**Semantic Web and Linked Data 2025/26**

**Example knowledge sources and computational tools**

**Core Knowledge Sources (General Linked Open Data)**

|  |  |  |
| --- | --- | --- |
| **Purpose** | **Recommended Source** | **Notes / How to Use** |
| General concepts & entities | **Wikidata**  ([wikidata.org](https://www.wikidata.org/)) | SPARQL endpoint: [query.wikidata.org](https://query.wikidata.org/); use for linking real-world entities (e.g., manufacturers, locations, materials). |
| Structured encyclopedia | **DBpedia** ([dbpedia.org/sparql](https://dbpedia.org/sparql)) | Good for linking to domain-independent resources (countries, companies, components). |
| Multilingual lexical data | **BabelNet**  ([babelnet.org](https://babelnet.org/)) | Multilingual entity and concept alignment. |
| Geography & locations | **GeoNames**  ([geonames.org](https://www.geonames.org/ontology/documentation.html)) | Useful for spatial or geolocation-based data (cities, countries, regions). |
| Sensors & IoT | **W3C SSN/SOSA Ontology** ([spec link](https://www.w3.org/TR/vocab-ssn/)) | Represent sensors, observations, measurements. |
| People / organizations | **FOAF** ([xmlns.com/foaf/spec](http://xmlns.com/foaf/spec/)) | For personal and institutional relationships. |
| Provenance & process tracking | **PROV-O**  ([w3.org/TR/prov-o](https://www.w3.org/TR/prov-o/)) | Represent how data and actions are generated. |
| Product data | **GoodRelations** ([goodrelations-vocabulary.org](http://www.heppnetz.de/projects/goodrelations/)) | E-commerce and product-based ontologies. |

**Domain-Specific Knowledge Sources (by Project Theme)**

|  |  |  |
| --- | --- | --- |
| **Project** | **Relevant Ontologies / Data** | **Typical Use** |
| Manufacturing diagnostics / predictive maintenance | - **SSN/SOSA** – for sensor events  - **MIMOSA** or **ISO 15926** – for industrial asset management  - **QUDT** – for physical quantities & units  - **DOLCE** or **BFO** – for event representation  - **DBpedia/Wikidata** – to enrich machine & component types | Model machine failures, causes, and dependencies; represent event chains; link sensor and log data. |
| Smart city knowledge base | - **GeoSPARQL** – for spatial data  - **SAREF** – smart appliances and energy ontologies  - **OpenStreetMap Linked Data (LinkedGeoData)**  - **SSN/SOSA** | Represent city infrastructure, energy grids, and real-time sensor data. |
| E-commerce / product management | - **GoodRelations**  - **Product Ontology** ([productontology.org](http://www.productontology.org/)) | Represent products, prices, and brands; link to Schema.org. |
| Health / biomedical data | - **FHIR RDF** ([hl7.org/fhir/rdf.html](https://hl7.org/fhir/rdf.html))  - **SNOMED CT**, **UMLS**, **MeSH**  - **BioPortal** ([bioportal.bioontology.org](https://bioportal.bioontology.org/)) | Represent medical terms, records, and sensors; integrate patient data for reasoning. |

**Computational Tools & Platforms**

|  |  |  |
| --- | --- | --- |
| **Category** | **Tool** | **Use** |
| Ontology creation & visualization | **Protégé** (desktop, by Stanford) | Create ontologies (OWL/RDF), visualize graphs, validate constraints (SHACL/SWRL). |
| SPARQL querying | **GraphDB Free**, **Apache Jena Fuseki**, or **Ontotext GraphDB Sandbox** | Local or hosted triplestore for querying your RDF graphs. |
| Data transformation | **OpenRefine + RDF Extension** | Convert CSV/JSON to RDF using templates. |
| Linked Data browsing | **LODE**, **Pubby**, or **Yasgui** ([yasgui.triply.cc](https://yasgui.triply.cc/)) | Explore and test SPARQL endpoints. |
| Reasoning / validation | - **SHACL Playground** ([shacl.org/playground](https://shacl.org/playground))  - **HermiT reasoner** (Protégé plugin) | Validate RDF graphs; infer new facts from defined rules. |
| Visualization | - **WebVOWL** ([visualdataweb.de/webvowl](https://visualdataweb.de/webvowl/))  - **RDF Grapher** (<https://www.ldf.fi/service/rdf-grapher>)  - **Neo4j** | Visualize RDF graphs interactively. |
| Python integration | - rdflib – for RDF parsing and SPARQL queries  - owlready2 – for ontology manipulation  - SPARQLWrapper – for endpoint querying | Automate data ingestion, reasoning, and analysis. |
| Ontology alignment / linking | - LIMES (https://github.com/dice-group/LIMES)  - OpenRefine reconciliation services (<https://openrefine.org/>) | Link your local graph entities to Wikidata/DBpedia. |