Extracting Intention from Web Queries – Application in eHealth Personalization

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Personalized e-Health System

- **E-Health Application**
  - e.g.:
    - Personal
    - Clinical

- **Personal Systems**
  - Physical:
    - Personal health records
  - Mental:
    - Intentions, plans, beliefs, etc.
  - Personal sensors

- **Institutional Systems**
  - Financial:
    - Health insurance
  - Electronic health records

**Personal Data**

**Privacy**
CARRE Project

- It is a EU funded project in the area of cardiorenal with focus to provide personalized health.
- Personal data: Sensor data (e.g. activity and blood pressure), PHR and patient’s intentions (travel, diet, diseases, etc).
Investigation of Patient’s Online Interaction

– **Capture Personal Information**
  – Goal: Detect intentions

– **Possible Sources:**
  – Social Media: Facebook, Twitter, etc
  – Browsing History
  – Web Searches

– **First choice:** Web searches to extract intentions
  – Good source to reveal user’s interests and intentions
  – Web search engines are one of the most popular uses of the web, e.g.
    >70% of internet users report looking online for health information

http://www.pewinternet.org/2013/01/15/health-online-2013/
What is privacy?
- “The right to be let alone” [Warren and Brandeis, 1890]
- “The right of the individual to decide what information about himself should be communicated to others and under what circumstances” [Westin, 1970]
- The right to informational self-determination [1983]

Personal Data: Any information that refers to a person

Related Legislation: e.g. EU Data Protection Directive 95/46/EC
- Indicative principles:
  - Reported and transparent processing
  - Finality & Purpose Limitation
  - Personal data quality
  - Security
  - Personal data traffic outside EU
Privacy-friendly Architecture

main principle: preserve the patients’ privacy
Extract Users Intentions via Query Classification*

(1) Offline, initialization process
   ◦ predefine query categories (~250)
   ◦ create index of documents = the collection of top most related documents to each category from a set representative of the entire web (ClueWeb 09_b)

(2) Real-time repetitive process
   ◦ run user query in the index
   ◦ based on the results, associate user query with predefined categories

privacy preserving: step #2 process is performed on user-side

Implementation

(Open Source)

- **Query Detector** as a browser extension
  - Firefox
  - Chrome
- **User Intention Extractor** as a Java application
  - Platform independent
Implementation

*Open Source*

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Example of Detected Intentions
Conclusions, Current & Future Work

Conclusions
  ◦ Provide a proof of concept
  ◦ Apply a privacy by design approach in our methodology

Work in Progress
  ◦ Improve the technique of query classification
  ◦ Determine the safe detected intentions based on classification technique (without a fixed limit, e.g. n=3)
  ◦ Perform a user study in the side of patients in order to determine the correctness of intentions

Future Work
  ◦ Detect intentions from other online activities (e.g. social media) of patient
  ◦ Investigate how to utilize the intentions in a Decision Support System (DSS)
- Slides & Reprints: http://www.drosatos.info
- Online Demonstration: http://youtu.be/IMHlIibwcDRY
- You can find binaries and source codes at:
  https://www.carre-project.eu/innovation/web-lifestyle-data-aggregator/
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CARRE Project: Personalized patient empowerment and shared decision support for cardiorenal disease and comorbidities.