

How to Add a User Interface on Top of an External SPARQL Endpoint: Case NOBEL PRIZE SAMPO

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Abstract

This paper discusses and demonstrates how to create an intelligent user interface (UI) on top of an external SPARQL endpoint, when only an open SPARQL API is available. As a case study, the *Nobel Prizes & Laureates* Linked Open Data (LOD) service provided by the Nobel Foundation, and the Sampo-UI framework for faceted search, browsing, and data analyses are considered. To show how this can be done easily, the semantic portal NOBEL PRIZE SAMPO, available online and on GitHub, is described and lessons learned discussed.

Keywords

linked data, user interface, semantic portal, SPARQL

1. Introduction: Adding a User Interface on a SPARQL endpoint

As more and more Linked Open Data (LOD) are published via SPARQL endpoints, the challenge of creating User Interfaces (UI) easily for searching, browsing, and analyzing the LOD has become ever more important. This paper presents lessons learned [1] in applying the Sampo-UI framework [2, 3] to create an UI on top of an external SPARQL endpoint. Key features of the Sampo-UI include: 1) The UI is created in a *declarative fashion* by modifying a set of JSON configuration files [3]. 2) Based on the Sampo model [4], the *data service is completely separated* from the UI design via the SPARQL API only, which makes it possible to create UIs for external endpoints. The UI is adapted to the underlying data model (ontologies) by tweaking SPARQL queries. 3) To facilitate extremely quick prototyping, an *existing “vanilla” Sampo-UI application is used as a starting point* and adapted to the new application by modifying the configuration files and SPARQL queries.

The Sampo-UI framework provides means for configuring dataset access and UI perspective definitions, thus making it conceptually applicable for declarative UI creation over any external knowledge graph that is available in the form of a SPARQL endpoint. The practical application of the Sampo UI framework up to now has been mainly in the development of semantic portals within the Finnish Linked Open Data Infrastructure for Digital Humanities initiative¹ [5, 4], where the UI developers had the possibility of influencing the decisions on the data storage system implementation (e.g., setting up the SPARQL endpoint, choosing the SPARQL engine and additional support tools, such as text search index). The work of this paper demonstrates the possibility of adapting Sampo-UI also for situations when the SPARQL endpoint is available externally and it is only the endpoint access and UI components that can be configured to ensure the functionality of the data portal.

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¹FIN-CLARIAH/DARIAH.fi research infrastructure for Digital Humanities: <https://seco.cs.aalto.fi/projects/fin-clariah/>

As an example, we developed and made available a Sampo-UI based portal on top of the Nobel Prizes SPARQL endpoint² that works with the original Nobel Prizes data maintained by the Nobel Prize Foundation. Experiences are discussed of developing the NOBEL PRIZE SAMPO portal configurations and adjustments to the Sampo-UI environment that have been necessary to enable its application in the externally available data environment.

2. Related Work

Sampo-UI is not the only available tool for building web applications based on SPARQL endpoints. For example, Metaphactory³ [6] is a commercial platform with a wide range of features to curate, visualize, and explore knowledge graphs. Although Metaphactory has powerful features, it is neither open source nor free. An example of a free and open source tool is the Linked Data Reactor (LD-R)⁴ [7]. LD-R provides a starting point for creating a web application that can be configured to view, browse, and edit knowledge graphs. FERASAT [8] is a tool built on top of LD-R to provide faceted search and visualization features.

The Nobel Prizes dataset itself has been the subject of numerous studies and presentations. In addition to the official Nobel Prizes portal⁵ maintained by the Nobel Prize Foundation, a demo portal was created in the Metaphactory environment, as well⁶. The demonstration portal described in this paper differs from the one created by Metaphactory by showing the possibilities of developing the portal based on the original data from the Nobel Prize SPARQL endpoint and on-the-fly integrating the data from other Linked Data resources (as e.g., Wikidata), as well as by relying on a fully open source Sampo-UI framework in its creation. The end users of the portal described in this demo would appreciate also the University perspective not included in other presentations.

3. UI Logic of the Sampo-UI Framework

Sampo-UI aims to create a kind of generic “standard” UI logic model for LOD applications, based on the basic concepts of classes, their properties, and instances in a Knowledge Graph (KG). The landing page of a Sampo portal⁷ based on the Sampo-UI tool⁸ contains a series of *application perspective* windows that allow one to search, browse, and analyze the underlying KG from different perspectives, based on the classes of the KG. A perspective for a class contains a faceted search engine whose facets are based on the properties of the class; by making selections on the facets, a corresponding subset of individuals of the class is retrieved as the search result, and hit counts on the facet categories are updated to guide the search. The result set can then be analyzed on different tabs, e.g., on a map or timeline or using graphs. At any point, an individual can be chosen for a closer look at its *instance page* that provides comprehensive linked data about the individual. Here it is also possible to analyze and visualize data about the individual by using separate tabs.

4. Nobel Prize Sampo: Demonstration

We built the NOBEL PRIZE SAMPO portal over the existing Nobel Prize dataset, using only the SPARQL access to the KG, as well as other Linked data sets, where appropriate. The Nobel Prize dataset schema is visualized in Figure 1 using the data schema presentation service of the ViziQuer tool; cf. [9]. To create

²Nobel Prizes data services: <https://www.nobelprize.org/about/developer-zone-2/>

³Documentation is available at <https://help.metaphacts.com/resource/Help:Documentation>.

⁴The source code of LD-R is available at <https://github.com/ali1k/ld-r>. Unfortunately, LD-R is apparently not currently maintained actively, as at the time of writing in June 2025 the last commit to the repository is from 2022.

⁵Nobel prizes: <https://nobelprize.org>

⁶Welcome to metaphactory: <https://nobelprize.metaphacts.cloud/resource/StartPage>

⁷Sampo portal series: <https://seco.cs.aalto.fi/applications/sampo/>

⁸Code on Github <https://github.com/SemanticComputing/sampo-ui>; project homepage <https://seco.cs.aalto.fi/tools/sampo-ui/>

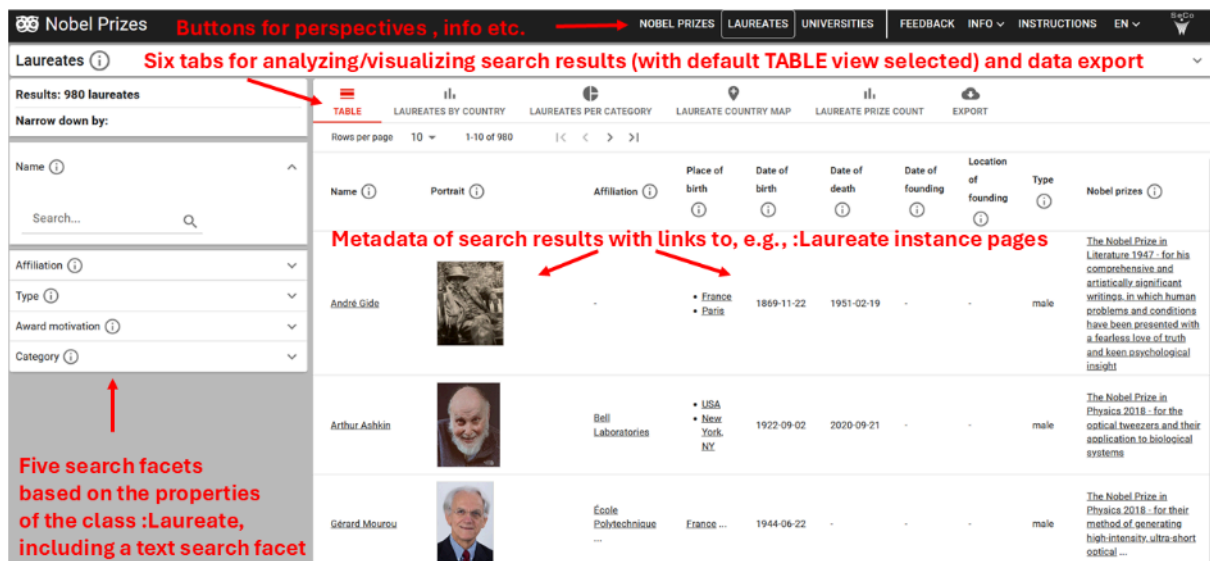


Figure 2: A view of the Laureates perspective in the NOBEL PRIZE SAMPO portal

- addition of universal text search functionality based of REGEX (in addition to the possibility to use FUSEKI JENA indexes when it has been possible to build these)
- handling of null/unknown values in facet value generation, with a recommendation to provide different SPARQL templates for different SPARQL engines serving the data
- introduction of SPARQL query pipeline mechanism (SPARQL query array with the result integration) for view data creation to provide a stable solution for on the fly data integration from multiple SPARQL endpoints (since the federated queries using SPARQL SERVICE clauses did not exhibit stable behaviour)
- addition of the possibility to use OpenStreetMaps¹⁰ for the map view visualization in addition to Mapbox¹¹ that is proprietary and require account creation
- re-arranging of ORDER BY clauses in the SPARQL query templates to widen the scope of SPARQL engines that serve the table data in correct order
- introduce URI encoding to allow correct handling of URIs containing non-ASCII characters

The crucial factor enabling the code adaptation and creation of a fully functional portal has been the open availability of the source code of the Sampo UI system.

Full code adjustments of the Sampo-UI system along with the specific NOBEL PRIZE SAMPO portal configuration are available on GitHub¹² from where a running version of the portal can be set up locally. Since the code adjustments are not particularly tied to handling the Nobel Prize endpoint, they can be reused in building other UI solutions, too. A running and maintained public version of the NOBEL PRIZE SAMPO portal is available online.

6. Conclusions

The Sampo-UI tool has been shown to be usable in creating a user interface on a given external knowledge graph. Furthermore, Sampo-UI has demonstrated the capability to integrate efficiently the

¹⁰: <https://www.openstreetmap.org>

¹¹: <https://www.mapbox.com>

¹²: <https://github.com/LUMII-Syslab/sampo-ui-nobel-prize>

data from various connected linked data sources, such as the Nobel Prize data set and Wikidata, thereby exploiting efficiently the Linked Open Data paradigm of bringing together decentralized enriching information.

The open source availability of the Sampo-UI allows to extend its functionality to meet the needs of a particular application scenario, and the additional configurations and the code created in this demonstration allows both for easy extending or modifying the created NOBEL PRIZE SAMPO portal example, and for reusing the code solutions in other situations of UI creation, including those of creating UIs over existing external SPARQL endpoints. Since Sampo-UI is a system of potential interest for different UI creators, an environment enabling easy integration of updates supplied by different users into it would be relevant and is work in progress as part of the Finnish national research infrastructure initiative FIN-CLARIAH/DARIAH.fi for Digital Humanities.

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