

GSAW 2023 Tutorial I:

Modeling Information with the Common Core Ontologies

Overview:

The Common Core Ontologies (CCO) are a set of mid-level ontologies based upon Basic Formal Ontology (BFO). BFO is an ISO standard top-level ontology used by hundreds of domain ontologies. The CCO are currently in process of becoming an IEEE standard mid-level ontology and are the presumptive choice for mid-level ontologies by the Defense and Intelligence Ontology Working Group.

The CCO comprises over 1400 classes and 200 object properties and this complexity can lead to data being mapped in different ways by different users. This tutorial will present patterns of expression that simplify the use of the CCO leading to more consistent conversions of data that in turn lead to improved precision and recall of queries, more accurate analytic results and better machine learning models.

The tutorial will follow this outline:

1. Basic Formal Ontology – a wireframe view (15 minutes)
2. The CCO Information Model (20 minutes)
 - a. Directives
 - i. Artifact Designs – artifacts as designed including both artifact models and families of such models
 - ii. Plans – planned processes
 - iii. Action Regulations – organizational charts
 - iv. Information Structural Specifications – structure and format of information artifacts
 - b. Descriptives
 - i. Measurements – timestamped measurements
 - c. Designatives
 - i. Identifiers – working with IDs having multiple bearers
 - d. Provenance and Pedigree
3. Immaterial Entities (15 minutes)
 - a. Sites – what sites cannot do
 - b. Tracks – managing scale
4. Material Entities (15 minutes)
 - a. Material Entity – States
 - b. Material Artifacts – Classifying subtypes
 - c. Objects vs. Object Aggregates
5. Specifically Dependent Continuants (15 minutes)
 - a. Artifact Functions – primary vs secondary
 - b. Roles – vs. States
6. Processes (20 minutes)
 - a. Phases
 - b. Subprocess – an agent's part
 - c. Spatiotemporal Regions – vs. Temporal Regions and Spatial Regions
7. Creating a Knowledge Graph (40 minutes)
 - a. Overview of R2RML
 - b. Overview of Data Source
 - c. Examples of Mappings
 - d. Ingest into Graph Database
8. Interrogating the Knowledge Graph (10 minutes)

Instructor: Ron Rudnicki, CUBRC Inc

Biography:

Mr. Rudnicki is lead ontologist at CUBRC, Inc. He is the principal designer of a set of ontologies called the Common Core Ontologies (CCO). Originally developed during the Knowledge Discovery and Dissemination Program of IARPA's Office of Incisive Analysis the CCO have been extended to cover domains including the space missions, cyber, manufacture of homemade explosives, video annotation, force tracking, sensor assignment to missions, undersea warfare, mission assurance and portions of life-cycle product management. Prior to his work at CUBRC, Mr. Rudnicki was employed at the University at Buffalo's Ontology Research Group (ORG) as the lead ontologist in developing a command and control ontology for CECOM's Army Net-Centric Data Strategy Center of Excellence. Also while at the ORG he conducted research on the Referent Tracking System, a leading edge semantic web application. Before his work in ontology, Mr. Rudnicki was a database developer in industry, including work on the design and development of a data warehouse for Gartner's IT Benchmarking Group. Mr. Rudnicki has taught courses at the University at Buffalo on Ontology Engineering and at Buffalo State College on Database Programming and Data Analytics.

Description of Intended Students and Prerequisites:

The intended audience of the tutorial is data scientists, ontologists, and knowledge graph developers. Audience members should have a working knowledge of the Web Ontology Language (OWL) and its use in developing ontologies. Audience members should also be cognizant of a use case in which large-scale integration of information would serve as a part of a solution.

What can Attendees Expect to Learn:

Attendees will learn:

- patterns of expression of events, locations, organizations, artifacts (as designed and as built), information (plans, measurements, identifiers), and attributes (qualities, roles and functions) from the Common Core Ontologies
- how to use these patterns as targets of mappings from structured data sources to CCO based rdf statements