

How the Semantic Web revolutionizes the Science

This concise summary aims to elucidate the progressively influential role of the Semantic Web within the realm of scientific pursuits.

1) Semantic Web Technology Index

"Semantic web (SW) technology has been widely applied to many domains such as medicine, health care, finance, geology." ([nature scientific reports](#), 07 March 2022)

2) Ontologies in agriculture

[CGIAR](#) (Consultative Group for International Agricultural Research) is a global partnership that unites international organizations engaged in research about food security. CGIAR [recommends](#) to use 21 different ontologies to annotate agrifood data:

Agronomy Ontology, Anatomical Entity Ontology, Animal Trait Ontology, Aquaculture Ontology, BRENDA tissues and enzyme Ontology, Cell Ontology, ChEBI Ontology, Compositional Dietary Nutrition Ontology, Crop Ontology, Environment Ontology, EPPO Ontology, Food Ontology, Gene Ontology, Mycobank Ontology, NCBI Taxonomy Ontology, Phenotype and Trait Ontology, Plant Ontology, Plant Experimental Conditions Ontology, Protein Ontology, SEONT Ontology, Sequence Ontology.

3) Ontologies in Biology

[ChEMBL](#) is a manually curated database of bioactive molecules with drug-like properties. It brings together chemical, bioactivity and genomic data to aid the translation of genomic information into effective new drugs.

[EMBL](#) (European Molecular Biology Laboratory) research topics: Cell Biology and Biophysics, Developmental Biology, Epigenetics and Neurobiology, Genome Biology, Structural and Computational Biology, Tissue Biology and Disease Modelling. EMBL: [Bioinformatics embraces Semantic Web technologies](#).

[EU initiative on Web 4.0](#) and virtual worlds: a head start in the next technological transition (Strasbourg, 11.7.2023)

[PubChem](#) is an open repository for chemical structures, biological activities and biomedical annotations. Semantic Web technologies are emerging as an increasingly important approach to distribute and integrate scientific data. PubChem is the world's largest collection of freely accessible chemical information.

4) Industry

In the context of [Industry 4.0](#), sensors are deployed on factory assets and machines to enable efficient condition monitoring. However, this task is challenging due to the need for integrating and processing heterogeneous data from various sources, characterized by disparate temporal resolutions and underlying semantics.

To address these challenges, ontologies have emerged as a suitable approach for data integration and the representation of manufacturing knowledge in a machine-interpretable manner. By constructing semantic models, ontologies facilitate the structuring of knowledge within knowledge bases, which also encompass instances and associated data.

The [article](#) on ontology-based digital map integration offers a comprehensive exploration into the extensive and profound usability of the Semantic Web, even within niche areas of the industry. It provides valuable insights into the application and impact of Semantic Web technology within a specific domain.

5) **Ontology in physics and mathematics**

This [paper](#) describes the ontology of classical and modern physics against their classical backgrounds and shows how it relates to the ontology of common sense and of mathematics.

6) **Conclusion**

The challenges associated with data access, integration, and management pose significant hurdles to scientific research, which is driven by the necessity of generating timely and cost-effective outcomes such as novel drugs and cures, as well as expanding the frontiers of knowledge.

Through the adoption of Semantic Web technologies, scientists can effectively tackle the ever-expanding volume of data in diverse scientific domains. This, in turn, enables them to derive insightful conclusions that would have otherwise remained inaccessible without the utilization of Semantic Web technology.

