CEDAR's Predictive Data Entry: Easier and Faster Creation of High-quality Metadata

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CEDAR is developing novel methods and tools to annotate biomedical datasets with metadata

High-quality metadata are crucial to finding experimental datasets, to understand how experiments were performed, and to reuse data to conduct new analyses.

Despite the growing set of standards and guidelines, quality of metadata in public repositories continues to be poor. A key difficulty is that **the typical metadata acquisition process is time-consuming and error prone**, with weak or nonexistent support for linking supplied metadata with semantic resources.

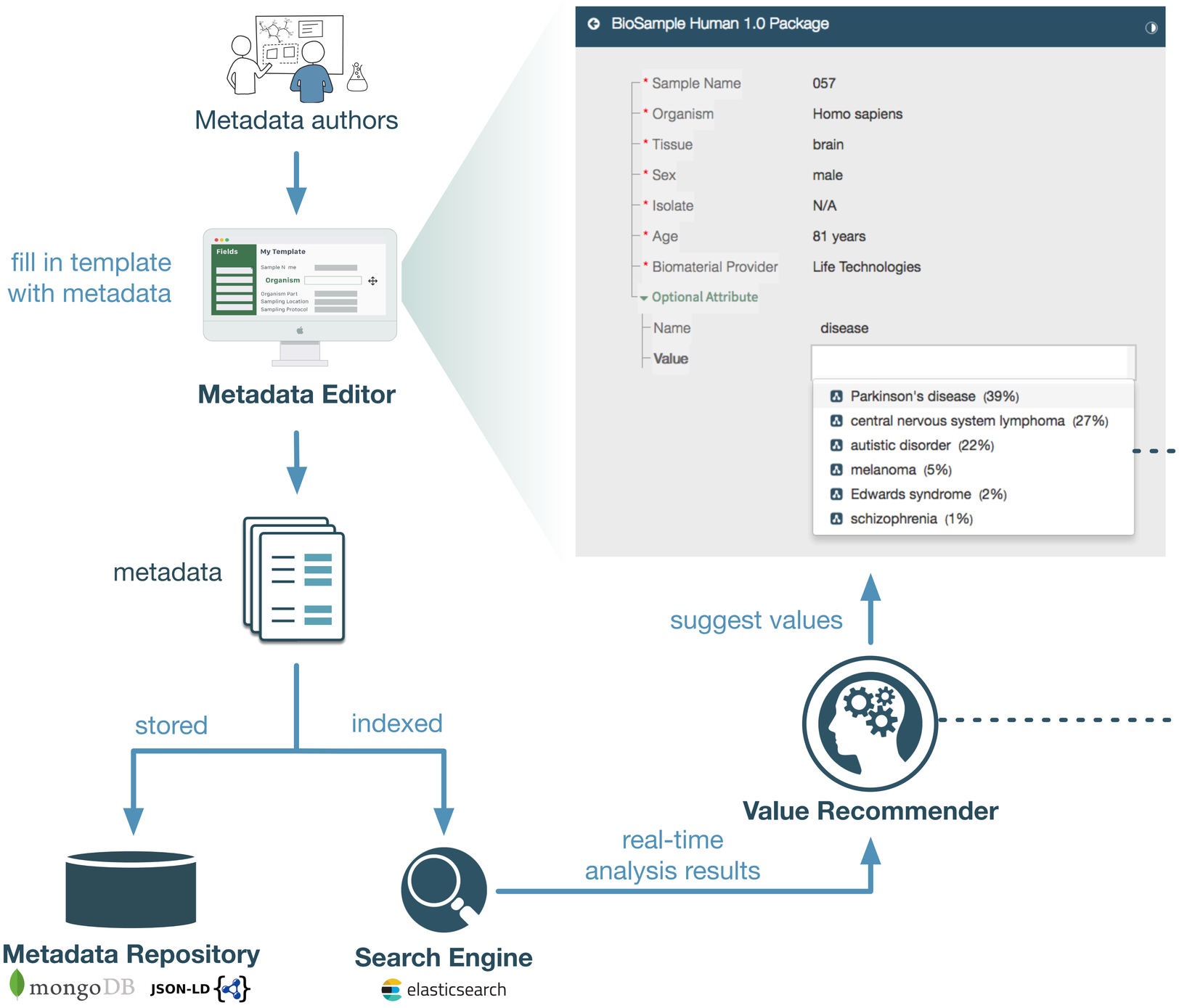
CEDAR is creating a **computational ecosystem for development, evaluation, use, and refinement of biomedical metadata**. Our approach centers on the use of *metadata templates*, which define data elements needed to describe biomedical experiments.

The **CEDAR Workbench** is a set of Web-based tools for the acquisition, storage, search, and reuse of metadata templates. One of those tools is the **Metadata Editor**, which allows users to fill in metadata templates with metadata.

We have enhanced the Metadata Editor with **value recommendation** capabilities.

CEDAR's Value Recommender identifies common patterns in the metadata repository, and generates **real-time suggestions** for filling out metadata templates.

The suggestions provided are context-sensitive, meaning that the values predicted for a particular field are **generated and ranked based on previously entered values.**



The Value Recommender supports both **free-text values** and **controlled terms**. In this particular example, the system suggests terms from the Human Disease Ontology (DOID).

BioSample is a database from the National Center for Biotechnology Information (NCBI) that captures descriptive information about the biological samples investigated in projects.

The 'BioSample Human' template contains the fields used in BioSample for human samples.

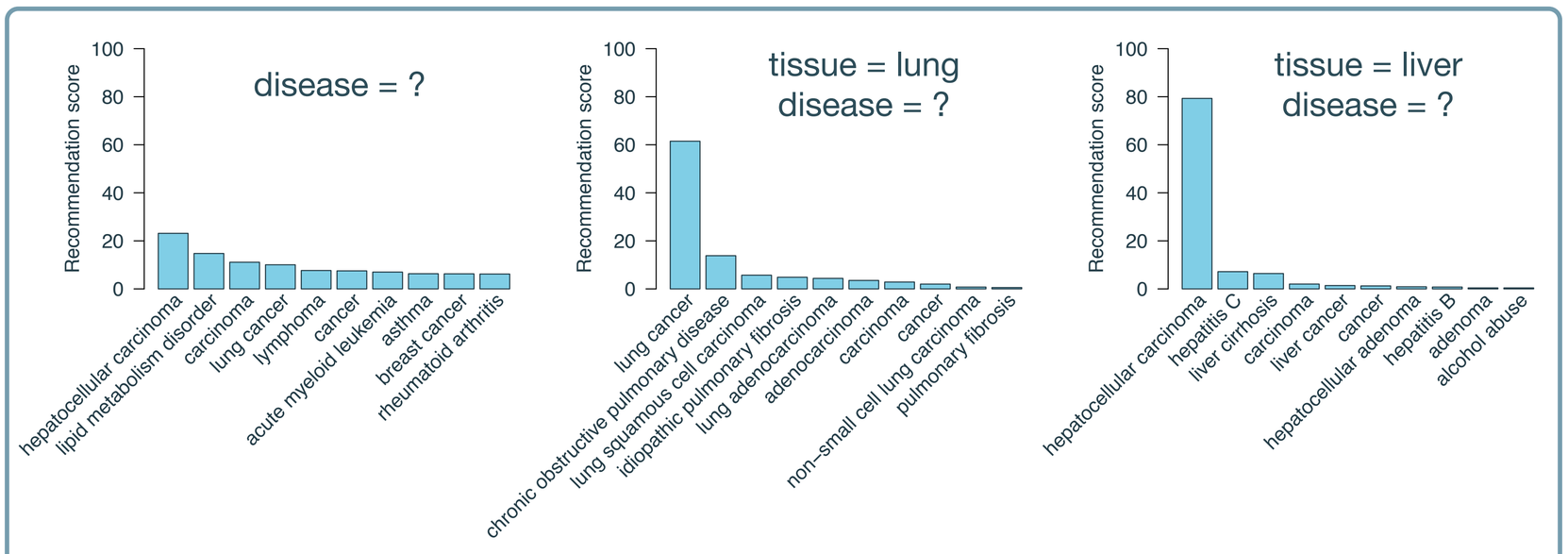
BioPortal — NCBO BioPortal Ontology Repository
> 500 biomedical ontologies, > 7.7M terms

Each suggested value is accompanied by an icon that indicates whether it is a term from an ontology or a free-text value. The relevancy score for each value is presented as a percentage

- ✔ **Decreases authoring time**
- ✔ **Increases metadata quality**
- ✔ **Generates reusable metadata**

CEDAR's value recommendation technology leverages **existing metadata** to make the authoring of **high-quality metadata** a **manageable task.**

The Value Recommender system is **the first of a planned set of intelligent authoring components** in the CEDAR system. Future efforts will concentrate on deeper analyses of metadata to discover more interesting relationships between metadata fields, which will then drive new tools to assist biomedical investigators when annotating their data.



Top 10 suggestions for the 'disease' field of the Biosample Human template. Generated based on over 35K template instances.

CEDAR Workbench: **cedar.metadatacenter.net**

github.com/metadatacenter
facebook.com/metadatacenter
twitter.com/metadatacenter

This work is based on: Panahiazar et al. Context Aware Recommendation Engine for Metadata Submission. First Int Work Capturing Sci Knowl. 2015; 3–7.

metadatacenter.org

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