Metadata-driven Software Systems In Biomedicine

1. What is metadata? Types of metadata.- Descriptive (interpreted by humans).- Technical (utilized by software).- Some metadata shows characteristics of both.- How metadata is represented.- Why use metadata to build biomedical systems? Caveat: Metadata-driven systems are initially harder to build, Building for change: flexibility and maintainability, Elimination of repetitious coding tasks, Case Study: Table-driven approaches to software design.- 2. Metadata for supporting electronic medical records.- The Entity-Attribute-Value (EAV) data model:.- Why EAV is problematic without metadata-editing capabilities: the TMR experience.- Pros and Cons of EAV: When not to use EAV.- How metadata allows ad hoc query to be data-model agnostic.- Transactional operations vs. warehousing operations.- Case Study: The I2B2 clinical data warehouse model.- Providing end-user customizability, Case Study: EpicCare Flowsheets.- 3. Metadata for clinical study data management systems (CSDMS).- Critical differences between an EMR and a CSDMS.- Essential elements of a CSDMS.- HTML-based vs. non-Web interfaces: pros and cons.- Case Study: Metadata for robust interactive data validation.- Metadata and the support of basic bioscience research.- Object dictionaries and synonyms: the NCBI Entrez approach.- Fundamentals of object-oriented modeling: the use of classes.- Case study: representing neuroscience data: SenseLab.- Case study: managing phenotype data.- 4. Descriptive Metadata: Controlled Biomedical Terminologies.- Classification of Controlled Vocabularies, with examples: Collections of Terms, Taxonomies: a hierarchical structure, Thesauri: Concepts vs. Terms, Ontologies: Classes and Properties, Cimino s criteria for a good controlled vocabulary, Fundamentals of Description Logics, Pre-coordination vs. compositional approaches to new concept definition, Challenges when the set of permissible operations is incomplete, Difficulties in end-user employment of large vocabularies, The use of vocabulary subsets: the 95/5 problem, Case Study: the SNOMED vocabulary.- 5. Metadata and XML.- Introduction to XML.- Strengths of XML for information interchange.- Misconceptions and common pitfalls in XML use.- Weaknesses of XML as the basis for data modeling.- The Microarray Gene Expression Data (MGED) experience.- Use of the Unified Modeling Language.- UML is intended for human visualization.- UML has an internal XML equivalent (XMI).- Case Study: Clinical text markup.- 6. Metadata and the modeling of

ontologies.- Ontology modeling tools: Protege.- Common Pitfalls in Ontology Modeling.- Scalable ontology designs.- Supporting reasoning in ontologies: classification.- An introduction to Semantic Web technologies.- Limitations: the open-world assumption.- Case Study: Implementing constraints in SNOMED.- 7. Metadata and Production-Rule Engines.- Introduction to Production-Rule Systems.- Strengths and weaknesses of rule frameworks.- Embedded rule engines.- Data that can be executed as code: the Eval function.- Designing for extensibility.- Supporting versioning.- Case Study: The Jones Criteria for Rheumatic Fever.- 8. Biomedical Metadata Standards.- Why there can be no universal standard: a metadata model is problem-specific.- Standards for Descriptive Metadata.- ISO/IEC 11179: Purpose and Limitations.- Standards for Technical Metadata.- Have been designed for individual problem domains.- CDISC for clinical study data interchange.- Interchange standards for gene expression and proteomics.- 9. The HL7 v3 Reference Information Model.- Elements of the model.- What the model is not intended to encompass.- The clinical document architecture.- The Messaging Standard: Backward Incompatibilities.- Limitations and controversies EAN/ISBN : 9780857295101 Publisher(s): Springer, Berlin, Springer, London Discussed keywords: Biologische Medizin Format: ePub/PDF Author(s): Nadkarni, Prakash M.