Scenario-Oriented Information Extraction from Electronic Health Records

Summary

Providing a comprehensive set of relevant information at the point of care is crucial for making correct clinical decisions in a timely manner. Retrieval of scenario specific information from an extensive EHR is a tedious, time-consuming and error-prone task. In this paper, we propose an approach for mining relevant information from the patient's EHR in a clinical scenario. We present a scenario-oriented approach that involves the following steps:

- **Problem:** determining the relevance of information to specific hypotheses.
- **Solution:** proposing a model and technique for mining relevant information from EHR.

**Overview of the Proposed Approach**

- **Generic graph representation of diseases and their attributes:**
  - (a) Generic graph representation of diseases and their attributes (e.g., symptoms, signs, EHR elements, etc.).
  - (b) Concept lattice representation of a specific diseases-attribute graph.
  - (c) Extending maximal association with evidences from EHR.
  - (d) Extending maximal association from EHR.

**Definition of Terms**

- **Clinical Scenario:** a set of clinical observations (symptoms and signs).
- **Diagnostic Hypothesis:** an explanation for the cause of observations (having a disease).
- **Investigation:** search for evidences which influence the proof of a hypothesis, including:
  - Recognizing the influencing factors (relevant clinical information).
  - Searching EHR to find evidences (supporting weakening).
  - Discriminating hypotheses based on evidences.
- **Relevant Clinical Information:** information from patient's EHR which help in discriminating hypotheses.

**Context Table**

- Captures the relationship between diseases and their symptoms & signs.
- We have employed Concept Explorer tool to generate and illustrate the concept lattice.

**Concept Lattice**

- 49 diseases and 64 common symptoms and signs for Fever of Unknown Origin (FUO) syndrome; 499 concepts.

**Discovering Probable Hypotheses**

- We proposed a solution to the challenges in retrieving relevant information from the patient's EHR. We believe that more intelligent retrieval systems are needed to provide different views of the EHR information for different purposes.

**Conclusion**

We presented a scenario-oriented view as an intelligent extraction of relevant and useful information to serve a more effective diagnostic procedure. The proposed approach is not intended to interfere with the clinicians' diagnostics of patients' health problems, however it assists in extracting relevant information that are necessary and useful for diagnostics and decision making. We assessed the usefulness of our approach in a clinical setting by modeling a challenging diagnostic problem.