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Medical Imaging as a Case Study of the Use of Metadata in Health Research Data Management

The Helmholtz Metadata Collaboration (HMC) promotes the use of metadata in Research Data Management as a means to achieving data findability, accessibility, interoperability, reusability (FAIR). These in turn enable or optimize software functionalities essential to automated research processes, such as multi-, inter- and transdisciplinary indexing and retrieval, versioning, provenance tracking, data contextualization, workflow reproduction, compliance assessment, publication. Metadata are also key to Hybrid Artificial Intelligence, i.e. the integration of sub-symbolic and symbolic techniques, which improves Machine Learning systems' trainability and explainability.

In this context, Hub Health is developing a framework for the identification and specification of metadata use cases in health data analysis workflows. This will provide stakeholders, e.g. researchers or developers, with insight into types and roles of metadata in a given workflow phase. For instance, metadata that are more extrinsic to the data, such as data format, are mostly needed during data acquisition. Metadata that are more intrinsic to the data, such as terminologies, may also contribute to the data analysis itself, for instance during feature extraction.

The initial case study for the framework is Medical Imaging. This offers a template for workflows that are ubiquitous in medical research and practice (e.g. diagnostics and prognostics) and it can be extended to the analysis of data other than images, e.g. natural language or diagnostic test data.

The toolkit KAAPANA, which supports AI-based medical data analysis workflows, is being used to benchmark the use of metadata in medical imaging workflows, to test new ideas and to integrate HMC resources, such as the Hub Health Information Portal or other tools from FAIR Data Commons or other Hubs.
In particular, image segmentation in KAAPANA, a phase shared by many imaging workflows, is currently being reviewed from the perspective of the functionalities targeted in HMC (from indexing and retrieval to trainability and explainability).

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Standards, Semantics, Tools

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other (please specify)

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