

ADVANCING SEMANTIC INTEROPERABILITY IN HERITAGE SCIENCE: THE FAIRMAP4ART PROJECT AND THE INFRA-ART SPECTRAL LIBRARY

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» THE INFRA-ART SPECTRAL LIBRARY



The **INFRA-ART Spectral Library** is a **FAIR data service** designed as a digital support tool for heritage research specialists working with spectroscopic techniques. The database has been designed, developed, and optimized over several years, and currently hosts a curated multi-analytical collection of more than 2,000 ATR-FTIR, XRF, Raman, and SWIR reflectance spectra from over 1,000 reference materials commonly found in artworks and archaeological objects.



» PROJECT OUTCOMES

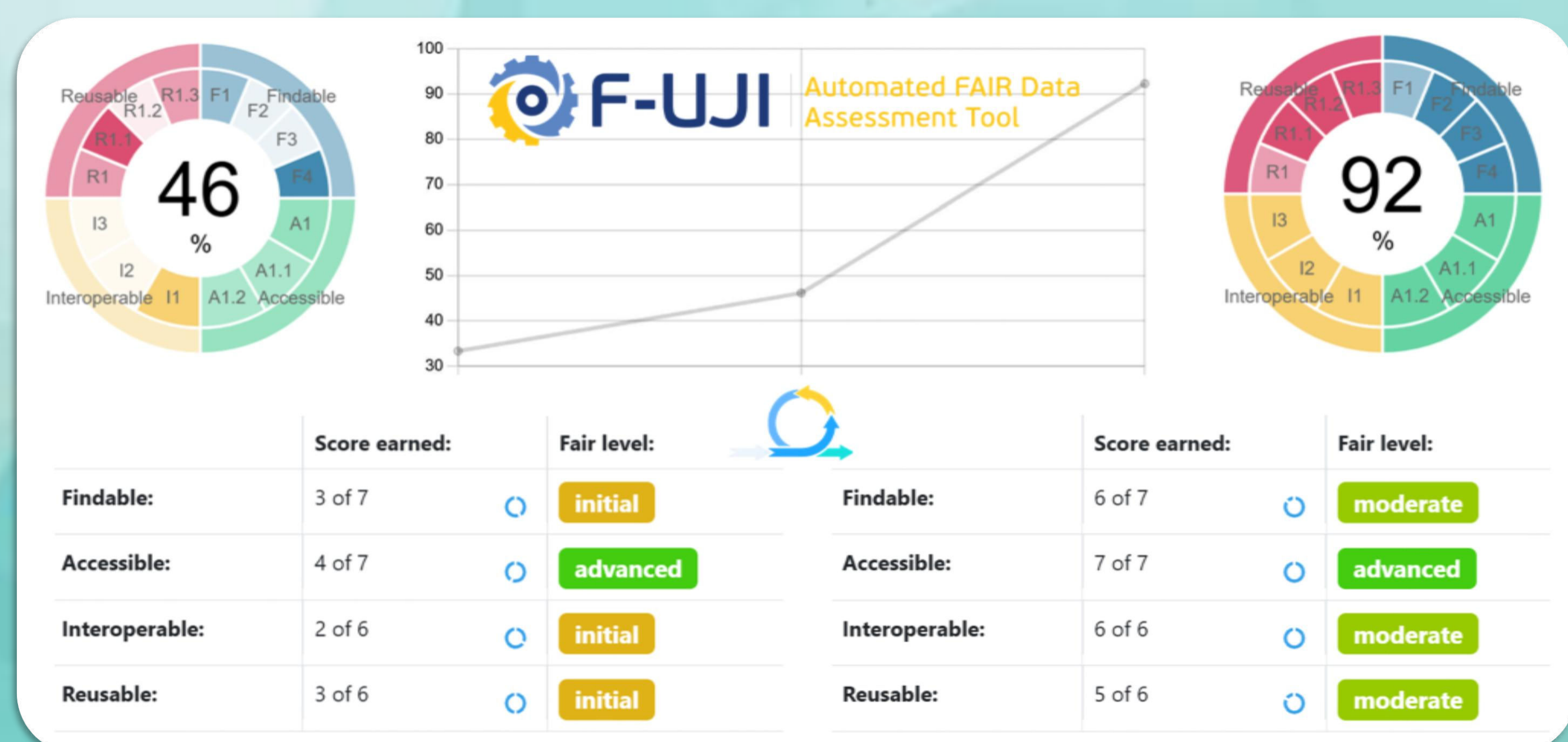
Machine-readable metadata schemas (**DCAT** and **Schema.org**) have been developed for all dataset types currently available in the INFRA-ART database, as well as for the entire data catalogue. The schemas build on the **EDMI Pilot metadata set** and follow **RDA recommendations** for structuring research dataset metadata. To date, **over 50 terms** have been mapped to relevant ontologies and controlled vocabularies — from Chemical Methods Ontology (CHMO) for general spectroscopy terms and the Ontology of Units of Measure (OM) for measurement variables, to the Getty Art & Architecture Thesaurus (AAT) for materials and domain terms. These schemas are embedded in the source code of the INFRA-ART website landing page, identified as **RDA dual schemas**. For full transparency, all crosswalks and ontology mappings are publicly accessible on Zenodo.

PROJECT DELIVERABLES

-  **Metadata gap report**
-  **Technical plan for metadata mappings and schema development**
-  **Crosswalks between EDMU recommended metadata properties, Schema.org, and DCAT**
-  **Ontology mappings to INFRA-ART datasets descriptors**
-  **JSON-LD schemas for all dataset collections and data catalog**
-  **Documentation of semantic artefacts with usage guidelines**
-  **FAIRness and interoperability assessment report**
-  **Dissemination materials:**
 - 1 blog post
 - 1 article (under review)
 - 2 conference presentations (LACONAXIV, IDW2025)




» FAIR SCORE BOOST

FAIRness evaluations conducted with the **F-UJI tool** demonstrated substantial improvement across all aspects of metadata quality. The overall **FAIR score increased from 46% to 92%**, with **Interoperability scoring 6 out of 6 metrics** — reflecting the successful implementation of structured metadata and integration with community vocabularies.



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▼ ACKNOWLEDGEMENT



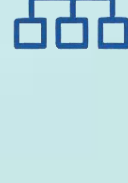


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» THE FAIRMAP4ART PROJECT

The **FAIRMap4ART project**, funded under the **RDA TIGER** framework, aimed to address the lack of semantic interoperability of the existing datasets within the INFRA-ART Spectral Library. The core objective was to improve the machine-actionability and discoverability of the existing datasets, ensuring that each spectral collection is described in a structured, machine-readable format that supports automated access, interpretation, and reuse. The project's objectives aligned with the **EOSC Interoperability Framework**, contributing to wider efforts in metadata harmonization, ontology mapping, and FAIR data stewardship. The project was also explicitly designed to implement **RDA Working Group recommendations**, with particular emphasis on: *Guidance on Data Granularity*, and *Guidelines for Publishing Structured Metadata on the Web*.

GAP-DRIVEN STRATEGY

-  **Lack of structured metadata at dataset level**
» Develop and embed dataset-level metadata schemas in JSON-LD
-  **No semantic mappings to external ontologies**
» Create metadata crosswalks mapping internal fields to CHMO, AAT, etc.
-  **Low metadata richness and granularity**
» Expand dataset descriptors and annotate fields using controlled vocabularies
-  **Lack of harvestability/API access**
» Implement OAI-PMH endpoint or lightweight metadata API for external services
-  **Moderate FAIR score; low findability/interoperability**
» Iteratively improve metadata using FAIR assessment tools like F-UJI

» PROJECT IMPACT

By addressing structural barriers to metadata interoperability, FAIRMap4ART has **substantially improved the discoverability, accessibility, and reuse potential of the INFRA-ART spectral datasets**, as demonstrated by a measurable increase in the overall FAIR score of the database. These FAIR improvements **strengthen integration with EOSC** and establish the repository as a more robust, machine-actionable resource within the European research ecosystem. More broadly, the project shows how **targeted metadata harmonization**—guided by FAIR and RDA recommendations—can accelerate the adoption of interoperable data practices, including in underrepresented research domains such as heritage science, with the potential to inspire other communities to follow similar approaches.

» COMMUNITY IMPACT

Since the implementation of machine-actionable metadata, the INFRA-ART Spectral Library has shown a **clear rise in user engagement**. Platform analytics reveal a significant increase in new users and dataset visits, along with more file access requests from researchers in conservation science, material analysis, and other cross-disciplinary fields benefiting from the datasets. Over the past 60 days, following the release of the metadata schemas, the database has recorded a **74% increase in new users** (exceeding 500), based on Google Analytics.



Help us refine our metadata mappings!

We value your feedback on metadata and ontology alignment

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