Prague University of Economics and Business

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SEMANTIC DATA VOCABULARY FOR ENTERTAINMENT AND MEDIA

Semestral project

Course: 4IZ441 - Graph data and knowledge

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Introduction

The entertainment and media industry generates extensive data, including information about movies, TV shows, streaming platforms, and awards. However, much of this data is unstructured, leading to inefficiencies in integration and retrieval. This semestral project focuses on designing a semantic vocabulary tailored to this domain using RDF, RDFS, OWL, and schema.org standards. By providing structured descriptions of entities and their relationships, this vocabulary enhances data organization, interoperability, and accessibility, enabling advanced applications such as recommendation systems and semantic queries.

1 Vocabulary Overview and Definitions

The vocabulary overview offers a comprehensive breakdown of the core entities and properties that are critical for representing the entertainment and media domain. Each entity represents a key component of the industry, such as movies, TV shows, or streaming platforms, while properties define the relationships and attributes associated with these entities.

1.1 Entities and Their Definitions

1. **MediaContent**
   - Definition: Represents a piece of media, such as a movie or TV show.
   - Superclass: `schema:CreativeWork`.
   - Attributes: `genre`, `releaseDate`, `rating`, `duration`.
2. **Person**
   - Definition: Represents an individual involved in media content, such as an actor, director, or producer.
   - Superclass: `schema:Person`.
   - Relationships: Can `starredIn` or `directedBy`, or `producedBy` MediaContent.
3. **StreamingPlatform**
   - Definition: Represents a digital platform where media content is hosted, such as Netflix, HBO, or Disney+.
   - Superclass: `schema:Organization.`
   - Relationships: MediaContent is `availableOn` StreamingPlatform.
4. **Award**
   - Definition: Represents awards or accolades given to individuals or media content, such as the Oscars or Emmys.
   - Attributes: Award name, date awarded.
5. **Franchise**
   - Definition: Represents a collection of related media content, such as sequels, spin-offs, or remakes.
   - Superclass: `schema:CreativeWork`.
   - Relationships: Can `includesContent` MediaContent.
6. **Review**
   - Definition: Represents feedback or critiques associated with media content.
   - Superclass: `schema:Review`.
   - Attributes: Reviewer name, rating, comment.
7. **ProductionCompany**
   - Definition: Represents a company involved in the production of media content.
   - Superclass: `schema:Organization.`
   - Relationships: MediaContent is `producedBy` ProductionCompany.

1.2 Properties and Their Definitions

1. **starredIn**
   - Definition: Links a `Person` to the `MediaContent` they have acted in.
   - Domain: `Person`.
   - Range: `MediaContent`.
2. **hasDirected**
   - Definition: Links a `Person` to the `MediaContent` they directed.
   - Domain: `Person`.
   - Range: `MediaContent`.
3. **wonAward**
   - Definition: Links a `Person` or `MediaContent` to an Award.
   - Domain: `Person` or `MediaContent`.
   - Range: `Award`.
4. **directedBy**
   - Definition: Links a `MediaContent` to the `Person` who directed it.
   - Domain: `MediaContent`.
   - Range: `Person`.
5. **producedBy**
   - Definition: Links a `MediaContent` to a `ProductionCompany` that produced it.
   - Domain: `MediaContent`.
   - Range: `ProductionCompany`.
6. **availableOn**
   - Definition: Links `MediaContent` to a `StreamingPlatform` where it is hosted.
   - Domain: `MediaContent`.
   - Range: `StreamingPlatform`.
7. **releaseDate**
   - Definition: Specifies the date a `MediaContent` was released.
   - Domain: `MediaContent`.
   - Range: `schema:Date`.
8. **genre**
   - Definition: Specifies the genre of a `MediaContent`, such as Comedy or Drama.
   - Domain: `MediaContent`.
   - Range: `schema:Text`.
9. **includesContent**
   - Definition: Links a `Franchise` to individual `MediaContent` items within it.
   - Domain: `Franchise`.
   - Range: `MediaContent`.
10. **reviewedBy**
    - Definition: Links a `Review` to the `MediaContent` it critiques.
    - Domain: `Review`.
    - Range: `MediaContent`.

11. hasProduced

- Definition: Links a `ProductionCompany` to the `MediaContent` it produced.
- Domain: `ProductionCompany`.
- Range: `MediaContent`.

2 Implementation

2.1 RDFS and Related Ontologies

RDFS (RDF Schema)

RDFS provides a basic set of constructs to define classes and properties in RDF. It is used in this project to define the hierarchical relationships among entities like `MediaContent`, `Person`, and `StreamingPlatform`.

- Example: `rdfs:Class` is used to define `MediaContent` as a class.
- Example: `rdfs:subClassOf` is used to state that `MediaContent` is a subclass of `schema:CreativeWork`.

XML Schema (XSD)

XML Schema is used for data types in RDF, such as dates, strings, and integers. It provides a foundation for expressing literal values in RDF.

- Example: `xsd:date` is used to represent the release date of `MediaContent`.

Schema.org

Schema.org offers a broad vocabulary for structured data on the web, making it a crucial component for this project. It provides predefined entities such as `CreativeWork` and `Person`, which are extended in the vocabulary to include domain-specific concepts. By incorporating schema.org, the vocabulary aligns with global standards and becomes compatible with APIs and data sources like TMDb and IMDb.

- Example: `schema:CreativeWork` serves as the superclass for `MediaContent`.
- Example: `schema:Organization` is reused for `StreamingPlatform`.

2.2 The Prefixed Reused Ontologies

```
@prefix schema: <http://schema.org/> .
@prefix rdf: <http://www.w3.org/1999/02/22-rdf-syntax-ns#> .
@prefix rdfs: <http://www.w3.org/2000/01/rdf-schema#> .
@prefix xsd: <http://www.w3.org/2001/XMLSchema#> .
@prefix owl: <http://www.w3.org/2002/07/owl#> .
```

2.3 Media and Entertainment Vocabulary (media-entertainment-voc)

Below is the complete RDF vocabulary along with its definitions, including the prefix.

```
@prefix em: <http://example.org/media-entertainment-voc#> .
```

Classes

MediaContent Class in Turtle

```
# MediaContent Class
em:MediaContent a owl:Class ;
    rdfs:label "Media Content" ;
    rdfs:comment "Represents movies or TV shows." ;
    rdfs:subClassOf schema:CreativeWork .
```

Person Class in Turtle

```
# Person Class
em:Person a owl:Class ;
    rdfs:label "Person" ;
    rdfs:comment "Represents an actor, director, or producer." ;
    rdfs:subClassOf schema:Person .
```

StreamingPlatform Class in Turtle

```
# StreamingPlatform Class
em:StreamingPlatform a owl:Class ;
    rdfs:label "Streaming Platform" ;
    rdfs:comment "Represents platforms hosting media content." ;
    rdfs:subClassOf schema:Organization .
```

Award Class in Turtle

```
# Award Class
em:Award a owl:Class ;
    rdfs:label "Award" ;
    rdfs:comment "Represents awards given to persons or media content." .
```

Franchise Class in Turtle

```
# Franchise Class
em:Franchise a owl:Class ;
    rdfs:label "Franchise" ;
    rdfs:comment "Represents a collection of related media content." ;
    rdfs:subClassOf schema:CreativeWork .
```

Review Class in Turtle

```
# Review Class
em:Review a owl:Class ;
    rdfs:label "Review" ;
    rdfs:comment "Represents feedback or critiques associated with media content." ;
    rdfs:subClassOf schema:Review .
```

ProductionCompany Class in Turtle

```
# ProductionCompany Class
em:ProductionCompany a owl:Class ;
    rdfs:label "Production Company" ;
    rdfs:comment "Represents a company involved in producing media content." ;
    rdfs:subClassOf schema:Organization .
```

Properties

Person Class Properties in Turtle

```
# Person Class Properties and links to MediaContent
em:starredIn a owl:ObjectProperty ;
    rdfs:label "Starred In" ;
    rdfs:domain em:Person ;
    rdfs:range em:MediaContent .

# Person Class Properties and links to MediaContent
em:hasDirected a owl:ObjectProperty ;
    rdfs:label "Has Directed" ;
    rdfs:domain em:Person ;
    rdfs:range em:MediaContent ;
    owl:inverseOf em:directedBy .

# Person Class and MediaContent Class Properties and links to Award
em:wonAward a owl:ObjectProperty ;
    rdfs:label "Won Award" ;
    rdfs:domain [ a owl:Class ; owl:unionOf (em:Person em:MediaContent) ] ;
    rdfs:range em:Award .
```

MediaContent Class Properties in Turtle

```
# Person Class and MediaContent Class Properties and links to Award
em:wonAward a owl:ObjectProperty ;
    rdfs:label "Won Award" ;
    rdfs:domain [ a owl:Class ; owl:unionOf (em:Person em:MediaContent) ] ;
    rdfs:range em:Award .

# MediaContent Class Properties and links to Person
em:directedBy a owl:ObjectProperty ;
    rdfs:label "Directed By" ;
    rdfs:domain em:MediaContent ;
    rdfs:range em:Person ;
    owl:inverseOf em:hasDirected .

# MediaContent Class Properties and links to ProductionCompany
em:producedBy a owl:ObjectProperty ;
    rdfs:label "Produced By" ;
    rdfs:domain em:MediaContent ;
    rdfs:range em:ProductionCompany ;
    owl:inverseOf em:hasProduced .

# MediaContent Class Properties and links to StreamingPlatform
em:availableOn a owl:ObjectProperty ;
    rdfs:label "Available On" ;
    rdfs:domain em:MediaContent ;
    rdfs:range em:StreamingPlatform .

# MediaContent Class Properties and specifies the release date
em:releaseDate a owl:DatatypeProperty ;
    rdfs:label "Release Date" ;
    rdfs:domain em:MediaContent ;
    rdfs:range schema:Date .

# MediaContent Class Properties and specifies the genre
em:genre a owl:DatatypeProperty ;
    rdfs:label "Genre" ;
    rdfs:domain em:MediaContent ;
    rdfs:range schema:Text .
```

Franchise Class Properties in Turtle

```
# Franchise Class Properties and links to MediaContent
em:includesContent a owl:ObjectProperty ;
    rdfs:label "Includes Content" ;
    rdfs:domain em:Franchise ;
    rdfs:range em:MediaContent .
```

Review Class Properties in Turtle

```
# Review Class Properties and links to MediaContent
em:reviewedBy a owl:ObjectProperty ;
    rdfs:label "Reviewed By" ;
    rdfs:domain em:Review ;
    rdfs:range em:MediaContent .
```

ProductionCompany Class Properties in Turtle

```
# ProductionCompany Properties and links to MediaContent
em:hasProduced a owl:ObjectProperty ;
    rdfs:label "Has Produced" ;
    rdfs:domain em:ProductionCompany ;
    rdfs:range em:MediaContent ;
    owl:inverseOf em:producedBy .
```

3 Addition

3.1 Reused Vocabularies

Classes

Person

- Reused from schema:Person from schema.org
- em:Person is defined as a subclass of schema:Person, inheriting properties such as schema:name, which can be used to represent the names of individuals.
- Link: https://schema.org/Person

Award

- Reused from schema:award property in schema:CreativeWork from schema.org
- Used to represent awards or accolades given to individuals, creative works, or organizations.
- Link: https://schema.org/awards

Review

- Reused from schema:Review from schema.org
- Subclasses schema:Review, inheriting properties like schema:reviewBody
- Link: https://schema.org/Review

ProductionCompany

- Reused from schema:Organization from schema.org
- As a subclass of schema:Organization, em:ProductionCompany can reuse properties like schema:name and schema:location to describe entities like Marvel Studios or Pixar
- Link: https://schema.org/Organization

Properties

wonAward

- Reused from schema:award from schema.org
- Applied owl:unionOf to allow the property to be used for both individuals (em:Person) and creative works (em:MediaContent)
- Its usage is demonstrated in the ANTLR GitHub repository, which showcases Schema.org properties in Turtle syntax

- GitHub ANTLR (Another Tool for Language Recognition) link: https://github.com/antlr/grammars-v4/blob/master/turtle/examples/schema.org.ttl

ANTLR GitHub version:

```
schema:award a rdf:Property;
    rdfs:label "Award"@en;
    rdfs:comment "An award won by this person or for this creative work."@en;
    rdfs:domain [ a owl:Class; owl:unionOf (schema:Person schema:CreativeWork) ];
    rdfs:range xsd:string;
    rdfs:isDefinedBy <http://schema.org/Person>;
    rdfs:isDefinedBy <http://schema.org/CreativeWork>;
```

3.1.1 What is ANTLR?

ANTLR (Another Tool for Language Recognition) is a tool used to define, parse, and process structured text or code. It generates parsers from a grammar file that describes the syntax of a specific language or format. These parsers can then read and validate text that adheres to the defined grammar.

releaseDate

- Reused from schema:Date
- Specifies the release date of em:MediaContent
- Link: https://schema.org/Date

genre

- It's reused from schema:genre
- Describes the genre of em:MediaContent, such as "Action" or "Drama."
- Link: https://schema.org/CreativeWork

reviewedBy

- It's reused from schema:Review
- Links media content to the reviews associated with it
- Link: https://schema.org/Review

3.2 Created Vocabularies

Classes

MediaContent

- Inspired by schema:CreativeWork from schema.org

- Represents movies or TV shows as distinct entities
- Link to schema.org: https://schema.org/CreativeWork

StreamingPlatform

- Designed to represent streaming platforms like Netflix and Disney+
- This class specifies digital platforms where media content is hosted

Franchise

- Designed to represent collections of related media content, such as sequels, spin-offs, or remakes
- This class makes it possible to link these related items and support queries like "What content is part of the Star Wars franchise?"

Properties

starredIn

- Links a Person to the MediaContent they acted in
- Schema.org includes properties like schema:actor, but it does not specifically define the relationship from a person's point of view
- This property explicitly defines the relationship from the person's perspective

hasDirected

- Links a Person to the MediaContent they directed
- Schema.org has similar property starredIn in schema:director
- Helps describe the relationship from the person's point of view

producedBy

- Links MediaContent to the ProductionCompany that produced it
- Schema.org lacks a direct equivalent, making this property essential for capturing production relationships
- It corresponds to the inverse property hasProduced

availableOn

- Links MediaContent to the StreamingPlatform where it is hosted

includesContent

- Links a Franchise to individual MediaContent items within it

hasProduced

- Links a ProductionCompany to the MediaContent it produced
- Complements the producedBy property

3.3 Explanation of wonAward Property

The current definition of the `wonAward` property uses the `owl:unionOf` axiom to specify that the property applies to both `Person` and `MediaContent`. The `owl:unionOf` axiom allows the domain of the `wonAward` property to be a combination of multiple classes. In this case, `em:Person` and `em:MediaContent` are combined using `owl:unionOf`, indicating that both classes can win an award. As a result, the ontology supports statements indicating that a Person can win an Award (e.g., *Leonardo DiCaprio won an Oscar*) and that MediaContent can also receive an Award (e.g., *Inception won an Oscar*).

Alternative Approach

To avoid using `owl:unionOf`, we can define the `wonAward` property with multiple domain statements or separate sub-properties for each domain class.

Multiple Domain Statements

```
em:wonAward a owl:ObjectProperty ;
    rdfs:label "Won Award" ;
    rdfs:domain em:Person ;
    rdfs:domain em:MediaContent ;
    rdfs:range em:Award .
```

Multiple `rdfs:domain` statements imply that the property can apply to any instance of either class (`Person` or `MediaContent`).

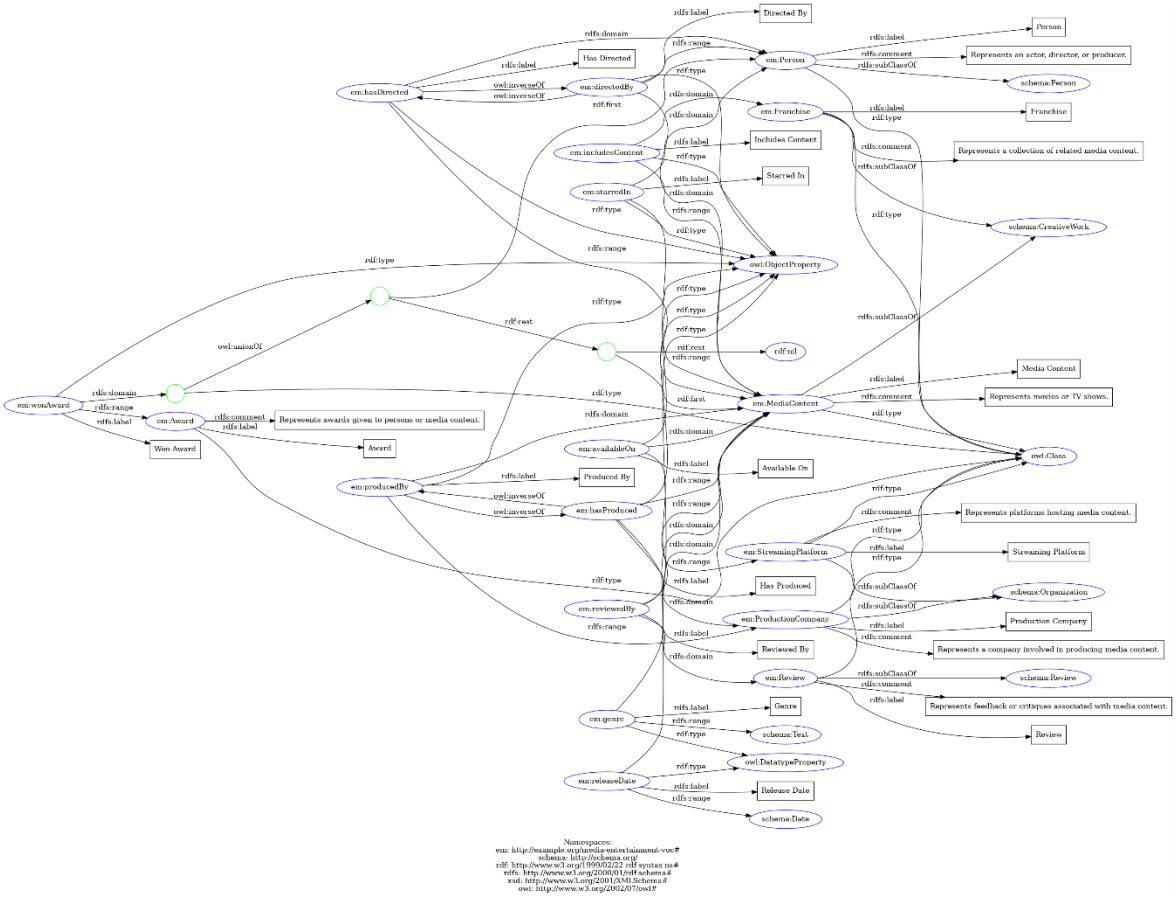
Sub-Properties

```
em:wonAward a owl:ObjectProperty ;
    rdfs:label "Won Award" ;
    rdfs:range em:Award .

em:personWonAward a owl:ObjectProperty ;
    rdfs:label "Person Won Award" ;
    rdfs:subPropertyOf em:wonAward ;
    rdfs:domain em:Person ;
    rdfs:range em:Award .

em:contentWonAward a owl:ObjectProperty ;
    rdfs:label "Media Content Won Award" ;
    rdfs:subPropertyOf em:wonAward ;
    rdfs:domain em:MediaContent ;
    rdfs:range em:Award .
```

The two sub-properties (`personWonAward` and `contentWonAward`) links `Person` and `MediaContent` to `Award`.

4 RDF Graph

The RDF graph was generated from the schema using RDF-Grapher (https://www.ldf.fi/service/rdf-grapher). The complete image is available in the file rdf-graph.png.



5 Ontology for Media Resources 1.0

The Ontology for Media Resources 1.0 (published by W3C) is a standard designed to provide a core vocabulary for metadata about media resources such as images, audio, and video.

5.1 Comparison of Media Ontology 1.0 with My Vocabulary

While Media Ontology focuses on standardizing metadata for media files, my vocabulary extends the scope to modern concepts such as streaming platforms, franchises, and production details. Here's a detailed comparison of similarities, inspirations, and extensions:

- Both ontologies are designed to describe and structure metadata for media content such as movies, TV shows, audio, and images
- The concept of `MediaContent` in my vocabulary is inspired by Media Ontology's `MediaResource`
- Media Ontology defines core metadata fields like `title`, `creator`, `date`, and `genre`, which inspired similar attributes in `MediaContent`
- Both vocabularies include properties to describe media content, such as:
    - Title: In Media Ontology, this is represented as `title`, while in my vocabulary, it is represented as `schema:name`
    - Date: In Media Ontology, this is represented as `date`, while in my vocabulary, it is represented as `schema:datePublished`
    - Genre: Used in both vocabularies to classify media content

Added Value of My Vocabulary

My vocabulary takes the foundational ideas of Media Ontology and extends them in several ways:

- Introduced StreamingPlatform and availableOn to describe where media can be accessed
- Introduced Franchise and includesContent to handle movie universes, spin-offs, and sequels
- My vocabulary differentiates between `starredIn` (actors), `hasDirected/directedBy` (directors), and `producedBy/hasProduced` (production companies). Media Ontology's `creator` property provides general attribution but lacks role specificity
- Introduced Award and wonAward to represent achievements related to media content or individuals
- Includes inverse properties (hasDirected/directedBy, producedBy/hasProduced)

My vocabulary focuses more on movies and TV shows rather than generic media files.

6 Sample Data in Turtle Format

This section provides sample data for the entertainment and media vocabulary in Turtle format. It shows how the main classes (MediaContent, Person, StreamingPlatform, ProductionCompany, Award, Franchise, and Review) are connected. Each class is represented with its key properties and links to other entities.

Summary of Classes in the Sample Data:

- **MediaContent:** Represents movies and TV shows such as Inception, Avatar, and Frozen.
- **Person:** Represents individuals involved in media production, such as Leonardo DiCaprio, Christopher Nolan, and James Cameron.
- **StreamingPlatform:** Represents platforms hosting media content, including Netflix, Hulu, and Disney+.
- **ProductionCompany:** Represents companies like Lightstorm Entertainment and Syncopy that produce media content.
- **Award:** Represents accolades given to individuals or media content, such as the Oscar 2010 for Best Actor awarded to Leonardo DiCaprio.
- **Franchise:** Represents collections of related media, such as the Avatar Franchise, which includes Avatar and Avatar 2.
- **Review:** Represents reviews and feedback for media content, such as critic and user reviews.

Here's how the vocabulary works with real-world examples. Movies are represented as `MediaContent`, people like directors as `Person`, and platforms like Netflix and Disney+ as `StreamingPlatform`. The sample data also links movies to awards, production companies, and franchises, showing how everything in the entertainment industry is interconnected.

MediaContent Class

```
### Media Content
em:Inception a em:MediaContent ;
    schema:name "Inception" ;
    schema:datePublished "2010-07-16"^^xsd:date ;
    schema:genre "Science Fiction" ;
    em:directedBy em:Nolan ;
    em:availableOn em:Netflix ;
    em:producedBy em:WarnerBros .
```

```
em:Avatar a em:MediaContent ;
    schema:name "Avatar" ;
    schema:datePublished "2009-12-18"^^xsd:date ;
    schema:genre "Adventure" ;
    em:directedBy em:Cameron ;
    em:availableOn em:DisneyPlus ;
    em:producedBy em:Lightstorm .

em:Frozen a em:MediaContent ;
    schema:name "Frozen" ;
    schema:datePublished "2013-11-27"^^xsd:date ;
    schema:genre "Animation" ;
    em:directedBy em:Buck ;
    em:availableOn em:DisneyPlus ;
    em:producedBy em:DisneyAnimationStudios .

em:JurassicPark a em:MediaContent ;
    schema:name "Jurassic Park" ;
    schema:datePublished "1993-06-11"^^xsd:date ;
    schema:genre "Adventure" ;
    em:directedBy em:Spielberg ;
    em:availableOn em:PrimeVideo ;
    em:producedBy em:Amblin .

em:BlackPanther a em:MediaContent ;
    schema:name "Black Panther" ;
    schema:datePublished "2018-02-16"^^xsd:date ;
    schema:genre "Action" ;
    em:directedBy em:Coogler ;
    em:availableOn em:DisneyPlus ;
    em:producedBy em:MarvelStudios .

em:Moana a em:MediaContent ;
    schema:name "Moana" ;
    schema:datePublished "2016-11-23"^^xsd:date ;
    schema:genre "Animation" ;
    em:directedBy em:Clements ;
    em:availableOn em:DisneyPlus ;
    em:producedBy em:DisneyAnimationStudios .

em:StarWars a em:MediaContent ;
    schema:name "Star Wars: A New Hope" ;
    schema:datePublished "1977-05-25"^^xsd:date ;
    schema:genre "Science Fiction" ;
    em:directedBy em:Lucas ;
    em:availableOn em:DisneyPlus ;
    em:producedBy em:Lucasfilm .
```

```
em:Coco a em:MediaContent ;
    schema:name "Coco" ;
    schema:datePublished "2017-11-22"^^xsd:date ;
    schema:genre "Animation" ;
    em:directedBy em:Unkrich ;
    em:availableOn em:DisneyPlus ;
    em:producedBy em:Pixar .
```

Person Class

```
### Persons
em:Nolan a em:Person ;
    schema:name "Christopher Nolan" ;
    em:starredIn em:Inception, em:Interstellar, em:Tenet .

em:DiCaprio a em:Person ;
    schema:name "Leonardo DiCaprio" ;
    em:starredIn em:Inception ;
    em:wonAward em:Oscar2010 .

em:Cameron a em:Person ;
    schema:name "James Cameron" ;
    em:hasDirected em:Avatar .

em:Buck a em:Person ;
    schema:name "Chris Buck" ;
    em:hasDirected em:Frozen .

em:Spielberg a em:Person ;
    schema:name "Steven Spielberg" ;
    em:hasDirected em:JurassicPark .

em:Coogler a em:Person ;
    schema:name "Ryan Coogler" ;
    em:hasDirected em:BlackPanther .

em:Lucas a em:Person ;
    schema:name "George Lucas" ;
    em:hasDirected em:StarWars .

em:Clements a em:Person ;
    schema:name "Ron Clements" ;
    em:hasDirected em:Moana .

em:Unkrich a em:Person ;
    schema:name "Lee Unkrich" ;
    em:hasDirected em:Coco .
```

StreamingPlatform Class

```
### Streaming Platforms
em:Netflix a em:StreamingPlatform ;
    schema:name "Netflix" .

em:DisneyPlus a em:StreamingPlatform ;
    schema:name "Disney+" .

em:PrimeVideo a em:StreamingPlatform ;
    schema:name "Prime Video" .
```

Award Class

```
### Awards
em:Oscar2020 a em:Award ;
    schema:name "Oscar 2020" ;
    em:wonAward em:Inception .

em:GoldenGlobe2021 a em:Award ;
    schema:name "Golden Globe 2021" ;
    em:wonAward em:Avatar .

em:BAFTA2022 a em:Award ;
    schema:name "BAFTA 2022" ;
    em:wonAward em:BlackPanther .

em:AcademyAward1994 a em:Award ;
    schema:name "Academy Award 1994" ;
    em:wonAward em:JurassicPark .

em:GoldenGlobe2017 a em:Award ;
    schema:name "Golden Globe 2017" ;
    em:wonAward em:Moana .

em:Oscar2010 a em:Award ;
    schema:name "Oscar 2010" ;
    em:wonAward em:DiCaprio .
```

Franchise Class

```
### Franchises
em:AvatarFranchise a em:Franchise ;
    schema:name "Avatar Franchise" ;
    em:includesContent em:Avatar, em:Avatar2 .

em:JurassicFranchise a em:Franchise ;
    schema:name "Jurassic Franchise" ;
    em:includesContent em:JurassicPark, em:JurassicWorld .

em:StarWarsFranchise a em:Franchise ;
    schema:name "Star Wars Franchise" ;
    em:includesContent em:StarWars .

em:FrozenFranchise a em:Franchise ;
    schema:name "Frozen Franchise" ;
    em:includesContent em:Frozen .
```

ProductionCompany Class

```
### Production Companies
em:Lightstorm a em:ProductionCompany ;
    schema:name "Lightstorm Entertainment" ;
    em:hasProduced em:Avatar .

em:Amblin a em:ProductionCompany ;
    schema:name "Amblin Entertainment" ;
    em:hasProduced em:JurassicPark .

em:MarvelStudios a em:ProductionCompany ;
    schema:name "Marvel Studios" ;
    em:hasProduced em:BlackPanther .

em:Pixar a em:ProductionCompany ;
    schema:name "Pixar Animation Studios" ;
    em:hasProduced em:Coco .

em:Lucasfilm a em:ProductionCompany ;
    schema:name "Lucasfilm Ltd." ;
    em:hasProduced em:StarWars .

em:DisneyAnimationStudios a em:ProductionCompany ;
    schema:name "Walt Disney Animation Studios" ;
    em:hasProduced em:Frozen, em:Moana .

em:WarnerBros a em:ProductionCompany ;
    schema:name "Warner Bros. Pictures" ;
    em:hasProduced em:Inception .
```

Review Class

```
### Reviews
em:Review1 a em:Review ;
    schema:name "Top Critic Review" ;
    em:reviewedBy em:Avatar ;
    schema:reviewBody "An amazing visual experience!" .

em:Review2 a em:Review ;
    schema:name "User Review" ;
    em:reviewedBy em:Inception ;
    schema:reviewBody "A mind-bending masterpiece." .

em:Review3 a em:Review ;
    schema:name "Critic Review" ;
    em:reviewedBy em:JurassicPark ;
    schema:reviewBody "A thrilling adventure with groundbreaking effects." .

em:Review4 a em:Review ;
    schema:name "Audience Review" ;
    em:reviewedBy em:Moana ;
    schema:reviewBody "Heartwarming and beautifully animated." .

em:Review5 a em:Review ;
    schema:name "Expert Review" ;
    em:reviewedBy em:Coco ;
    schema:reviewBody "An emotional journey with stunning visuals." .
```

7 SPARQL Queries

This section includes SPARQL queries that show how the entertainment and media vocabulary can be used in practice. These queries demonstrate how to retrieve information from the RDF dataset, such as details about movies, awards, production companies, and streaming platforms.

1. **Movies and their directors**
   Lists all movies and their directors, showing how `MediaContent` is linked to `Person` through `em:directedBy`.

```
SELECT ?movieName ?directorName
WHERE {
    ?movie a em:MediaContent ;
           schema:name ?movieName ;
           em:directedBy ?director .
    ?director schema:name ?directorName .
}
```

2. **Streaming platforms hosting movies**
   Finds all movies and the platforms where they are available, using `em:availableOn` to connect `MediaContent` and `StreamingPlatform`.

```
SELECT ?movieName ?platformName
WHERE {
    ?movie a em:MediaContent ;
           schema:name ?movieName ;
           em:availableOn ?platform .
    ?platform schema:name ?platformName .
}
```

3. **Movies by genre**
   Retrieves movies of a specific genre, like "Science Fiction," using `schema:genre`.

```
SELECT ?movieName
WHERE {
    ?movie a em:MediaContent ;
           schema:name ?movieName ;
           schema:genre "Science Fiction" .
}
```

4. **Awards won by movies**
   Lists awards won by movies, connecting `Award` and `MediaContent` through `em:wonAward`.

```
SELECT ?movieName ?awardName
WHERE {
    ?award a em:Award ;
           schema:name ?awardName ;
           em:wonAward ?movie .
    ?movie schema:name ?movieName .
}
```

5. **Reviews for a movie**
   Retrieves reviews for a specific movie, such as Avatar, showing the link between `Review` and `MediaContent` using `em:reviewedBy`.

```
SELECT ?reviewName ?reviewBody
WHERE {
    ?review a em:Review ;
            schema:name ?reviewName ;
            schema:reviewBody ?reviewBody ;
            em:reviewedBy em:Avatar .
}
```

6. **Movies on a platform**
   Lists all movies available on a specific platform, like Disney+, using `em:availableOn`.

```
SELECT ?movieName
WHERE {
    ?movie a em:MediaContent ;
           schema:name ?movieName ;
           em:availableOn em:DisneyPlus .
}
```

7. **Movie directors**
   Retrieves all directors of movies by linking `Person` and `MediaContent` with `em:directedBy`.

```
SELECT ?directorName
WHERE {
    ?movie a em:MediaContent ;
           em:directedBy ?director .
    ?director schema:name ?directorName .
}
```

8. **Franchises and their content**
   Lists franchises and the movies or TV shows they include, using `em:includesContent`.

```
SELECT ?franchiseName ?contentName
WHERE {
    ?franchise a em:Franchise ;
               schema:name ?franchiseName ;
               em:includesContent ?content .
    ?content schema:name ?contentName .
}
```

9. **Awards for a person**
   Shows awards won by a specific person, like Leonardo DiCaprio, using `em:wonAward`.

```
SELECT ?awardName
WHERE {
    ?award a em:Award ;
           schema:name ?awardName ;
           em:wonAward ?person .
    ?person schema:name "Leonardo DiCaprio" .
}
```

10. **Movies released after a date**
    Finds movies released after a specific date by filtering `schema:datePublished`.

```
SELECT ?movieName ?releaseDate
WHERE {
    ?movie a em:MediaContent ;
           schema:name ?movieName ;
           schema:datePublished ?releaseDate .
    FILTER(?releaseDate > "2010-01-01"^^xsd:date)
}
```

11. **Movies per genre**
    Counts how many movies belong to each genre, grouping results by `schema:genre`.

```
SELECT ?genre (COUNT(?movie) AS ?movieCount)
WHERE {
    ?movie a em:MediaContent ;
           schema:genre ?genre .
}
GROUP BY ?genre
```

12. Production companies and their movies

Lists production companies and the movies they've produced, using `em:hasProduced`.

```
SELECT ?companyName ?movieName
WHERE {
    ?company a em:ProductionCompany ;
             schema:name ?companyName ;
             em:hasProduced ?movie .
    ?movie schema:name ?movieName .
}
```

Conclusion

This project showcases the design and use of a custom semantic vocabulary tailored for the entertainment and media industry. By following RDF/OWL standards and incorporating established ontologies like schema.org, it provides a solid framework for organizing and querying entertainment-related data. The sample data and SPARQL queries demonstrate its practical value, showing how semantic technologies can enhance data management and make systems more interoperable in the media world.

Creating this vocabulary was important because existing general-purpose ontologies, like schema.org, don't fully capture the unique relationships and details of the entertainment industry. Media content involves complex connections—actors starring in films, franchises linking multiple works, streaming platforms hosting content, and awards recognizing achievements. These complexities require a specialized structure to represent the data accurately.

Working on this vocabulary has been a great learning experience for me. It's fascinating to see how semantic technologies can simplify complex data and make it easier to work with. This project has not only helped me understand the potential of these tools but also how they can make a real difference in industries like entertainment.

Sources

Ontology for Media Resources 1.0, [no date]. Online. Available from: https://www.w3.org/TR/mediaont-10/ [Accessed 29 January 2025].

Schema.org - Schema.org, [no date]. Online. Available from: https://schema.org/ [Accessed 29 January 2025].

ANTLR. (n.d.). ANTLR (Another Tool for Language Recognition), [no date]. Online. Available from: https://www.antlr.org [Accessed 29 January 2025].

RDF Grapher. Linked Data Finland, [no date]. Online. Available at: https://www.ldf.fi/service/rdf-grapher https://www.antlr.org [Accessed 29 January 2025].