Objective

A knowledge enabled analytical framework for Augmented Personalized Healthcare (APH) approach involving continuous monitoring of chronic disease and its progression, and the patient’s overall health.

kHealth Kit for Pediatric Asthma involves multiple sensors collecting personalized multimodal data (from Clinical notes, mHealth application, PGHD and Outdoor environmental observations)

Questions to be answered

● Can we assess the asthma control level, determine patient vulnerability, and medicine compliance?
● Can we reduce the number of asthma attacks through continuous monitoring of the patient’s health condition?
● Can we predict the asthma attack based on the data collected about the patient and their surroundings?
● Can we understand the causal relationship between the asthma symptoms and possible factors responsible for them?

Continuous: Patient Centric Healthcare involving Patient Generated Health Data (PGHD)

● In the ongoing trial involving pediatric asthma patients, we have consented 90 patients out of 150 study cohort.
● The kHealth kit collects 1862 data points patient/day on 29 different parameters.

kHealth reasoner

Example: knoeais Asthma Ontology (KAO)

Integration of several ontologies relevant to interpret kHealth datasets

● W3C Semantic Sensor Networks (SSN/SOSA)
● Asthma ontologies from BioPortal
● Weather and smart home ontologies [Staroch 2013] [Kofler et al. 2011]

Additional ontologies to integrate:

● SNOMED-CT from BioPortal (e.g., Cough, Pollen concepts)
● Symptoms Ontology
● Etc.

Architecture

Reasoning mechanisms

● Context-Awareness refers to the use of external data that can impact the user’s situation.
  ○ E.g., for Asthma: environmental triggers such as air pollution and pollen level.

● Personalization adjusts the treatment to each patient’s condition.
  ○ E.g., for severe Asthma patient: determine patient sensitivities (tree vs. grass pollen) and corresponding medication/dosage (rescue vs. inhaled steroids)

KHealth Asthma Ontology (KAO)

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  ○ Symptoms Ontology
  ○ Etc.

References

● Amelie Gyrard, Manas Gaur, Krishnaprasad Thirunarayan, Amit Sheth and Saeedeh Shekarpour. Personalized Health Knowledge Graph. 1st Workshop on Contextualized Knowledge Graphs (CKG) co-located with International Semantic Web Conference (ISWC), 8-12 October 2018, Monterey, USA.

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