

# **Ontology Summit 2021**

## **Ontology Generation and Harmonization**

### **First Synthesis Session**

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# Narrative

Ontologies are increasingly being **generated** rather than being manually built. As a result, ontologies are proliferating, producing a **landscape** of many types for many purposes. The large variety of ontologies has made it difficult to communicate about them and between them. There is a need for **harmonization**. It isn't enough to construct ontologies, they must be **sustained**.

# Neuro-Symbolic Learning Ontologies

- There are significant benefits for tighter integration of neural and symbolic paradigms, but how can it be done?
- There are different roles that the neuro and symbolic models could perform in a system: A landscape is emerging. (Kautz)
  - Generation of ontologies by machine learning techniques (Sriram)
  - Using ontologies to develop better neural network models (Sriram)
  - Symbiosis of neural networks and ontologies (Sriram)

# Neuro-Symbolic Symbiosis

- Various connectionist modal/temporal models (Lamb)
- RDFS reasoning using memory networks (Hitzler)
- Generative RDFS reasoning using pointer networks (Hitzler)
- Completion reasoning emulation for the description logic EL+ (Hitzler)
- Logic Tensor Networks for first-order predicate logic (Hitzler)

# Neuro-Symbolic Symbiosis

- Ontology from graph signal processing (Majumdar)
- Cognitive Memory (Sowa)
- Modularity is suitable to knowledge extraction, which can result in the development of effective knowledge extraction methods towards explainable AI. (Lamb)

# The Ontological Landscape

- Ontologies are for communication of many kinds (Schneider)
- The interface between the business language and the technical language is fundamental to ontology development (Bennett, Woods)
- Dialogue is an essential requirement for communication (Sowa)
- There are 4 main 'types' of ontologies (Schneider)
- However, the landscape has many dimensions and aspects (Schneider, Bennett)

# Ontological Landscape Dimensions

- Truth makers and data surrogates (Bennett)
- Another dimension: from Ontology to ontology (pluralistic attitude toward "reality") (Masolo)
- Yet another dimension: From Logic to logic (different forms of reasoning) (Masolo)
- Manage ontologies by modularization (Masolo)
- What is "ontological commitment"?

# Definitions

- Notion of a definition (Berg-Cross, Seppälä)
- Writing a good definition requires training and experience (Berg-Cross, Seppälä)
- Even for well understood domains, the results of manual classification tasks are highly inconsistent (Westerinen)
- Examples from the earth sciences (Buttigieg)

# Definitions

- Creating definitions is a collaborative effort within and between communities (Blumberg)
- Events and narratives can be an effective means for communication (Westerinen)
- The interface between the business (natural) language and the technical language (FOL) helps human-machine communication (Woods)

# Synthesis

- Synthesizing all of this will be hard!
- We still have 7 more sessions.
- It is time to start the discussion.