FUJITSU

Introduction

Introduction
A bit of context & challenges

1. Current EHR solutions focus on recording and storing all the relevant information associated to the patients´ health but have very limited capabilities to help doctors and managers to perform data analytics or to predict future events affecting the patients´ health

2. When available, the BI tools integrated in the EHR systems provide very limited functionalities to investigate and manage group of patients.

3. Existing EHR solutions manage unstructured data (medical notes, images) usually as complementary information and provide limited functionalities to analyse this kind of data inside the system.

European Parliament

Introduction
Our approach: Sholark Healthcare - Hikari

Hikari (Sholark Healthcare) provides a fresh view of the hospital allowing doctors and managers to investigate the service/hospital/region situation making groups and comparing different performances. It is based on Fujitsu's SHOLARK framework

- **HIKARI's health risks assessment module** (extra component) estimates important health risks and create alerts for doctors and managers to take precautions and design better treatments (current available for mental health, extensible to other diseases)
- **HIKARI's patient behaviour module** (extra component) predicts future behaviours in the life of the patients (diagnoses, readmissions, length of stay in the hospital)
- **HIKARI's natural language processing module** (extra component) automatically extracts relevant information from medical texts helping doctors and nurses with the task of collecting the information
- **HIKARI's image recognition module** (extra component) uses AI to extract information from medical images

The solution works as an assistant for supporting human decisions not as substitute of doctors' duties and ensures the right level of privacy and security of patients' health data.

European Parliament

FUJITSU

The solution

The solution.

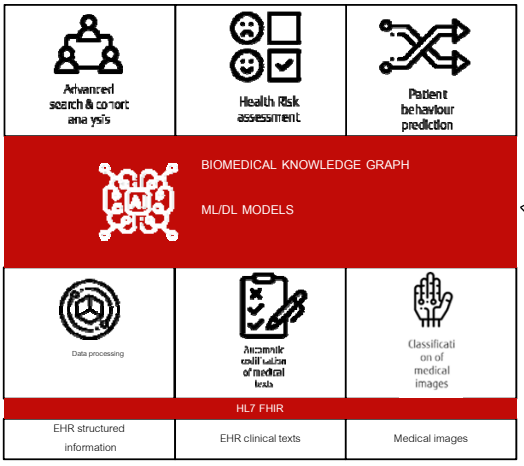
Overview & use cases

FUJITSU

Intelligent Healthcare™

SHOLARK - HEALTHCARE

Sholark Healthcare is a modular solution that add analytics & predictive capabilities to the existing EHR resources. The solution support two main use cases



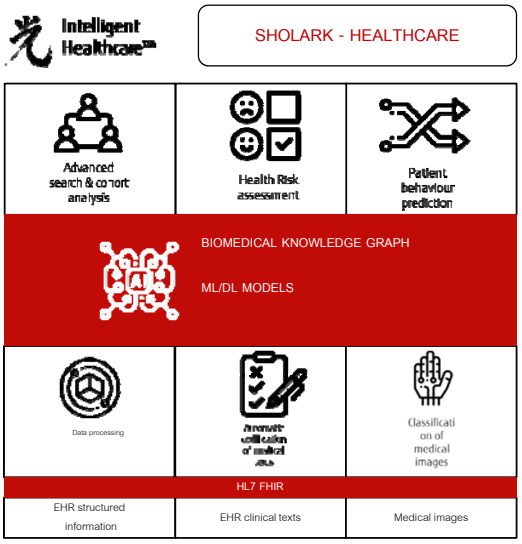
Clinical Decision Support System (CDSS)

Hospital management decision support system

European Parliament

5

The solution.
Strengths



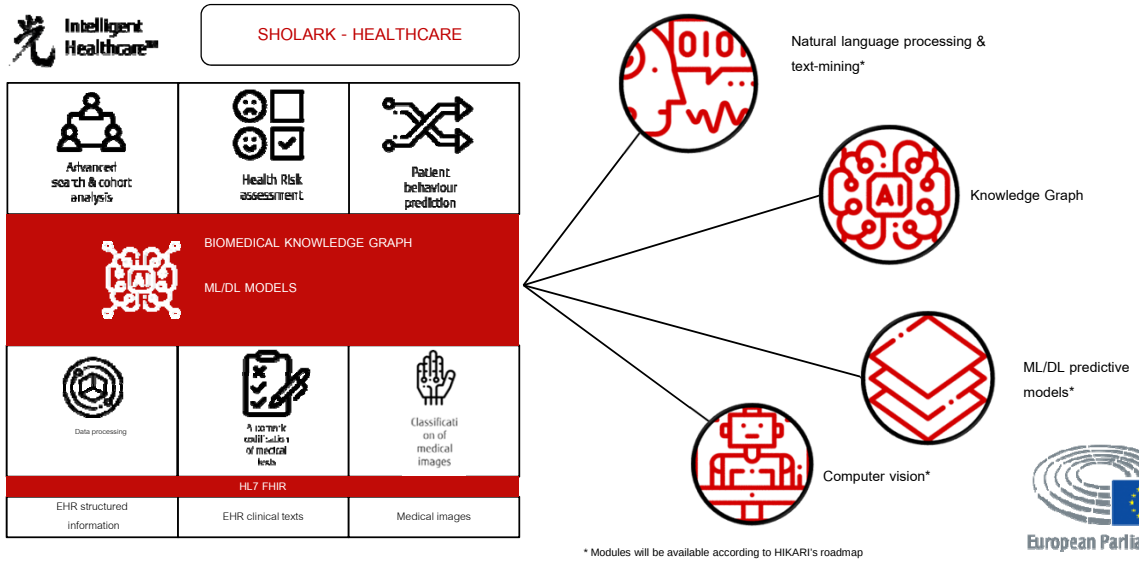
- ✓ Dynamic dashboards with advanced search & cohorts analytics
- ✓ Predictive algorithms to estimate health risks and future patient behaviours*
- ✓ Biomedical knowledge graph built on anonymised healthcare data from more than 0.6 millions of patients and more than 1.5 millions of medical papers
- ✓ Capacity to process structured and non structured data, the latter in the form of texts and images*

* Functionalities will be available according to HIKARI's roadmap

European Parliament

6

The solution
Core Analytics Capabilities



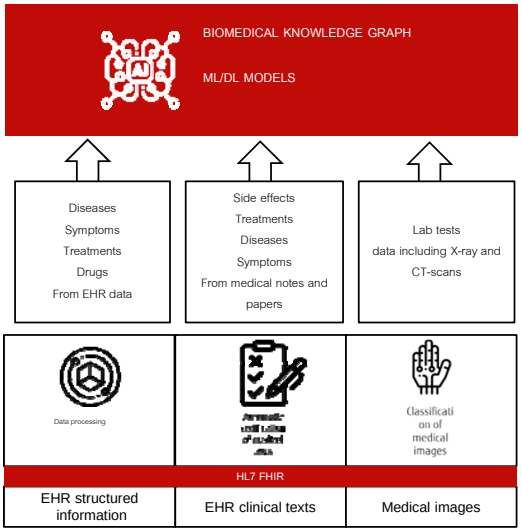
* Modules will be available according to HIKARI's roadmap

European Parliament

7

The solution

Semi-automatic generation of the knowledge graph



- ✓ The knowledge graph is built in a semi-automatic way
- ✓ Nodes and relationships are extracted from:
  - ✓ EHR (patients) data, including diagnoses, symptoms, treatments, etc.
  - ✓ Clinical notes, medical publications and clinical guidelines
  - ✓ Laboratory tests including X-ray and other medical images.
- ✓ The knowledge graph contains universal knowledge but can be adapted to different countries.

* Modules will be available according to HIKARI's roadmap

European Parliament

8

Sholark

SHOLARK
Overview

FUJITSU

Ability to collect data regardless of its origin (social networks, database, web services, files, logs, voice, image, video, etc.)

Flexibile

In Real Time
Ability to store and/or process large volumes of structured, semi-structured and unstructured data in real time.

Massive Scale
Ability to scale to support additional data and features over time

Insightful
Ability to generate a homogeneous semantic model (knowledge graph)by the automatic recognition of entities and relations, in which advanced analytical techniques can be applied

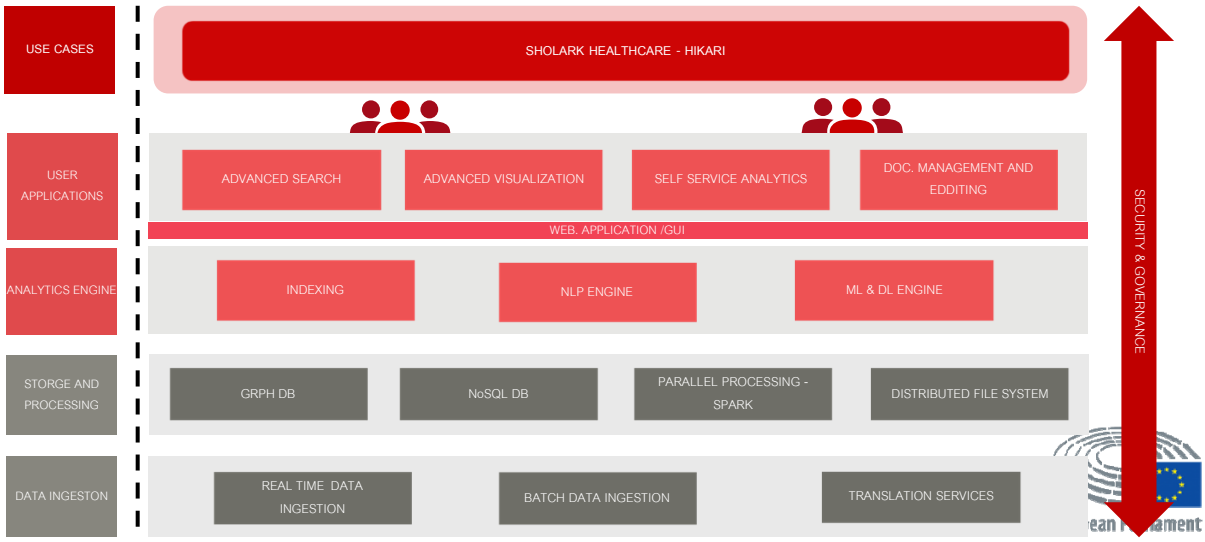
Usability
Thanks to the GUI the solution can be used for non-advanced users which shortens the learning curve

Modularity
The architecture of the solution allows to increase or decrease the functionalities included in order to be easy adaptable to customer's' needs.

European Parliament

SHOLARK
Architecture overview

FUJITSU



FUJITSU

Use Case

USE CASE

Mental Health Risk assessment – Hospital Clinico San Carlos

FUJITSU

Customer

The **San Carlos Clinical Hospital (HCSC)** has sought to improve care, teaching and research since it was founded in 1787. Throughout the last two centuries, the hospital has changed and adapted to meet the demands of the residents of Madrid and the high standard of its facilities and staff have made it a national and international leader.

Julio Mayol

CMO Hospital Clinico San Carlos

CHALLANGE

Clinical Documentation Specialists **(CDS)** are in charge of keeping clinical documentation updated and at high quality. This is fundamental for the healthcare providers for two reasons: 1) to make further decisions about the patient treatments and 2) to get the reimbursement from the health plans providers. This task requires considerable amount of time and effort.

SOLUTION AND RESULTS

HIKARI uses NLP and text-mining technologies to infer ICD10 codes from doctor's clinical descriptions. This technology helps to reduce the time required by the CDS to perform his/her tasks.

European Parliament

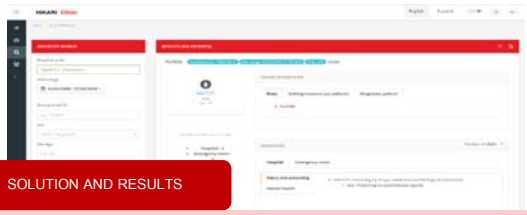
13

USE CASE

Mental Health Risk assessment – Hospital Clínico San Carlos

CHALLANGE

The sooner clinicians are able to identify the patient's disease, the better probabilities they have of finding the patient an effective cure. This is a general mantra in medicine. Moreover the cost of early diagnostic and intervention is far less than the cost of treating a disease in an acute phase.



SOLUTION AND RESULTS

HIKARI uses knowledge graph technology to identify potential health risks using the previous history of the patient as input data, in particular: symptoms, previous diagnoses, procedures. The technology has been tested in a field trial with around 400 patients and the results were compered against the assessment of more than 30 doctors. The accuracy obtained was higher than 75%

CHALLANGE

Certain episodes like hospitalizations are very relevant for the patients and the healthcare providers. To increase the efficiency of the healthcare process is necessary to estimate certain properties of those episodes, for example how many days the patient will stay in the hospital or if the patient will be readmitted or not.

SOLUTION AND RESULTS

HIKARI uses machine learning and deep learning algorithms to predict several variables associated to those events. In particular we are working to predict the Length of Stay in the Hospital (LOS).

The technology is still on development and some preliminary results have been obtained.

14

FUJITSU

shaping tomorrow with you