

Knowledge Graphs as Educational Tools in Biomedical Education



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Introduction

Knowledge graphs (KGs) provide powerful visualization for analyzing complex biomedical concepts. This research explores the educational potential of our biomedical KG methodology, originally developed for drug research.

Visualization & Analytics

The KG enables three analytical dimensions impossible with traditional tabular analysis: 1. **Drug-Disease Relationship Mapping** reveals therapeutic clusters and regulatory patterns through connections, indications, and contraindications; 2. **Temporal Analysis** tracks drug approvals showing regulatory evolution and development acceleration; 3. **Administration Route Analysis** reveals layered delivery pathways from general to specialized methods.

Methodology

The biomedical KG framework follows a **4-step process**:

1. Data Integration & Quality Assurance: Combines DailyMed, Orange, and Purple Books databases with preprocessing for quality control.

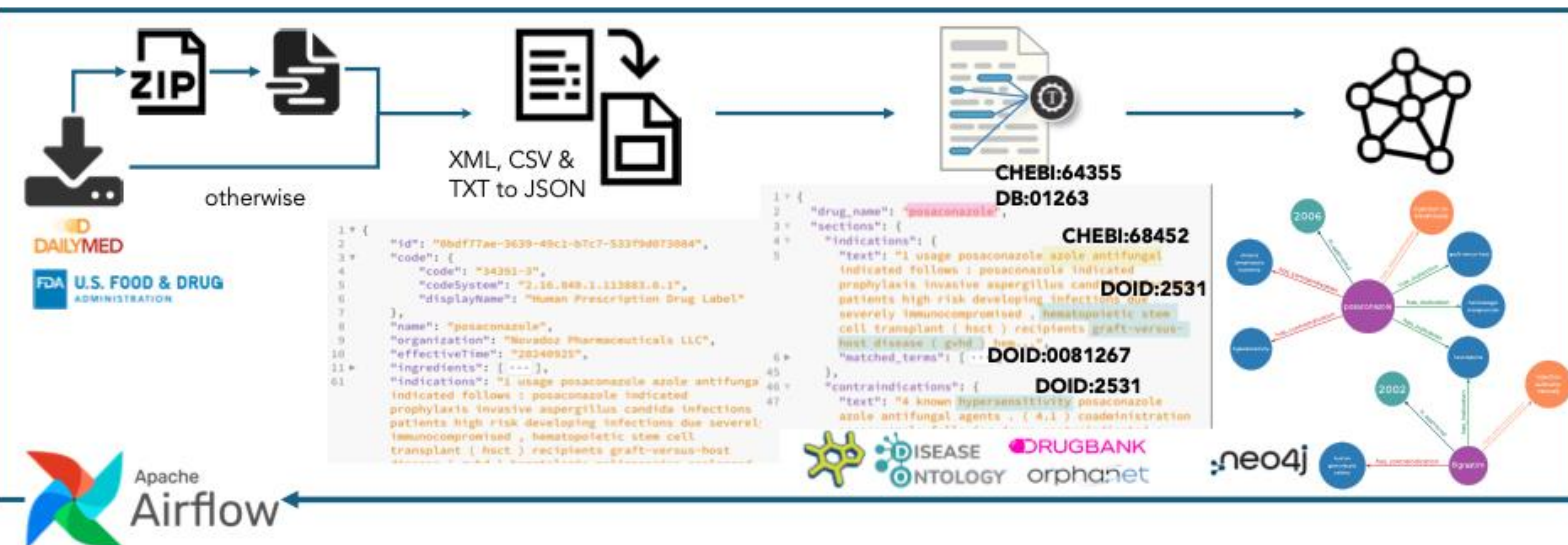
2. Data Standardization: Converts heterogeneous data sources (XML, CSV, TXT) into consistent JSON format.

3. Named Entity Recognition (NER): Assigns unique identifiers using hierarchical mapping:

Drugs: DrugBank → ChEBI → ingredient-based IDs;

Diseases: Disease Ontology and Orphanet.

4. Graph Implementation: Builds the KG in Neo4j, enabling complex relationship traversal, interactive visualization, and sophisticated querying.



Potential for Educational Impact

By converting complex drug-disease relationships into engaging, explorable graphics, we are pioneering a new era of biomedical learning where students can *see* and *discover* connections rather than memorize isolated facts—making complex medical knowledge accessible, memorizable, and exciting for the next generation of healthcare professionals.

References

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