🏠 🌐 ⋮

[Library of Congress](#) >> [MARC](#) >> [Bibliographic](#)



**MARC 21 Format for
BIBLIOGRAPHIC DATA**
*Library of Congress
Network Development and MARC Standards Office*

1999 Edition
Update No. 1 (October 2000) through Update No. 37 (December 2023)

This online publication provides access to both the full and concise versions of the *MARC 21 Format for Bibliographic Data*. The "full" bibliographic format contains detailed descriptions of every data element, along with examples, input conventions, and history sections. The "concise" bibliographic format contains abridged descriptions of every data element, along with examples. The full and concise versions are identified in the header of each field description.

Changes to the *MARC 21 Format for Bibliographic Data* that resulted from Update No. 37 (December 2023) are displayed in red print. The date located in the header of the full version of each field indicates the last month and year of update.

Table of Contents

- [Introduction \[Full | Concise\]](#)
- [Format Summary](#)
- [Leader \[Full | Concise\]](#)
- [Directory](#)
- [00X: Control Fields](#)
- [01X-09X: Numbers and Code Fields](#)
- [Heading Fields - General Information](#)
- [1XX: Main Entry Fields](#)
- [20X-24X: Title and Title-Related Fields](#)
- [25X-28X: Edition, Imprint, Etc. Fields](#)
- [3XX: Physical Description, Etc. Fields](#)
- [4XX: Series Statement Fields](#)
- [5XX: Note Fields](#)
- [6XX: Subject Access Fields](#)
- [70X-75X: Added Entry Fields](#)
- [76X-78X: Linking Entry and Description Fields](#)
- [80X-83X: Series Added Entry Fields](#)
- [841-88X: Holdings, Location, Alternate Graphics, Etc. Fields](#)
- [Appendix A: Control Subfields](#)
- [Appendix B: Full Level Record Examples](#)
- [Appendix C: Minimal Level Record Examples](#)
- [Appendix D: Multiscript Records](#)
- [Appendix E: Alphabetical List of Ambiguous Headings](#)
- [Appendix F: Initial Definite and Indefinite Articles](#)
- [Appendix G: Format Changes for Update No. 37 \(December 2023\)](#)
- [Appendix H: Local Data Elements](#)
- [Appendix I: Organization Code Sources](#)
- [Appendix J: Data Provenance Subfields](#)

[Library of Congress](#) >> [MARC](#) >> [Bibliographic](#)
(12/07/23) [Contact Us](#)

FIGURE 30 | [MARC 21 Format for Bibliographic Data](#)

Introduction

MARC 21 Bibliographic - Concise

2007

MARC 21 Format for Bibliographic Data is designed to be a carrier for bibliographic information about printed and manuscript textual materials, computer files, maps, music, continuing resources, visual materials, and mixed materials. Bibliographic data commonly includes titles, names, subjects, notes, publication data, and information about the physical description of an item. The bibliographic format contains data elements for the following types of material:

- **Books (BK)** - used for printed, electronic, manuscript, and microform textual material that is monographic in nature.
- **Continuing resources (CR)** - used for printed, electronic, manuscript, and microform textual material that is issued in parts with a recurring pattern of publication (e.g., periodicals, newspapers, yearbooks). (**NOTE:** Prior to 2002, Continuing resources (CR) were referred to as Serials (SE)).
- **Computer files (CF)** - used for computer software, numeric data, computer-oriented multimedia, online systems or services. Other classes of electronic resources are coded for their most significant aspect. Material may be monographic or serial in nature.
- **Maps (MP)** - used for all types of printed, electronic, manuscript, and microform cartographic materials, including atlases, sheet maps, and globes. Material may be monographic or serial in nature.
- **Music (MU)** - used for printed, electronic, manuscript, and microform music, as well as musical sound recordings, and non-musical sound recordings. Material may be monographic or serial in nature.
- **Visual materials (VM)** - used for projected media, non-projected media, two-dimensional graphics, three-dimensional artifacts or naturally occurring objects, and kits. Material may be monographic or serial in nature.
- **Mixed materials (MX)** - used primarily for archival and manuscript collections of a mixture of forms of material. Material may be monographic or serial in nature. (**NOTE:** Prior to 1994, Mixed materials (MX) were referred to as Archival and manuscript material (AM)).

Kinds of Bibliographic Records

MARC bibliographic records are distinguished from all other types of MARC records by specific codes in Leader/06 (Type of record) which identifies the following bibliographic record types.

Language material	Nonmusical sound recording
Manuscript language material	Musical sound recording
Computer file	Projected medium
Cartographic material	Two-dimensional nonprojectable graphic
Manuscript cartographic material	Three-dimensional artifact or natural objects
Notated music	Kit
Manuscript music	Mixed material

FIGURE 31 | [MARC 21 Types](#). This fits into Books (BK).

Leader (NR)

MARC 21 Bibliographic - Full

November 2016

Indicators and Subfield Codes

Has no indicators or subfield codes; the data elements are positionally defined.

Character Positions

00-04 - Record length

05 - Record status

- a - Increase in encoding level
- c - Corrected or revised
- d - Deleted
- n - New
- p - Increase in encoding level from prepublication

06 - Type of record

- a - Language material
- c - Notated music
- d - Manuscript notated music
- e - Cartographic material
- f - Manuscript cartographic material
- g - Projected medium
- i - Nonmusical sound recording
- j - Musical sound recording
- k - Two-dimensional nonprojectable graphic
- m - Computer file
- o - Kit
- p - Mixed materials
- r - Three-dimensional artifact or naturally occurring object
- t - Manuscript language material

07 - Bibliographic level

- a - Monographic component part
- b - Serial component part
- c - Collection
- d - Subunit
- i - Integrating resource
- m - Monograph/Item
- s - Serial

08 - Type of control

- # - No specified type
- a - Archival

09 - Character coding scheme

- # - MARC-8
- a - UCS/Unicode

10 - Indicator count

- 2 - Number of character positions used for indicators

11 - Subfield code count

- 2 - Number of character positions used for a subfield code

12-16 - Base address of data

[number] - Length of Leader and Directory

17 - Encoding level

- # - Full level
- 1 - Full level, material not examined
- 2 - Less-than-full level, material not examined
- 3 - Abbreviated level
- 4 - Core level
- 5 - Partial (preliminary) level
- 7 - Minimal level
- 8 - Prepublication level
- u - Unknown
- z - Not applicable

18 - Descriptive cataloging form

- # - Non-ISBD
- a - AACR 2
- c - ISBD punctuation omitted
- i - ISBD punctuation included
- n - Non-ISBD punctuation omitted
- u - Unknown

19 - Multipart resource record level

- # - Not specified or not applicable
- a - Set
- b - Part with independent title
- c - Part with dependent title

20 - Length of the length-of-field portion

- 4 - Number of characters in the length-of-field portion of a Directory entry

21 - Length of the starting-character-position portion

- 5 - Number of characters in the starting-character-position portion of a Directory entry

22 - Length of the implementation-defined portion

- 0 - Number of characters in the implementation-defined portion of a Directory entry

23 - Undefined

- 0 - Undefined

FIGURE 32 | [MARC 21 Leader](#)

MARC 21 Bibliographic Format

Full Level Record - Book

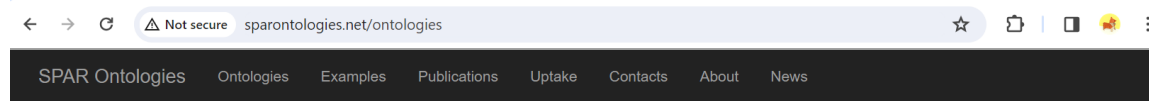
Network Development and MARC Standards Office
Library of Congress

This example can be identified as a record for printed language material by code a in Leader/06, and further as a monograph by code m in Leader/07. The record contains the basic bibliographic information fields (fields 100, 245, 260, and 300), as well as additional fields (e.g., fields 020 (International Standard Book Number), 050 (Library of Congress Call Number), 082 (Dewey Decimal Classification Number), 246 (Varying Form of Title), 500 (General Note), and 650 (Subject Added Entry Topical Term)).

```
LDR          *****nam##22*****a#4500
001          <control number>
003          <control number identifier>
005          19920331092212.7
007          ta
008          |820305|s1991####|nyu####|#####|#001#0#|eng##
020  ##     Sa0845348116 :Sc$29.95 (£19.50 U.K.)
020  ##     Sa0845348205 (pbk.)
040  ##     Sa<organization code>-Sc<organization code>
050  14     SaPN1992.8.S4SbT47 1991
082  04     Sa791.45/75/0973S219
100  1#     SaTerrace, Vincent.Sd1948-
245  10     SaFifty years of television :Sba guide to series and pilots, 1937-1988 /ScVincent Terrace.
246  1#     Sa50 years of television
260  ##     SaNew York :SbCornwall Books.Scc1991.
300  ##     Sa864 p. ;Sc24 cm.
500  ##     SaIncludes index.
650  #0     SaTelevision pilot programsSzUnited StatesSvCatalogs.
650  #0     SaTelevision serialsSzUnited StatesSvCatalogs.
```

FIGURE 33 | MARC 21 Book example

SPAR Ontologies

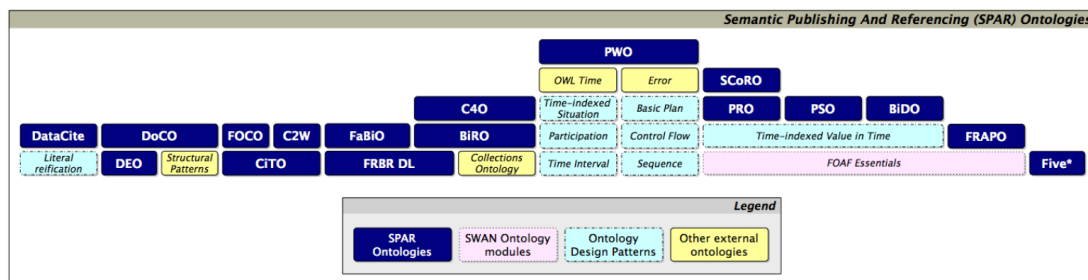


Semantic Publishing and Referencing Ontologies

In the past, several groups have proposed (Semantic Web) models, such as RDFS vocabularies and OWL ontologies, to describe particular aspects of the publishing domain. However, these models were mainly concerned with the description of the metadata of bibliographic resources (e.g., DC Terms, PRISM and BIBO). One of the first attempts to address the description of the whole publishing domain is the introduction of the **Semantic Publishing and Referencing (SPAR) Ontologies**. SPAR is a suite of orthogonal and complementary OWL 2 ontologies that enable all aspects of the publishing process to be described in machine-readable metadata statements, encoded using RDF.

Please use the following reference for citing the SPAR Ontologies suite in your works:

Peroni, S., Shotton, D. (2018). The SPAR Ontologies. In Proceedings of the 17th International Semantic Web Conference (ISWC 2018): 119-136. DOI: https://doi.org/10.1007/978-3-030-00668-6_8



While the current suite contains several ontologies (see the figure above), the original suite of SPAR ontologies comprises eight distinct modules:

- the FRBR-aligned Bibliographic Ontology (FaBiO) is an ontology for describing entities that are published or potentially publishable (e.g., journal articles, conference papers, books), and that contain or are referred to by bibliographic references;
- the Citation Typing Ontology (CiTO) is an ontology that enables characterization of the nature or type of citations, both factually and rhetorically;
- the Bibliographic Reference Ontology (BiRO) is an ontology meant to define bibliographic records, bibliographic references, and their compilation into bibliographic collections and bibliographic lists, respectively;
- the Citation Counting and Context Characterisation Ontology (C4O) is an ontology that permits the number of in-text citations of a cited source to be recorded, together with their textual citation contexts, along with the number of citations a cited entity has received globally on a particular date;
- the Document Components Ontology (DoCO) is an ontology that provides a structured vocabulary written of document components, both structural (e.g., block, inline, paragraph, section, chapter) and rhetorical (e.g., introduction, discussion, acknowledgements, reference list, figure, appendix);
- the Publishing Status Ontology (PSO) is an ontology designed to characterise the publication status of documents at each stage of the publishing process (draft, submitted, under review, etc.);
- the Publishing Roles Ontology (PRO) is an ontology for the characterisation of the roles of agents – people, corporate bodies and computational agents in the publication process. These agents can be, e.g. authors, editors, reviewers, publishers or librarians;
- the Publishing Workflow Ontology (PWO) is a simple ontology for describing the steps in the workflow associated with the publication of a document or other publication entity.

The main part of the aforementioned ontologies are based on other available and more general models. Two of those have been developed within the SPAR Ontologies:

- the Essential FRBR in OWL2 DL Ontology (FRBR) is an expression in OWL 2 DL of the basic concepts and relations described in the IFLA report on the Functional Requirements for Bibliographic Records (FRBR), also described in Ian Davis's RDF vocabulary. It is imported by FaBiO and BiRO.
- the Discourse Elements Ontology (DEO) is an ontology that provides a structured vocabulary for rhetorical elements within documents (e.g., Introduction, Discussion, Acknowledgements, Reference List, Figures, Appendix). It is imported by DoCO.

The aforementioned ontologies form the original set of SPAR ontologies. However, this set has more recently been extended with other complementary ontologies that extend the coverage of the possible description of the publishing domain:

- the Scholarly Contributions and Roles Ontology (SCoRO) is an ontology based on PRO for describing the contributions that may be made, and the roles that may be held by a person with respect to a journal article or other publication (e.g. the role of article guarantor or illustrator);
- the Funding, Research Administration and Projects Ontology (FRAPO) is an ontology for describing the administrative information of research projects, e.g., grant applications, funding bodies, project partners, etc.;
- the DataCite Ontology (DataCite) is an ontology that enables the metadata properties of the DataCite Metadata Schema Specification (i.e., a list of metadata properties for the accurate and consistent identification of a resource for citation and retrieval purposes) to be described in RDF;
- the Bibliometric Data Ontology (BiDO) is a modular ontology that allows the description of numerical and categorical bibliometric data (e.g., journal impact factor, author h-index, categories describing research careers) in RDF;
- the Five Stars of Online Research Articles Ontology (FiveStars) is an ontology written in OWL 2 DL to enable characterization of the five attributes of an online journal article - peer review, open access, enriched content, available datasets and machine-readable metadata.
- the FAIR* Reviews Ontology (FR) enables the description of reviews of scientific articles and other scholarly resources.

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[Back to top](#)

FIGURE 34 | Semantic Publishing and Referencing Ontologies (SPAR)

Essential FRBR in OWL2 DL Ontology (FRBR)

- URL** <http://purl.org/spar/frbr> (alternative at w3id.org)
- DOI** [10.25504/FAIRsharing.b34b43](https://doi.org/10.25504/FAIRsharing.b34b43)
- Documentation** <http://purl.org/spar/frbr.html>
- Source** <http://purl.org/spar/frbr.xml> (RDF/XML)
<http://purl.org/spar/frbr.ttl> (Turtle)
<http://purl.org/spar/frbr.nt> (N-triples)
<http://purl.org/spar/frbr.json> (JSON-LD)
- Repository** <https://github.com/sparontologies/frbr>

The *Functional Requirements for Bibliographic Record (FRBR)* is a general model, proposed by the International Federation of Library Association (IFLA), for describing documents and their evolution. It works for both physical and digital resources and it has proved to be very flexible and powerful. One of the most important aspects of FRBR is the fact that it is not associated with a particular metadata schema or implementation.

FRBR describes all documents from four different and correlated points of view: *Work*, *Expression*, *Manifestation* and *Item*; each of which is a FRBR *Endeavour*. These can be illustrated by considering of the book *Alice's Adventures in Wonderland* by Lewis Carroll as an example:

- *Work*. A FRBR Work is a high-level abstract Platonic concept of the essence of a distinct intellectual or artistic creation, for example the ideas in Lewis Carroll's head concerning *Alice's Adventures in Wonderland*, independent of any representation of these ideas in a particular form. A Work is realised through one or more Expressions;
- *Expression*. A FRBR Expression is the realisation of the intellectual or artistic content of a Work. Thus the original text of *Alice's Adventures in Wonderland* and its Italian translation *Le Avventure di Alice nel Paese delle Meraviglie* refer to different Expressions of the same Work. An Expression is embodied in one or more Manifestations;
- *Manifestation*. A FRBR Manifestation of a work defines its particular physical or electronic embodiment, for example, the particular format in which *Alice's Adventures in Wonderland* is stored: as a printed object or in HTML, represent two quite different Manifestations. In publishing, different manifestations of a journal article will all bear the same Digital Object Identifier (DOI), which identifies the Expression of the work, not its various Manifestations. However, a paperback and a hardback version of a book will bear different International Standard Book Numbers (ISBNs), since these identifiers are assigned at the Manifestation level. A Manifestation is exemplified by one or more Items;
- *Item*. A FRBR Item is a particular physical or electronic copy of *Alice's Adventures in Wonderland* that a person can own, for example the printed version of the book you have in your bookcase, or the Mobipocket format copy you have downloaded to read on your e-book device. All Items that are identical to one another – for example books from the same printing, are exemplars of the same Manifestation.

Starting from Ian Davis's [RDF vocabulary](#) that expresses the basic concepts and relations described in the IFLA report on the Functional Requirements for Bibliographic Records (FRBR), we have created an expression in OWL 2 DL of FRBR in order to be used in other [SPAR Ontologies](#) that require this kind of descriptions, e.g., [FaBio](#) and [BiRO](#).

FIGURE 35 | [Functional Requirements for Bibliographic Record \(FRBR\)](#)

📄 Using FRBR for describing a bibliographic entity



FRBR DL allows one to describe information related to a bibliographic entity such as the following one:

Pompeu Casanovas, Núria Casellas, Christoph Tempich, Denny Vrandečić, Richard Benjamins (2007). OPJK and DILIGENT: ontology modeling in a distributed environment. *Artificial Intelligence and Law*, 15 (2): 171-186. June 2007. Springer. DOI: 10.1007/s10506-007-9036-2. Print ISSN 0924-8463. Online ISSN 1572-8382. Published online (PDF) May 31, 2007.

From the previous reference we can extract the following information:

1. the document is an academic research article – deducible from the journal in which it is published;
2. Pompeu Casanovas, Núria Casellas, Christoph Tempich, Denny Vrandečić, and Richard Benjamins are the authors of the article;
3. the article was published in 2007;
4. the article is entitled "OPJK and DILIGENT: ontology modeling in a distributed environment";
5. it was published in the 2nd issue of the 15th volume of *Artificial Intelligence and Law*;
6. the DOI of the article is "10.1007/s10506-007-9036-2";
7. the Print ISSN of the journal is "0924-8463";
8. the Online ISSN of the journal is "1572-8382";
9. the PDF version of the article was published online on May 31, 2007;
10. the journal issue within which the printed version of the article was published bears the publication date June 2007;
11. the page range of the article within the printed version is "171-186";
12. the publisher of the journal is Springer.

Although it is possible to use FRBR (in combination with [DC Terms](#)) to give a structured and unambiguous description of all the bibliographic entities, the example makes it clear the severe limitations of FRBR. These are caused by the lack of terms in the [FRBR Core ontology](#) which allow publications to be described in normal everyday language. This issue is addressed by using [FaBio](#) entities, has shown in [one of its available examples](#).

FIGURE 36 | FRBR - [Limitations of FRBR](#) – no everyday language

FRBR-aligned Bibliographic Ontology (FaBiO)

- URL** <http://purl.org/spar/fabio> (alternative at w3id.org)
- DOI** [10.25504/FAIRsharing.2f3180](https://doi.org/10.25504/FAIRsharing.2f3180)
- Documentation** <http://purl.org/spar/fabio.html>
- Source** <http://purl.org/spar/fabio.xml> (RDF/XML)
<http://purl.org/spar/fabio.ttl> (Turtle)
<http://purl.org/spar/fabio.nt> (N-triples)
<http://purl.org/spar/fabio.json> (JSON-LD)
- Repository** <https://github.com/sparontologies/fabio>
- Reference** Peroni, S., Shotton, D. (2012). FaBiO and CiTO: ontologies for describing bibliographic resources and citations. In *Journal of Web Semantics: Science, Services and Agents on the World Wide Web*, 17 (December 2012): 33-43. Amsterdam, The Netherlands: Elsevier.
<https://doi.org/10.1016/j.websem.2012.08.001>
 Open Access at: <http://speroni.web.cs.unibo.it/publications/peroni-2012-fabio-cito-ontologies.pdf>

FaBiO, the **FRBR-aligned Bibliographic Ontology**, is an ontology for recording and publishing on the Semantic Web descriptions of entities that are published or potentially publishable, and that contain or are referred to by bibliographic references, or entities used to define such bibliographic references. FaBiO entities are primarily textual publications such as books, magazines, newspapers and journals, and items of their content such as poems, conference papers and editorials. However, they also include blogs, web pages, datasets, computer algorithms, experimental protocols, formal specifications and vocabularies, legal records, governmental papers, technical and commercial reports and similar publications, and also anthologies, catalogues and similar collections.

FaBiO already imports several entities from existing standards for bibliographic entity descriptions, i.e., **FRBR**, **DC Terms**, **PRISM** and **SKOS**. In addition, FaBiO has been developed so to limit any restriction to its classes as well as the domains and ranges of its properties. This flexibility has the great advantage of allowing FaBiO to be used together with other models.

In particular, FaBiO classes are structured according to the **FRBR** schema of *Works*, *Expressions*, *Manifestations* and *Items*. The following **Graffoo** diagram shows additional properties that have been added to extend the **FRBR data model** by linking Works and Manifestations (`fabio:hasManifestation` and `fabio:isManifestationOf`), Works and Items (`fabio:hasPortrayal` and `fabio:isPortrayedBy`), and Expressions and Items (`fabio:hasRepresentation` and `fabio:isRepresentedBy`).

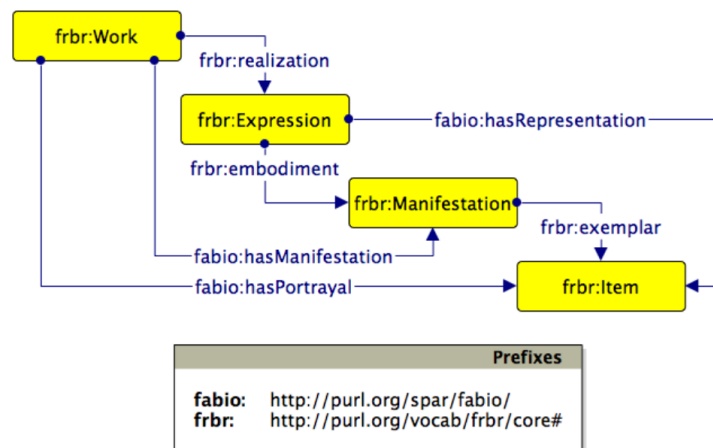


FIGURE 37 | FRBR-aligned Bibliographic Ontology (FaBiO) - improves on FRBR with everyday speech but not fully OWL 2 Description Logic (DL) compliant and does not address libraries.

Dewey Decimal Classification

← → ↻ oclc.org/content/dam/oclc/dewey/ddc23-summaries.pdf 🔍 ☆ 📄 🖨️

☰ ddc23-summaries.pdf 7 / 17 | - 94% + | 📄 ↻ 📄 🖨️

Second Summary

Hundred Divisions

000	Computer science, knowledge & systems	500	Science
010	Bibliographies	510	Mathematics
020	Library & information sciences	520	Astronomy
030	Encyclopedias & books of facts	530	Physics
040	[Unassigned]	540	Chemistry
050	Magazines, journals & serials	550	Earth sciences & geology
060	Associations, organizations & museums	560	Fossils & prehistoric life
070	News media, journalism & publishing	570	Biology
080	Quotations	580	Plants (Botany)
090	Manuscripts & rare books	590	Animals (Zoology)
100	Philosophy	600	Technology
110	Metaphysics	610	Medicine & health
120	Epistemology	620	Engineering
130	Parapsychology & occultism	630	Agriculture
140	Philosophical schools of thought	640	Home & family management
150	Psychology	650	Management & public relations
160	Philosophical logic	660	Chemical engineering
170	Ethics	670	Manufacturing
180	Ancient, medieval & eastern philosophy	680	Manufacture for specific uses
190	Modern western philosophy	690	Construction of buildings
200	Religion	700	Arts
210	Philosophy & theory of religion	710	Area planning & landscape architecture
220	The Bible	720	Architecture
230	Christianity	730	Sculpture, ceramics & metalwork
240	Christian practice & observance	740	Design & related arts
250	Christian pastoral practice & religious orders	750	Painting
260	Christian organization, social work & worship	760	Printmaking & prints
270	History of Christianity	770	Photography, computer art, film, video
280	Christian denominations	780	Music
290	Other religions	790	Sports, games & entertainment
300	Social sciences, sociology & anthropology	800	Literature, rhetoric & criticism
310	Statistics	810	American literature in English
320	Political science	820	English & Old English literatures
330	Economics	830	German & related literatures
340	Law	840	French & related literatures
350	Public administration & military science	850	Italian, Romanian & related literatures
360	Social problems & social services	860	Spanish, Portuguese, Galician literatures
370	Education	870	Latin & Italic literatures
380	Commerce, communications & transportation	880	Classical & modern Greek literatures
390	Customs, etiquette & folklore	890	Other literatures
400	Language	900	History
410	Linguistics	910	Geography & travel
420	English & Old English languages	920	Biography & genealogy
430	German & related languages	930	History of ancient world (to ca. 499)
440	French & related languages	940	History of Europe
450	Italian, Romanian & related languages	950	History of Asia
460	Spanish, Portuguese, Galician	960	History of Africa
470	Latin & Italic languages	970	History of North America
480	Classical & modern Greek languages	980	History of South America
490	Other languages	990	History of other areas

Consult schedules for complete and exact headings

FIGURE 38 | [Dewey Decimal Classification](#) - 8xx is literature - only broken down by language

The Library of Congress Genre/Form Terms (LCGFT)

The screenshot shows a web browser displaying the Library of Congress Genre/Form Terms (LCGFT) page for the Literature genre. The browser's address bar shows the URL: id.loc.gov/authorities/genreForms/gf2014026415.html. The page header includes the Library of Congress logo, a search bar with the text "Search id.loc.gov", and a navigation menu. The main content area is titled "Literature" and lists various terms and categories. The breadcrumb trail reads: "The Library of Congress > Linked Data Service > LC Genre/Form Terms (LCGFT)".

LIBRARY LIBRARY OF CONGRESS

Linked Data Services Search id.loc.gov

The Library of Congress > Linked Data Service > LC Genre/Form Terms (LCGFT)

Literature

URI(s)

- <http://id.loc.gov/authorities/genreForms/gf2014026415>

Form

- Literature

Variants

- Anthologies, Literary
- Belles-lettres
- Collections, Literary
- Creative writing
- Literary anthologies
- Literary collections

Narrower Terms

- Avadana stories
- Bestiaries
- Bible stories
- Black humor
- Book of Mormon stories
- Cartonera books
- Comics (Graphic works)
- Cut-ups (Literature)
- Dialogues (Literature)
- Doctrine and Covenants stories
- Drama
- Exempla
- Fiction
- Fiction
- Folk literature
- Gift books
- Hadith stories
- Invectives (Literature)
- Jataka stories
- Memorates
- Musical texts
- Parodies (Literature)
- Pastiche (Literature)
- Poetry
- Poetry
- Prologues and epilogues
- Qur'an stories
- Romances
- Sagas
- Satirical literature

FIGURE 39 | [The Library of Congress Genre/Form Terms \(LCGFT\) for Literature genre](http://id.loc.gov/authorities/genreForms/gf2014026415.html)



The Library of Congress > [Linked Data Service](#) > [LC Genre/Form Terms \(LCGFT\)](#)

Fiction

URI(s)
- <http://id.loc.gov/authorities/genreForms/gf2014026339>

Form
- Fiction

Variants
- Stories
- Tales

Broader Terms
- Literature

- Narrower Terms**
- Action and adventure fiction
 - Action and adventure fiction.
 - Africanfuturist fiction
 - Alternative histories (Fiction)
 - Animal fiction
 - Bible fiction
 - Bildungsromans
 - Bildungsromans
 - Biographical fiction
 - Bizarro fiction
 - Campus fiction
 - Choose-your-own stories
 - Christmas fiction
 - Confessional fiction
 - Cryptologic fiction
 - Detective and mystery fiction
 - Detective and mystery fiction
 - Dialect fiction
 - Diary fiction
 - Didactic fiction
 - Domestic fiction
 - Easter fiction
 - Epic fiction
 - Epic fiction
 - Epistolary fiction
 - Erotic fiction
 - Ethnographic fiction
 - Experimental fiction
 - Fan fiction
 - Fantasy fiction
 - Fantasy fiction.
 - Fictional autobiographies
 - Fishing fiction
 - Folk tales
 - Frame stories
 - Gangster fiction
 - Gothic fiction
 - Historical fiction
 - Historical fiction
 - Historical fiction.
 - Horror fiction
 - Horror fiction
 - Humorous fiction
 - Hunting fiction
 - Hypertext fiction
 - Legal fiction (Literature)
 - Light novels
 - Magic realist fiction
 - Martial arts fiction
 - Mathematical fiction
 - Medical fiction
 - Military fiction
 - Monster fiction
 - Mythological fiction
 - Nature fiction
 - Nonfiction novels
 - Nonsense fiction
 - Novellas
 - Nouvelle
 - Novels
 - Novels.
 - Paranormal fiction
 - Passover fiction
 - Pastoral fiction
 - Philosophical fiction
 - Picaresque fiction
 - Political fiction
 - Political fiction
 - Pornographic fiction
 - Prison fiction
 - Proletarian fiction
 - Psychological fiction
 - Queer fiction
 - Religious fiction
 - Road fiction
 - Robinsnades
 - Romance fiction
 - Romance fiction
 - Romans à clef
 - Samurai fiction
 - Scar literature
 - School fiction
 - Science fiction
 - Science fiction.
 - Sea fiction
 - Sensation fiction
 - Serialized fiction
 - Short stories
 - Short stories
 - Short stories.
 - Social problem fiction
 - Sports fiction
 - Spy fiction
 - Stories in rhyme
 - Survival fiction
 - Theatrical fiction
 - Thrillers (Fiction)
 - Thrillers (Fiction)
 - Urban fiction
 - Utopian fiction
 - War fiction
 - Western fiction
 - Western fiction

FIGURE 40 | [LCGFT Fiction Genre](#)

Book Industry Standards And Communications (BISAC)

The screenshot shows the BISAC subject headings list on the BISG website. The browser address bar shows 'bisg.org/complete-bisac-subject-headings-list'. The website header includes the BISG logo and navigation links: BISAC, COMMITTEES, MEMBERSHIP, ABOUT, EVENTS, POLICY & RESEARCH, and DIGITAL RESOURCES. The main content area displays a list of 40 subject headings, each preceded by a green arrow icon and underlined. The headings are arranged in two columns. The first column contains: ANTIQUES & COLLECTIBLES, ARCHITECTURE, ART, BIBLES, BIOGRAPHY & AUTOBIOGRAPHY, BODY, MIND & SPIRIT, BUSINESS & ECONOMICS, COMICS & GRAPHIC NOVELS, COMPUTERS, COOKING, CRAFTS & HOBBIES, DESIGN, DRAMA, EDUCATION, FAMILY & RELATIONSHIPS, FICTION, FOREIGN LANGUAGE STUDY, GAMES & ACTIVITIES, GARDENING, HEALTH & FITNESS, HISTORY, HOUSE & HOME, HUMOR, JUVENILE FICTION, JUVENILE NONFICTION, LANGUAGE ARTS & DISCIPLINES, and LAW. The second column contains: LITERARY COLLECTIONS, LITERARY CRITICISM, MATHEMATICS, MEDICAL, MUSIC, NATURE, PERFORMING ARTS, PETS, PHILOSOPHY, PHOTOGRAPHY, POETRY, POLITICAL SCIENCE, PSYCHOLOGY, REFERENCE, RELIGION, SCIENCE, SELF-HELP, SOCIAL SCIENCE, SPORTS & RECREATION, STUDY AIDS, TECHNOLOGY & ENGINEERING, TRANSPORTATION, TRAVEL, TRUE CRIME, YOUNG ADULT FICTION, and YOUNG ADULT NONFICTION.

Please note: If your title doesn't have subject content, i.e. a blank book, please use the Non-Classifiable term below. Otherwise, use the Subject/General term in the closest descriptive area.

NON000000: NON-CLASSIFIABLE

FIGURE 41 | BISAC – Includes audiences: adult, young adult, and juvenile. Includes genres for each audience for both fiction and non-fiction.

← → ↻ bisg.org/fiction 🔍 ☆ 📄 📱 🔔 ⋮

Join | Login | Contact | 🔍

 **BISG** | **BOOK INDUSTRY STUDY GROUP** | [BISAC](#) | [COMMITTEES](#) | [MEMBERSHIP](#) | [ABOUT](#) | [EVENTS](#) | [POLICY & RESEARCH](#) | [DIGITAL RESOURCES](#)

FIC064000 **FICTION** / Absurdist

FIC002000 **FICTION** / Action & Adventure

FICTION / Action & Adventure / Fantasy *see* Fantasy / Action & Adventure

FICTION / Action & Adventure / Romance *see* Romance / Action & Adventure

FIC075000 **FICTION** / Adaptations & Pastiche

FICTION / Adventure *see* Action & Adventure

FIC049000 **FICTION** / African American & Black / General

FIC049010 **FICTION** / African American & Black / Christian

FIC049030 **FICTION** / African American & Black / Erotica

FIC049040 **FICTION** / African American & Black / Historical

FIC049050 **FICTION** / African American & Black / Mystery & Detective

FICTION / African American & Black / Romance *see* Romance / African American & Black

FIC049070 **FICTION** / African American & Black / Urban & Street Lit

FIC049020 **FICTION** / African American & Black / Women

FIC040000 **FICTION** / Alternative History

FIC053000 **FICTION** / Amish & Mennonite

FIC067000 **FICTION** / Animals

FIC003000 **FICTION** / Anthologies (multiple authors)

FIC054000 **FICTION** / Asian American & Pacific Islander

FIC041000 **FICTION** / Biographical

FIC078000 **FICTION** / Buddhist

FIC042000 **FICTION** / Christian / General

FICTION / Christian / African American & Black *see* African American & Black / Christian

FIC042090 **FICTION** / Christian / Biblical

FIC042010 **FICTION** / Christian / Classic & Allegory

FIC042050 **FICTION** / Christian / Collections & Anthologies

FIC042100 **FICTION** / Christian / Contemporary

FIC042080 **FICTION** / Christian / Fantasy

FIC042020 **FICTION** / Christian / Futuristic

FIC042030 **FICTION** / Christian / Historical

FIC042040 **FICTION** / Christian / Romance / General

FIC042110 **FICTION** / Christian / Romance / Historical

FIC042120 **FICTION** / Christian / Romance / Suspense

FIC042060 **FICTION** / Christian / Suspense

FIC042070 **FICTION** / Christian / Western

FIC069000 **FICTION** / City Life

FIC004000 **FICTION** / Classics

FICTION / Comics *see headings under* **COMICS & GRAPHIC NOVELS**

FIGURE 42 | [BISAC Adult Fiction](#) (subset)



- JUV000000 **JUVENILE FICTION** / General
- JUV001000 **JUVENILE FICTION** / Action & Adventure / General
- JUV001020 **JUVENILE FICTION** / Action & Adventure / Pirates
- JUV001010 **JUVENILE FICTION** / Action & Adventure / Survival Stories
- JUV054000 **JUVENILE FICTION** / Activity Books / General
- JUV054010 **JUVENILE FICTION** / Activity Books / Coloring
- JUV054020 **JUVENILE FICTION** / Activity Books / Sticker
- JUV011010 **JUVENILE FICTION** / African American & Black
- JUV002000 **JUVENILE FICTION** / Animals / General
- JUV002010 **JUVENILE FICTION** / Animals / Alligators & Crocodiles
- JUV002020 **JUVENILE FICTION** / Animals / Apes, Monkeys, etc.
- JUV002370 **JUVENILE FICTION** / Animals / Baby Animals
- JUV002030 **JUVENILE FICTION** / Animals / Bears
- JUV002040 **JUVENILE FICTION** / Animals / Birds
- JUV002300 **JUVENILE FICTION** / Animals / Butterflies, Moths & Caterpillars
- JUV002050 **JUVENILE FICTION** / Animals / Cats
- JUV002310 **JUVENILE FICTION** / Animals / Cows
- JUV002290 **JUVENILE FICTION** / Animals / Deer, Moose & Caribou
- JUV002060 **JUVENILE FICTION** / Animals / Dinosaurs & Prehistoric Creatures
- JUV002070 **JUVENILE FICTION** / Animals / Dogs
- JUV002270 **JUVENILE FICTION** / Animals / Dragons, Unicorns & Mythical
- JUV002280 **JUVENILE FICTION** / Animals / Ducks, Geese, etc.
- JUV002080 **JUVENILE FICTION** / Animals / Elephants
- JUV002090 **JUVENILE FICTION** / Animals / Farm Animals
- JUV002100 **JUVENILE FICTION** / Animals / Fish
- JUV002110 **JUVENILE FICTION** / Animals / Foxes
- JUV002120 **JUVENILE FICTION** / Animals / Frogs & Toads
- JUV002320 **JUVENILE FICTION** / Animals / Giraffes
- JUV002330 **JUVENILE FICTION** / Animals / Hippos & Rhinos
- JUV002130 **JUVENILE FICTION** / Animals / Horses
- JUV002140 **JUVENILE FICTION** / Animals / Insects, Spiders, etc.
- JUV002340 **JUVENILE FICTION** / Animals / Jungle Animals
- JUV002350 **JUVENILE FICTION** / Animals / Kangaroos
- JUV002150 **JUVENILE FICTION** / Animals / Lions, Tigers, Leopards, etc.

FIGURE 43 | [BISAC Juvenile Fiction](#) (subset)



- YAF000000 **YOUNG ADULT FICTION** / General
- YAF001000 **YOUNG ADULT FICTION** / Action & Adventure / General
- YAF001010 **YOUNG ADULT FICTION** / Action & Adventure / Pirates
- YAF001020 **YOUNG ADULT FICTION** / Action & Adventure / Survival Stories
- YAF046120 **YOUNG ADULT FICTION** / African American & Black
- YAF071000 **YOUNG ADULT FICTION** / Alternative History
- YAF002000 **YOUNG ADULT FICTION** / Animals / General
- YAF002010 **YOUNG ADULT FICTION** / Animals / Horses
- YAF002020 **YOUNG ADULT FICTION** / Animals / Marine Life
- YAF002030 **YOUNG ADULT FICTION** / Animals / Mythical Creatures
- YAF002040 **YOUNG ADULT FICTION** / Animals / Pets
- YAF004000 **YOUNG ADULT FICTION** / Art
- YAF046130 **YOUNG ADULT FICTION** / Asian American & Pacific Islander
- YAF005000 **YOUNG ADULT FICTION** / Biographical
- YAF076000 **YOUNG ADULT FICTION** / Biracial & Multiracial *
- YAF006000 **YOUNG ADULT FICTION** / Books & Libraries
- YAF007000 **YOUNG ADULT FICTION** / Boys & Men
- YAF008000 **YOUNG ADULT FICTION** / Careers, Occupations, Internships
- YAF009000 **YOUNG ADULT FICTION** / Classics
- YAF072000 **YOUNG ADULT FICTION** / Clean & Nonviolent
- YAF010000 **YOUNG ADULT FICTION** / Comics & Graphic Novels / General
- YAF010050 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Action & Adventure
- YAF010190 **YOUNG ADULT FICTION** / Comics & Graphic Novels / African American & Black *
- YAF010200 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Asian American & Pacific Islander *
- YAF010060 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Classic Adaptation
- YAF010070 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Coming of Age
- YAF010180 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Diversity & Multicultural
- YAF010080 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Dystopian
- YAF010090 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Fairy Tales, Folklore, Legends & Mythology
- YAF010100 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Fantasy
- YAF010210 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Hispanic & Latino *
- YAF010110 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Historical
- YAF010120 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Horror
- YAF010130 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Humorous
- YAF010220 **YOUNG ADULT FICTION** / Comics & Graphic Novels / Indigenous *

FIGURE 44 | [BISAC Young Adult Fiction](#) (subset)

SPARQL

[SPARQL does not work beyond Protégé 5.5.0](#). Two options are proposed:

1. Downgrade to Protégé 5.5.0
2. Use Snap SPARQL plugin

Option two did not work, so proceeded with option one. However, then the Protégé 5.5.0 small font bug appears. The fix for that is [here](#). The fix on Windows 10 requires modifying javaw.exe properties. Other Java executables may have to be modified for other operating systems. The explanation for the small font fix is [here](#).

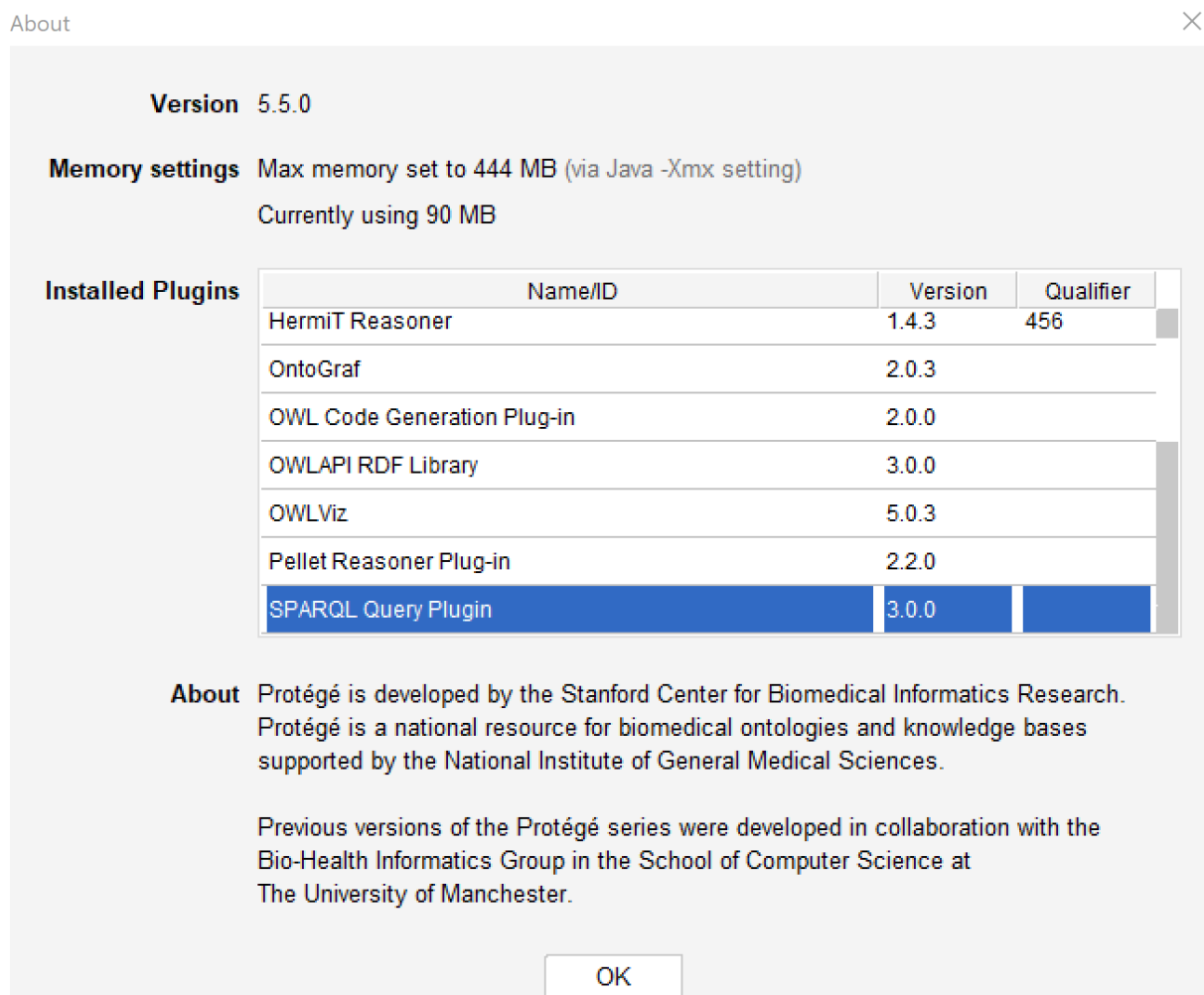


FIGURE 45 | SPARQL Query plugin installed (and working) in Protégé 5.5.0

SPARQL Query and Search

The intention was to use SPARQL to create a Search instance with the searchDate data property set with the current time when performing a search.

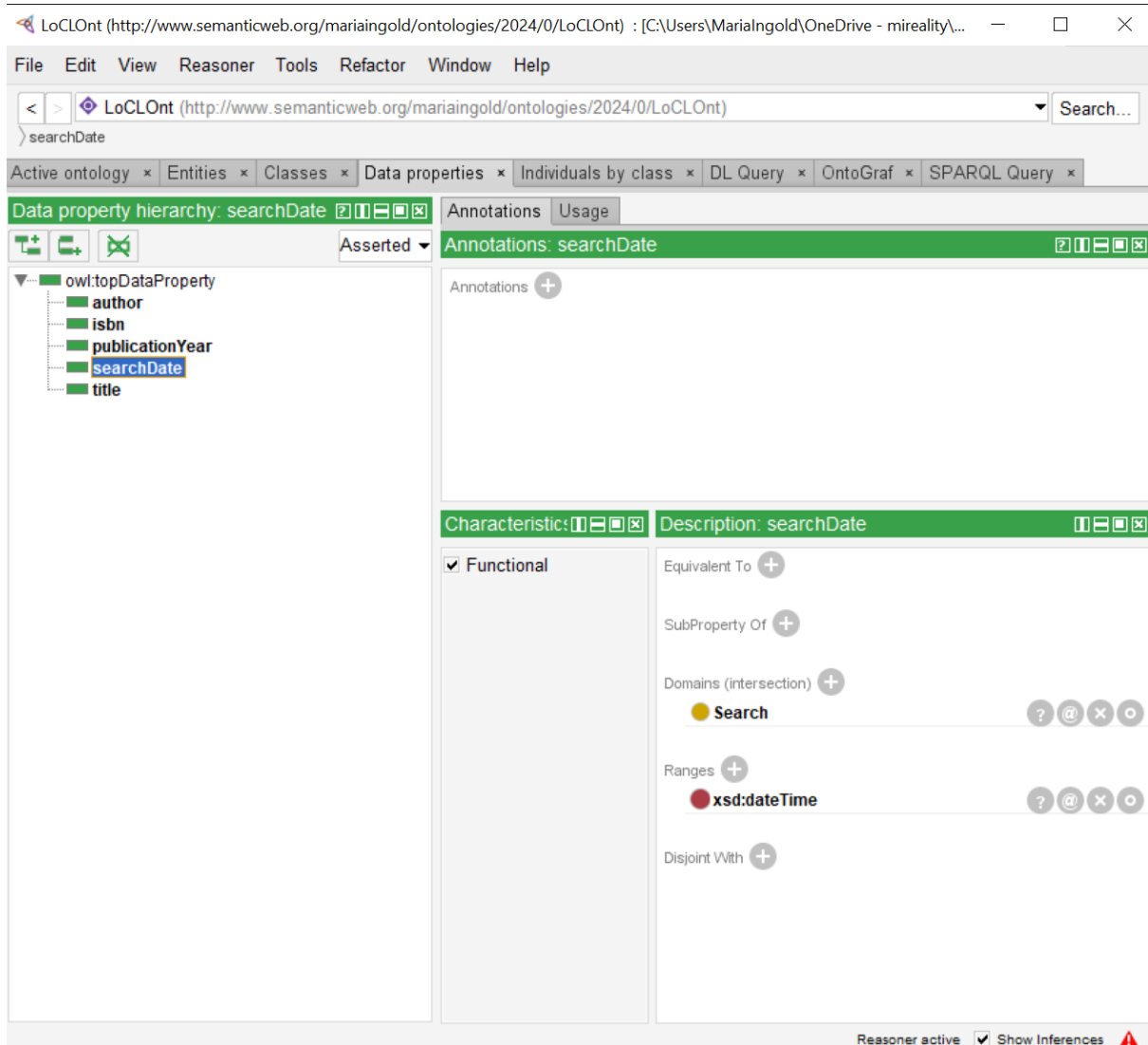


FIGURE 46 | Search class: searchDate data property of dateTime type

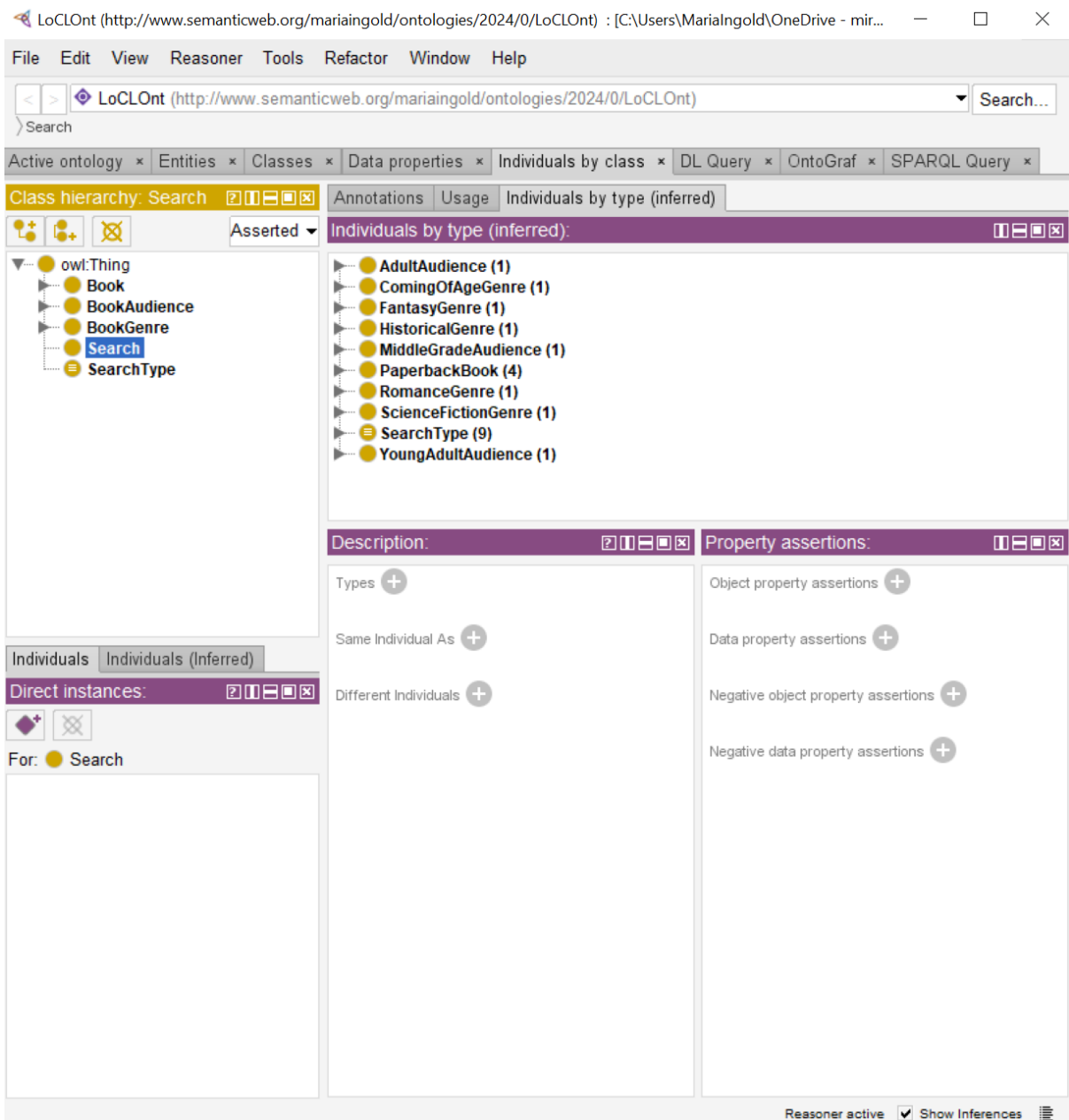


FIGURE 47 | The intention was to get SPARQL to create a Search instance with searchDate set.

However, because SPARQL Query for Protégé is only a *query* language, no updates like insertion of instances are allowed. Furthermore, NOW(), to get the current datetime, is not supported in SPARQL Query 3.0.0. As this is the only SPARQL seemingly able to work Protégé, creating an instance and updating the time of the search using SPARQL has proved impossible.

This SELECT query works:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX rdfs: <http://www.w3.org/2000/01/rdf-schema#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX LoCLOnt:
<http://www.semanticweb.org/mariaingold/ontologies/2024/0/LoCLOnt#>
SELECT ?title WHERE {
    ?book rdf:type/rdfs:subClassOf* LoCLOnt:Book;
    LoCLOnt:title ?title.
}
```

However, adding `now()`, even though it passes the SPARQL Query Validator, does not work. [Stack overflow confirms this](#).

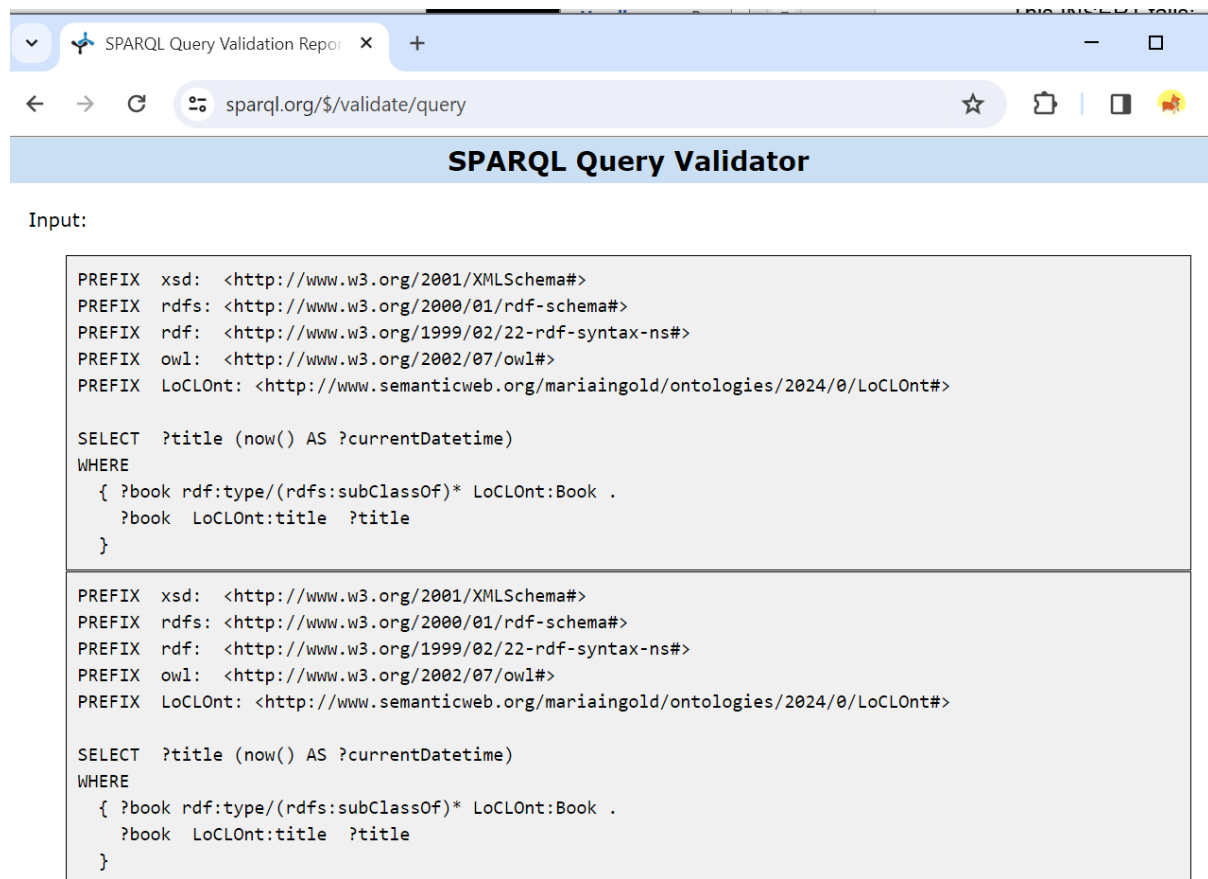


FIGURE 48 | [Validated use of returning now\(\) in a SPARQL query](#)

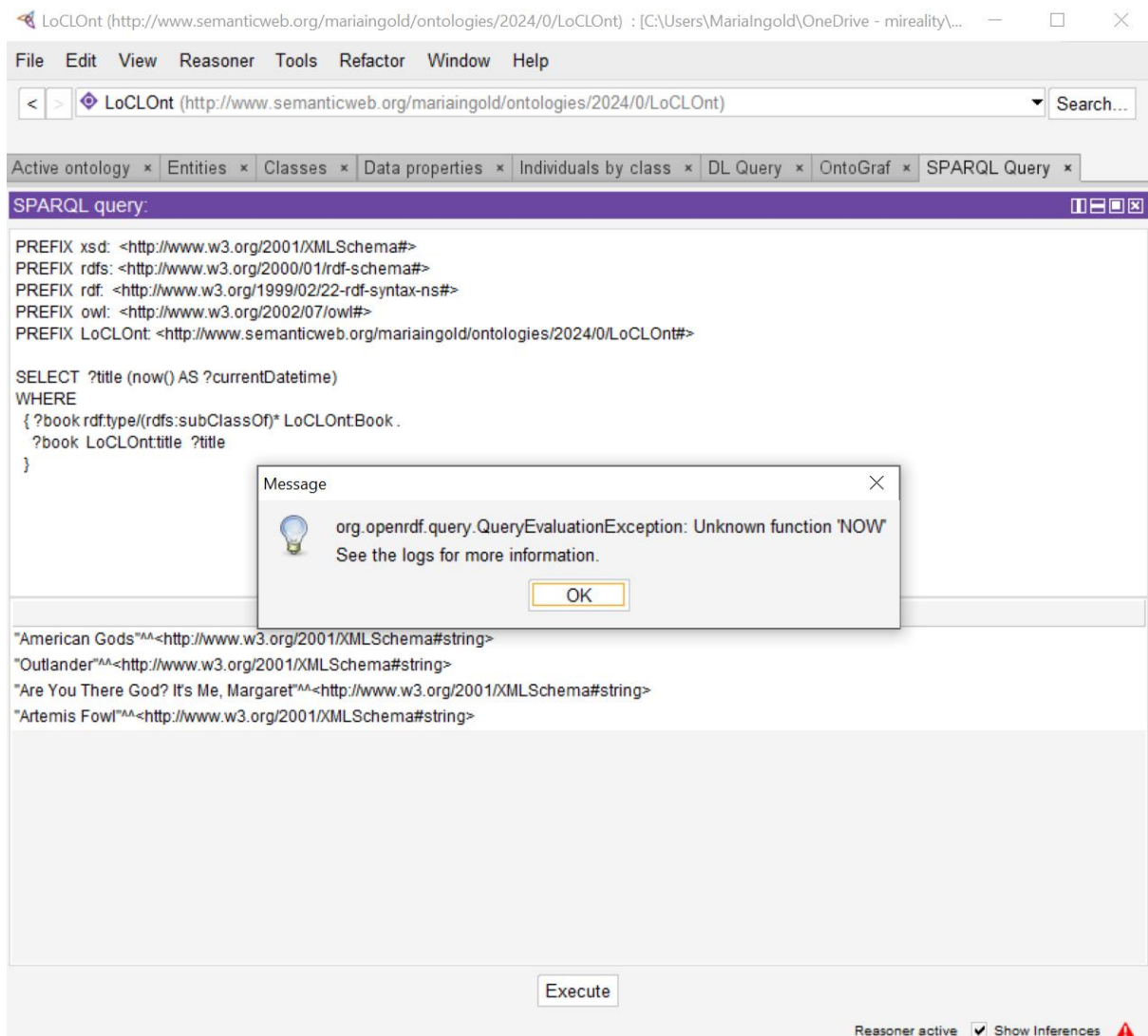
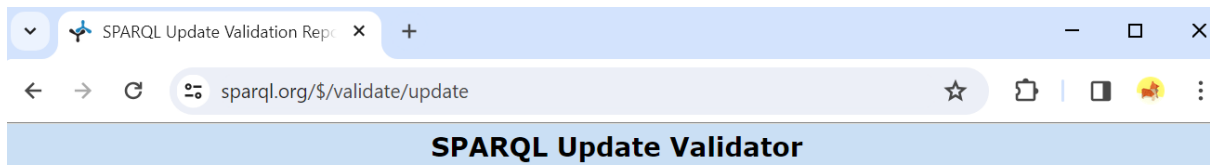


FIGURE 49 | The now() fails on a query apparently because now(), while part of SPARQL is not supported in this implementation.

While passing the [update validator](#), the INSERT also fails. While it could be because of using now(), it fails on INSERT, because this is SPARQL Query, not SPARQL Update and INSERT is unsupported. Others on Stack Overflow also found that they cannot do updates on Protégé: [here](#), [here](#), and [here](#).



Input:

```
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX LoCLOnt: <http://www.semanticweb.org/mariaingold/ontologies/2024/0/LoCLOnt#>

INSERT {
  LoCLOnt:UniqueID100 rdf:type LoCLOnt:Search .
  LoCLOnt:UniqueID100 LoCLOnt:searchDate ?now .
}
WHERE {
  BIND(NOW() AS ?now)
}
```

Formatted, parsed update request:

```
PREFIX xsd: <http://www.w3.org/2001/XMLSchema#>
PREFIX rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#>
PREFIX owl: <http://www.w3.org/2002/07/owl#>
PREFIX LoCLOnt: <http://www.semanticweb.org/mariaingold/ontologies/2024/0/LoCLOnt#>

INSERT {
  LoCLOnt:UniqueID100 rdf:type LoCLOnt:Search .
  LoCLOnt:UniqueID100 LoCLOnt:searchDate ?now .
}
WHERE
{ BIND(now() AS ?now) }
```

FIGURE 50 | Validating use of INSERT and now() in SPARQL

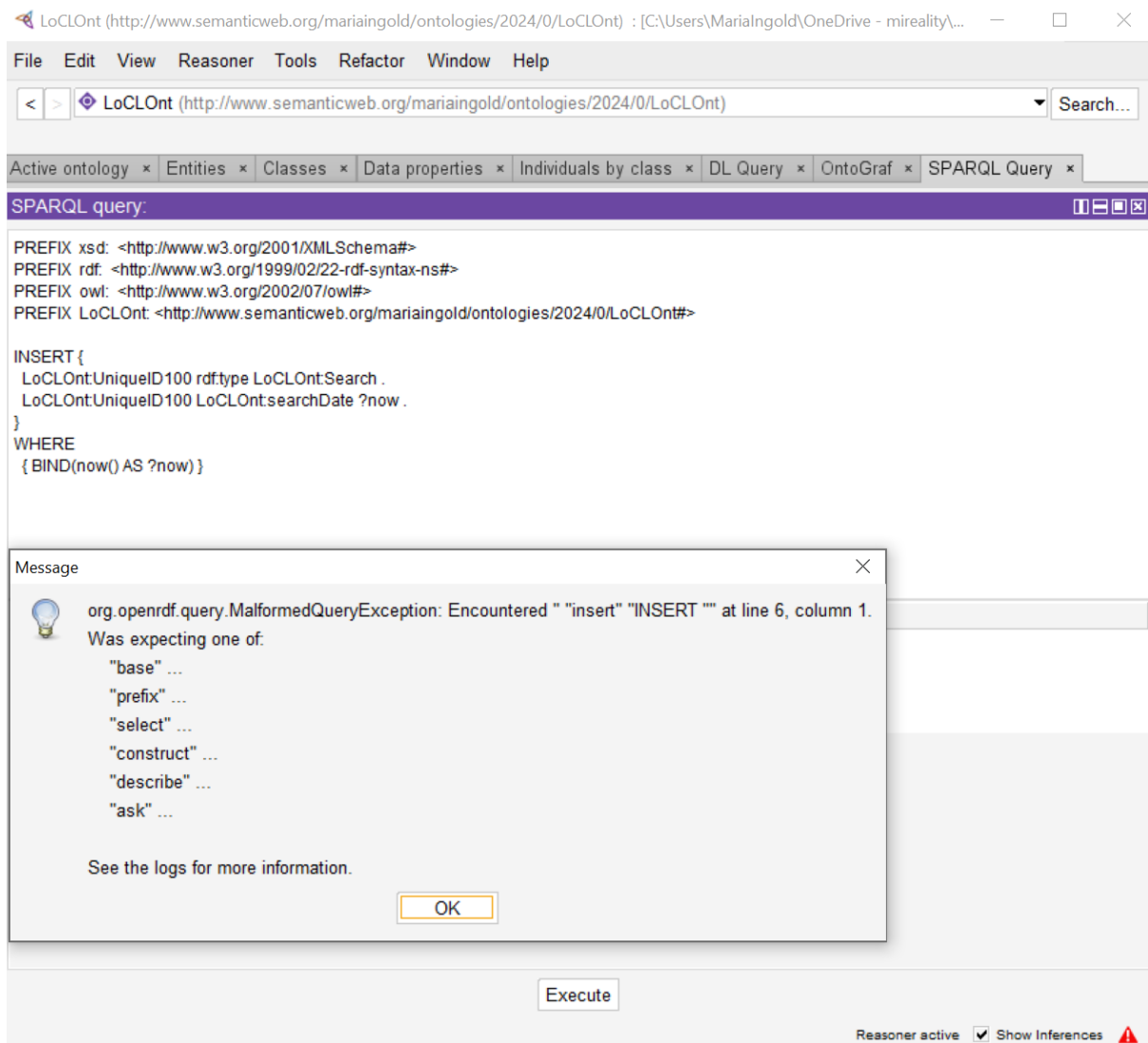


FIGURE 51 | SPARQL Query INSERT error in Protégé. Notes that it is not an expected query.