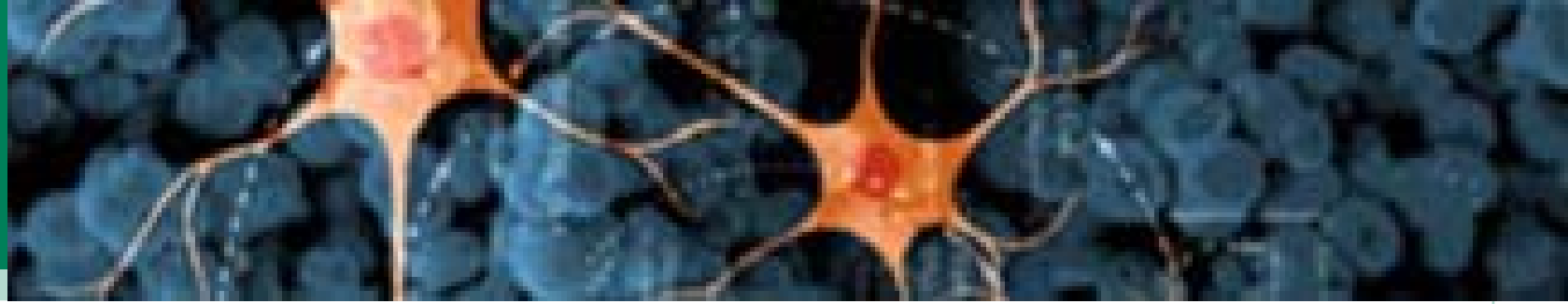

Module for Easy and Interoperable Data Analysis in Electronic Medical Records

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Putting Knowledge to Work

Introduction

- **Data analysis** in electronic medical records (EMR) is crucial for **patient treatment, quality management, administration** and **research**.

- Nowadays **SQL** is **widely used** to accomplish this task

Introduction

Characteristics of plain SQL queries:

- **tightly bound** to **database schemas** (DBSs) and **database management systems** (DBMSs)
- in medical domain queries often have recurring requirements with **similar or identical patterns**
- **greater flexibility** can be obtained through **parameterisation** of SQL queries

Introduction

The **aim** of developed data analysis module:

- to ease analysis development by providing **abstractions for recurring patterns** in SQL queries,
- to **minimise dependence on DBSs and DBMSs**,
- to make analyses **modifiable at runtime** and
- to visualise results as **customisable charts and tables**.

Methods

Used technologies:

- The **Java** platform and **open source libraries**
- **XML Schema** to define mark-up for analysis and configuration instances
- **SQL** to query databases

Methods

Analysis XML instances contain:

- **generalised SQL query patterns**
- **parameter-based definition** of the data to analyse **referencing reusable sets** of data in the configuration XML instance
- **default visualisation properties**

Methods

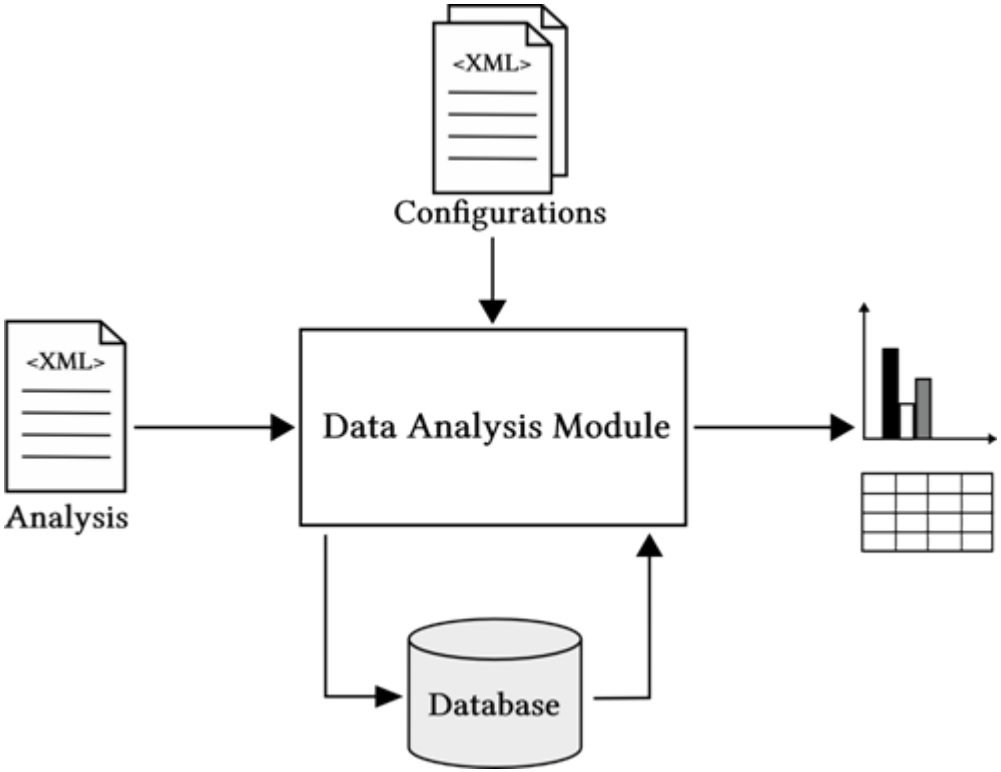
Configuration XML instances for queries contain:

- **metadata about DBMS**
- **metadata about DBS**
- **reusable sets** of data to analyse
- available **parameters for parameterisation** of the data to analyse

Configuration XML instance for visualisation contains:

- specification of which chart types are permitted with which kinds of analyses **avoiding meaningless combinations** such as longitudinal trends of patients' blood pressures visualised as a pie chart

Results

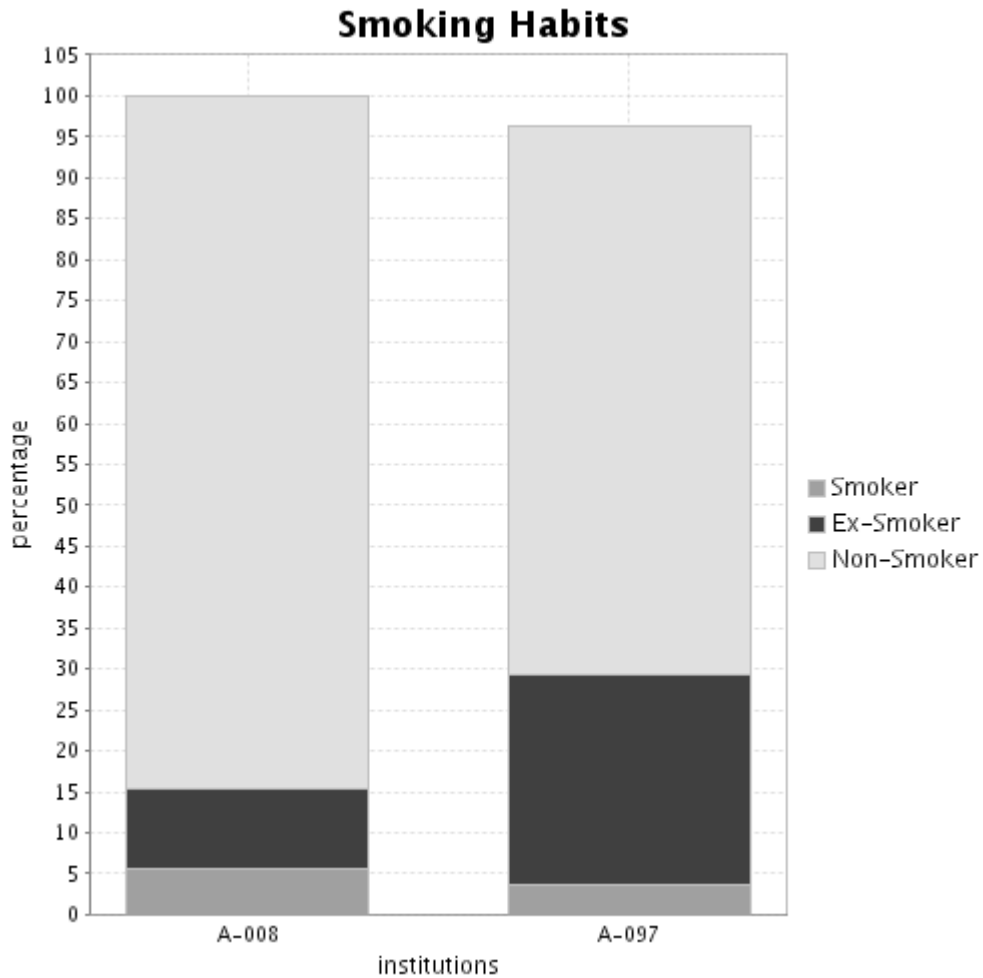


The data analysis module developed **generates** SQL queries from **database-independent analysis** XML instances and **database-specific configuration** XML instance, **executes** the SQL queries and **visualises** the results.

Configurations have to be defined **only once** per information system.

Results

Analysis results generated by the module



Comparison of two institutions regarding the smoking habits of their female patients. For this analysis the **classification pattern** was used classifying patients regarding their smoking habits. Additionally the analysis was **parameterised** in order to select only female patients**.**

(100% are not reached for A-097 due to missing data)

Conclusion

Benefits:

- easier development, maintenance and reuse of analyses **on a higher level of abstraction**
- faster and easier development and maintenance of **interoperable analysis** of data in EMRs
- Modularity of analysis structure simplifies **parameter-based modifications at runtime**
- Visualisation of results can be easily **customised**
- Analysis XML instances unify query and result visualisation **in one place**

Conclusion

Data analysis module integrated in:

- **quality management web applications** for hepatitis and cardiovascular disease hosted at **www.healthgate.at**
- module for **generation of PDF reports**

Future work:

- improving **visualisation capabilities**
- **user interface integration** using metadata
- adding **automatically adaptable analysis descriptions** to analysis XML instances
- further **separation** of database-independent components from database-specific ones
- Exploration of practicability for **open source** release

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