***related work:***

A large portion of the world's population does not have access to adequate healthcare. We approach this problem from two angles: prevention and treatment. Prevention by monitoring; Diagnosis as part of treatment. The monitoring part is still in the idea stage, while we have made some progress on the diagnostic aspect. While we present our view of machines that aid in both monitoring and diagnosis, the focus of this paper is more on the diagnostic part.

The ultimate goal of the Diagnostics Project is to put medical diagnostics in the hands of millions of underprivileged people without reaching a doctor, which is made possible thanks to the proliferation of portable smart devices including wearable devices that can instantly connect to the enormous computing power in the cloud. The project aligns with seeing the web as the ubiquitous computer. A Guide to the Concept of Embedded Ideas has also been published, using Semantic Web Concepts for a Restaurant Find app previously. This project expands these ideas and uses machine learning / text mining techniques to solve a critical problem affecting a large segment of the population - those related to medical diagnosis and broadening that insight to include health monitoring. The paper will present some preliminary findings in this direction and conclude with future directions.

Innovative medical technologies are developing day by day, as there is an important need for integrated medical expert systems (ESs) that will help to effectively manage and control diagnosis and treatment processes. These systems, with new approaches, have improved the experiences and capabilities of physicians to make the diagnosis of diseases. In this work, an integrated medical ES called Expert Doctor Verdis (Ex-Dr Verdis) is developed, which combines an advanced medical information system containing various medical services supported by information technologies, with ES capabilities in a single system. This system is also one kind of decision support system. Implementation of this system is applied for vertebral column diseases. Ex-Dr Verdis is a strong decision support tool with 94% sensitivity, 71% specificity, 87% positive, and 86% negative predictive values for the diagnosis of vertebral diseases. In addition to its facilities of medical information, Ex-Dr Verdis, with a sharing platform, provides physicians with the opportunity to share and discuss their own patients, cases, experiences, and expert knowledge with other colleagues. This integrated medical ES can be used in all hospital services, such as hematology, neurology, or cardiology, by adding new expert modules for other diseases.

Information Extraction (IE) refers to the automatic extraction of concepts, entities and events

as well as their relations and associated attributes from free text. A recent review of clinical IE applications (Wang et al., 2018) notes the increasing interest to NLP but lists only 25 IE systems

which were used multiple times, outside the labs where they were created. Isolated attempts exist

to apply IE in the context of EHR processing in frameworks for semantic search, for instance

SemEHR deployed to identify contextualized mentions of biomedical concepts within

EHRs in a number of UK hospitals (Wu et al., 2018). We mention the following research prototypes

as experimental developments, based on some sort of IE: (Shi et al., 2017) reports about

a system extracting textual medical knowledge from heterogeneous sources in order to integrate

it into knowledge graphs; (Hassanpour and Langlotz, 2016) describes a machine learning system

that annotates radiology reports and extracts concepts according to a model covering most clinically

significant contents in radiology; (Jackson et al., 2018) presents the information extraction

and retrieval architecture CogStack, deployed in the King’s College Hospital. CogStack has functionality

to transform records into de-identified text documents and applies generic clinical IE

pipelines to derive additional structured data from free texts. Most of the successful systems listed above work for clinical narratives in English. All major resources, ontologies and terminology classifications like UMLS4 and MESH5 are available in English. The comprehensive ontology SNOMED CT6 was developed initially in English and then translated to other languages.