

# **JOWO 2016**

## The Joint Ontology Workshops Episode 2—The French Summer

CAOS | ONTO.COM | NSWOW | WOMOCO  
Ontology Competition | Demos | Early Career Symposium

held at the

9th International Conference on Formal Ontology in  
Information Systems—FOIS 2016  
July 6–9, 2016

Annecy, France

<http://iaoa.org/jowo/>

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# PREFACE

## **JOWO – The Joint Ontology Workshops**

JOWO 2016—Episode II: The French Summer, was the second edition of the ‘The Joint Ontology Workshops’, which comprised a confederation of four ontology workshops and moreover 3 FOIS satellite events. It was hosted by the 9th International Conference on Formal Ontology in Information Systems – FOIS 2016, held between July 6–9, 2016, in Annecy, France.<sup>1</sup> JOWO’s mission is to join forces of the diverse communities interested in building, reasoning with, and applying formalised ontologies in the wide spectrum of Information Systems, Artificial Intelligence, Philosophy, Linguistics and Cognitive Science, both in theory and applications.

The present edition of JOWO 2016 collocated workshops that cover a broad spectrum of contemporary ontology research focusing on cognition (CAOS), modularity and context (WOMoCoE), new standards (NSWO) and foundational ontologies (Onto.Com). **JOWO** included

**CAOS** 1st International Workshop on Cognition and Ontologies<sup>2</sup>

**Onto.Com** 4th International Workshop on Ontologies and Conceptual Modeling<sup>3</sup>

**NSWO** New Standards for the Working Ontologist: Common Logic and DOL<sup>4</sup>

**WOMoCoE** Workshop on Ontology Modularity, Contextuality, and Evolution<sup>5</sup>

A more detailed description of these workshops can be found below. For Onto.Com 2016, we include a summary of the workshop program in the proceedings.

The JOWO 2016 proceedings also include the results of the three major FOIS 2016 satellite events, namely:<sup>6</sup>

### **FOIS 2016 Ontology Competition**

### **FOIS 2016 Demo Track**

### **FOIS 2016 Early Career Symposium**

Brief description of these satellite events can also be found below, and corresponding papers are documented in the JOWO proceedings.

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<sup>1</sup>The first JOWO edition was ‘Episode 1: The Argentine Winter of Ontology’, held in Buenos Aires in co-location with the 24th International Joint Conference on Artificial Intelligence—IJCAI 2015. The proceedings of JOWO 2015 appeared as volume 1517 of CEUR, see <http://ceur-ws.org/Vol-1517/>

<sup>2</sup>See <http://caos.inf.unibz.it>

<sup>3</sup>See <http://www.mis.ugent.be/ontocom2016/>

<sup>4</sup>See <http://nswo.inf.unibz.it>

<sup>5</sup>See <http://www.iaoa.org/womocoe/2016/>

<sup>6</sup>See <http://iaoa.org/fois2016/index.php?n=Main.SatelliteActivities>

# Workshops

## **Workshop on Cognition and Ontologies (CAOS)**

Ontology and cognition are closely intertwined: By virtue of the nature of ontologists as cognising beings, by the use of ontologies in cognitive models as possible structuring foundations, by the (debated) grounding of ontology in cognition, etc. Building on these many connections the 1st International Workshop on Cognition and Ontologies (CAOS) 2016 addresses the difficult and topical question how key cognitive phenomena and concepts (and the involved terminology) that can be found across language, psychology and reasoning, can be formally and ontologically understood and analysed. It moreover seeks to identify and assess ways in which such formalisations and ontological analysis can be exploited in Artificial Intelligence and information systems in general.

Against this conceptual backdrop, the goal of CAOS is to provide a forum for researchers coming from a range of different perspectives and disciplines who are interested in jointly investigating the outlined questions further. Contributed papers on topics related to the ontology of hypothesised building blocks of cognition (such as, for instance, image schemas, affordances, and related notions) and of cognitive capacities (such as, for instance, concept invention) form the basis of discussion, complemented by keynote lectures from renowned experts in ontology and cognition.

The diversity (and current relevance) of the addressed questions also becomes clear from the following (non-exhaustive) list of general areas of interest covered by the workshop:

1. Formal/ontological approaches:
  - Ontologies of cognitive phenomena
  - Formal representation of cognitive structures/functions/processes
  - Formalisation of language, image schemas and/or affordance
2. Cognition and language:
  - Embodied cognition
  - Embodied language acquisition
  - Concept invention
  - Cognitive development from an ontological perspective
  - Cognitive development of image schemas/affordances
  - Image schemas in natural language
  - Relationship between image schemas, metaphors and affordances
3. Artificial intelligence and applications:
  - Artificial language understanding
  - Image schemas/affordances in artificial intelligence
  - Natural language applications/system-demonstrations
  - Cognitively-adequate interaction modalities and interfaces for intelligent systems
  - Embodied approaches to knowledge acquisition in AI and Robotics

- Concept invention and concept-based computational creativity
- Embodied approaches to computational creativity

In sum, we hope that CAOS will serve as first event in a series of meetings and exchanges working towards the integration between ontology and cognition as areas of academic study, but also as applied disciplines with direct relevance for industry and end-users. The workshop program gives evidence of this breadth of ambition: Dagmar Gromann and Maria M. Hedblom work towards simplifying complex financial concepts by identifying movement structures from the image schema PATH-following, Fahim Imam and Thomas Dean study the potential role of affordances in the representation of the behaviour of event-based systems, Miroslav Vacura and Vojtěch Svátek develop a deontic cognitive event ontology, and Marco Schorlemmer, Roberto Confalonieri and Enric Plaza present a category-theoretic approach to formally modeling the Buddhist Monk concept blend using the Yoneda lemma. Moreover—in addition to the joint JOWO keynote lectures by Gem Stapleton, Brandon Bennett, and Jérôme Euzenat—Olivier Georjeon served as CAOS keynote speaker and reported on his work in developmental robotics designing algorithms for artificial agents to perform Whiteheadian abstraction.

#### **International Workshop on Ontologies and Conceptual Modeling (Onto.Com)**

The theme of the 4th International Workshop on Ontologies and Conceptual Modeling is foundational ontologies and their meta-ontological choices. Expert representatives of major foundational ontologies have been invited to discuss and compare their meta-ontological choices within the context of a common case study. The workshop is aimed at exploring the ways in which different meta-ontological choices impact conceptual modelling in information systems. A more detailed description of the program of this event can be found in the proceedings.

#### **New Standards for the Working Ontologist: Common Logic and DOL (NSWO)**

NSWO 2016 consisted of two tutorials on two new standards in the realm of applied ontology: the second revision of Common Logic (CL) and the new Distributed Ontology, Model, and Specification Language (DOL).

CL is a family of first-order logic-like languages, which share a common semantics. The CL tutorial, held by Fabian Neuhaus, introduced the abstract syntax and the semantics of CL and discussed the changes and added features of the upcoming revision.

DOL is a meta-language that supports the reuse and modification of ontologies as well as the declaration of relationships between ontologies (e.g., alignments and refinements). The DOL tutorial, held by Till Mossakowski, covered the main motivations behind developing DOL and discussed how DOL may be used to address a number of modelling and interoperability problems.

## Workshop on Ontology Modularity, Contextuality, and Evolution (WOMoCoE)

In actual applications, it is impractical to treat knowledge as a monolithic and unchanging structure. Partitioning knowledge into modular structures is central to organize optimal knowledge repositories: from their design, to their management, from their maintenance to their use for knowledge sharing. Understanding, representing and reasoning about the context of the different knowledge sources is essential for their correct exploitation and for reliable and effective reasoning in changing situations. The correct acquisition of new knowledge, the evolution of underlying ontologies and the updates in knowledge sources are important factors that influence the quality of stored knowledge over time.

The International Workshop on Ontology Modularity, Contextuality, and Evolution (WOMoCoE 2016) built on the success of the previous editions of the WoMO and ARCOE-Logic workshop series. It offered the ground to practitioners and researchers to discuss current work on theoretical and practical aspects on the topics of modularity, contextuality, and evolution of ontologies and knowledge resources. The aim was to bring together an interdisciplinary crowd of researchers from various areas of AI and knowledge representation, semantic web, linked data knowledge engineering and application domains as well as from domains like philosophy, logic, cognitive science, and linguistics.

The call for papers was open to any aspect of modularity, contextuality and evolution, and explicitly listed the following topics:

- **Theoretical and formal aspects of modularity and context:** module and context acquisition, representation and interpretation, philosophical and cognitive aspects of modularity;
- **Modules and context in applications:** knowledge integration using context, contextual search and information retrieval, modelling for context of agents, tools and methodologies for handling context, role of modularity in applications;
- **Modules and context in reasoning:** effective methods of reasoning over modules, exploiting contextual information in reasoning, distributed and incremental evaluation of contexts, modularity and explanations;
- **Modules and context in ontologies:** ontologies and models of context, ontology modules in ontology engineering, representing context in Semantic Web standards, application of context on Linked Data, visualization of modules;
- **Evolution and versioning of knowledge resources.**

The accepted contributions were both from the theoretical and application side. In the first paper Werner Ceusters and Jonathan P. Bona studied the representation of SNOMED CT concepts evolution using Information Artifact Ontology and Process Profiles. Bahar Aameri, Michael Gruninger and Carmen Chui in their paper discussed properties of residues (subtheories that are not contained in any proper module of the theory) and their role in ontology modularization. The paper by Robert John Rovetto presented different ontology architecture options for space data and space domain modeling needs. Paula Chocron and Marco Schorlemmer considered specifications of interlocutors interaction as ontology contexts. In another paper, Ivars Blums and Hans Weigand provided an ontological model for the domain of Accounting Information Systems. Finally, the paper by Jieying Chen, Michel Ludwig and Dirk Walther presented an algorithm for the computation of modules that are minimal with respect to subsumption in  $\mathcal{EL}$ .

## FOIS 2016 Satellite Events

### **FOIS 2016 Ontology Competition**

The FOIS Ontology Competitions are intended to recognize high-quality ontologies and to encourage the spread of best practices in the ontology community.

The topic of the 2016 Ontology Competition was “Representing Change in Ontologies”. Applied ontologies often need to represent information about changing situations: e.g., cells are parts of different body parts during different stages of the development of an animal, objects gain new parts and capabilities while they are processed in a factory, associations gain and lose members and the members change their social roles and relationships. Representing change often requires difficult design decisions; in particular if the ontology is written in a language like OWL, which only supports unary and binary predicates. The goal of the competition was to highlight the different approaches that are available in representing change, and compare the advantages and disadvantages.

The three finalists of the competition are included in the proceedings. The winner of the competition was the paper “Permanent Generic Relatedness and Silent Change” by Niels Grewe, Ludger Jansen, and Barry Smith. The runner-up was the paper “General Legal Entity Identifier Ontology” by Robert Trypuz, Dominik Kuziński, and Mirek Sopek. The third finalist was the paper “Spatio-Temporal Ontology for Change Analysis of Flood Affected Areas Using Remote Sensing Images” by Kuldeep R. Kurte and Surya S. Durbha.

### **FOIS 2016 Demo Track**

For the first time in the FOIS conference series, the main track with its focus on research papers has been complemented with a demonstration track. The intended scope of this track includes software and methodologies for the ontology lifecycle as well as ontology-based software, for example, computational environments and prototypes for ontological engineering, advances in applying ontologies, lessons learned, practical ontology projects, and innovative uses of ontology-based and/or ontology engineering techniques.

This first edition of the FOIS demonstration track received four submissions, three of which were accepted, based on their reviews by selected FOIS program committee members. Eugen Kuksa and Till Mossakowski present the ontology repository engine Ontohub, on the basis of which the equally named ontology portal <http://ontohub.org> is run. Ontohub offers sophisticated means for specifying and managing ontologies, such as the support of different logical and ontology languages as well as modular ways of ontology representation. Thereby it conforms to DOL, the Distributed Ontology, Model and Specification Language, standardized by the Object Management Group (OMG).

The other two demonstrations belong to the field of conceptual modeling. The Mentor Editor for ontology-driven conceptual modeling, demonstrated by Joo Moreira et al., is meanwhile a commercial tool that grew out of academic efforts. The software enables the development of well-founded ontologies in the OntoUML

language, grounded in ontological analysis based on the Unified Foundational Ontology (UFO). The demonstration features the system capabilities by showcasing different ontologies authored in the tool, as well as it outlines the process of developing a domain ontology in a case of model-driven engineering. Finally, with Object-Role Modeling (ORM) Francesco Sportellis demonstration of the conceptual modeling tool NORMA (for Natural Object-Role Modeling Architect) exhibits yet another foundation in terms of the representation language. Beyond modeling in NORMA, the demonstration expands on ORMie, the ORM Inference Engine, which accounts for reasoning over ORM conceptual schemas.

Assessing the first FOIS demonstration track altogether, an increase in resonance by authors is clearly desirable for its future editions. Notwithstanding, we believe that the three solid cases of modeling- and ontology-related software are not only valuable for the FOIS audience and thereby constitute an adequate first step in 2016, but furthermore they give rise to the idea that an increase in submissions can be realistically expected.

### **FOIS 2016 Early Career Symposium**

As in the past editions, the 2016 FOIS conference included an Early Career Symposium (ECS), giving starting researchers the opportunity to present their work and engage with senior scientists in their field as well as to meet and discuss their work with each other in a dedicated event. This year the ECS committee accepted five students which were invited to present their work in the ECS. The topics covered areas like software engineering (functional behavior of cross-platform event-driven systems), space environment (orbital space situational awareness and related risks) and linguistics (the role and the classification of questions for human and natural sciences). The co-location of the ECS and the Demo track was useful for the students to see how their work could benefit from existing tool development and related experiences. The ECS organizers are particularly thankful to the researchers that agreed to mentor the students during the conference: Cecilia Zenni-Merk, Robert Hoehndorf and Aldo Gangemi.

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