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[Lecture]

Semantic Orchestration for Time-Domain Astronomy

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Abstract: Time-domain astronomy relies on heterogeneous data from telescopes, surveys, detectors, archives, and value-added alert brokers. Those instruments may capture the same astronomical phenomena, yet their data interfaces and response structures differ, as do their identifiers and semantic conventions. We present Alertissimo, a research prototype for the semantic orchestration of heterogeneous astronomical data services. At its core, a hierarchical semantic model assigns provider-neutral, serialization-independent addresses to astronomical entities, measurements, classifications, associations, and data products. Reusable concepts are composed into typed records whose context distinguishes the role of each value, while provenance and explicit relationships between records are preserved in canonical, object-centric Portfolios. Alertissimo supports provider-agnostic scientific workflows that are expressed through a domain-specific language (DSL) and compiled into a typed intermediate representation independent of any particular broker or service. The principal contribution is an executable semantic layer that decouples scientific intent from provider interfaces without depending on the universal adoption of a single standard or serialization. It also provides a deterministic target for future natural-language interfaces: a language model may translate user requests into the DSL.

Keywords: astronomy, Alertissimo, DSL