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e-Health Technical Committee NewsLetter

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On behalf of the e-Health Technical Committee (TC) of the IEEE Communications Society (ComSoc), we wish all our members a very instructive reading of this letter.

The contribution from this edition is coming from: Profs Pantelis Angelidis and Alexis Fourlis, University of West Macedonia, Vidavo Greece, paggelidis@uowm.gr and afourlis@vidavo.eu

Members of the e-Health community are invited to contact the author for further information or collaborations.

We also welcome all our members to share their research activities and field experiences through this open newsletter and to open up new opportunities for discussions and collaborations.

Editor: Dr. Nada Philip (Kingston University London, UK)

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TinYML TRIAGES AND PRIORITIZES COVID-19 PATIENTS IN EMERGENCY DEPARTMENTS

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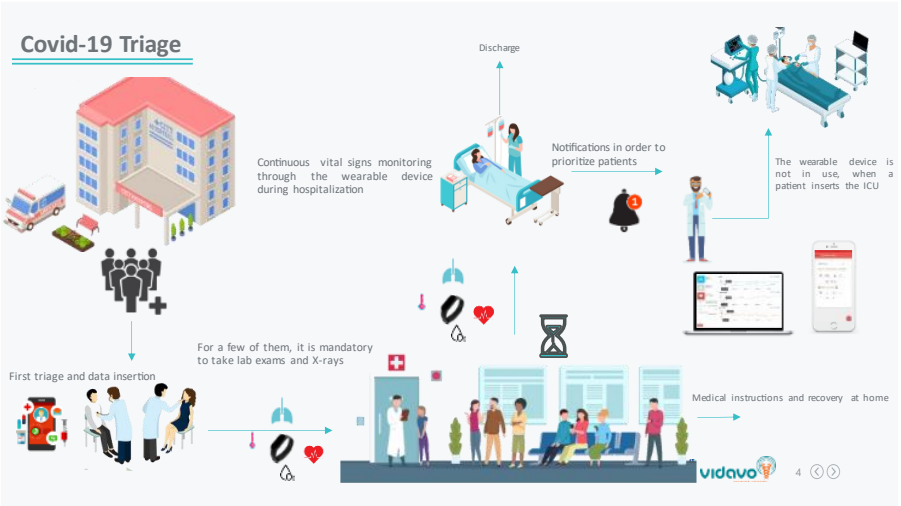

Figure 1 Covid-19 triage use case.

In order to limit the spread of Covid-19, certain measures are needed to alleviate the burden from public health organizations,

including reference hospitals. One of the most significant is to reduce Emergency Department (ED) overcrowding, minimizing waiting time of suspicious incidents and increase in-hospital safety. Fever and shortness of breath are considered as two of the main symptoms of patients infected by Covid-19. Both symptoms can be objectively tracked by measuring vital signs, such as body temperature, breathing rate and/or oxygen saturation levels. Continuous monitoring of those vitals is not currently considered as an option offered by EDs, unless a patient is admitted to the ICU. Instead, sporadic checks may occur depending on the availability of human resources (usually limited and under huge pressure). In addition, the commercially available medical devices are not always portable, while more than one device is needed to provide the full spectrum of required vital signs.

Exploiting edge computing and advanced digital signal processing techniques, Vidavo designed, developed and filed a patent of a wrist-wearable device able to continuously extract heart rate, blood oxygen saturation, body temperature and evaluates patients' respiration, realizing a Clinical Decision Support System (CDSS). Specifically, the wearable is able to deploy the CDSS on the edge avoiding raw data transmission over a radio channel to expensive, power hungry and vulnerable cloud infrastructures, ensuring data privacy, security, energy efficiency and minimizing latency. It is worth mentioning that the CDSS is not just extracting vital signs but identifies health dysfunctions depending on other parameters too, like age, height, weight, symptoms and short medical history. Furthermore, the CDSS realizes a probabilistic framework able to notify physicians about the probabilities of a patient a) to need hospitalization and b) to be admitted in the Intensive Care Unit (ICU).

To this end, the CDSS extends the invention's value regarding medical data and provides projection insights on Hospital's resources. This is dynamic and during patients' journey inside the EDs probabilities are recalculated on real-time. The fact that the solution exploits edge computing technologies establishes a significant advantage against current state-of-the-art solutions. It realizes a more feasible and sustainable business case, where users are not frustrated by solutions that do not work or miss important events when internet connection is unavailable. For example, in a Hospital environment, where sending data out of the physical area of the hospital is forbidden, the solution is able to provide CDSS results without having internet connection at any stage of data processing.

Figure 1 presents a typical use case of Covid-19 suspicious cases arriving to ED and how the solution is applied. All patients that suffer from Covid-19 related symptoms undergo a pre-triage procedure for identification of suspected or confirmed COVID-19 cases according to the World Health Organisation criteria. Those who meet the criteria are shown to the Covid-19 ED area, where triage and prioritization algorithms and protocols are performed by specialized physicians. Based on the results, patients' category that the applied protocol refers as the intermediate severity and medical attention is required, are registered to the system through the mobile application. Questions concern demographics, vital signs, past medical history and main presenting symptoms are composing patients' profiles. Using the mobile application, these profiles are shared with the rest of the system and are linked with one wearable device.

At this point, the physician installs the wearable device and it starts continuous monitoring of the patient's vital signs. For the Covid-19 example, the vital signs that it is worth monitoring are hear rate, respiration rate, blood oxygen saturation and skin temperature. The wearable device is aware of the patient's profile that it is installed on, enabling the detection of potential patient's health deterioration that demands immediate medical attention by exploiting the CDSS.

Regardless of the patient journey in the EDs, physicians are able to monitor patients' vital signs and their location and receive notifications from the CDSS. Based on CDSS notifications and the correlation with the clinical overview, physicians are able to decide whenever patients should be hospitalized, admitted to the ICU or give them medical instructions in order to recover at home.

Part of the patent-pending technology was published on IEEE GLOBECOM 2020 Special Workshop on Communications and Networking Technologies for Responding to COVID-19 in Taipei, Taiwan on December 2020. You can download the paper from IEEEXplore®.

The solution has been set up and keeps operating in the Emergency Department of AHEPA Hospital in Thessaloniki, Greece since July 2020, where suspicious Covid-19 cases are referred to from the Region of Central Macedonia. Furthermore, the solution was selected and awarded from the COVID eXponential Programme H2020 project. The goal is to further validate the CDSS and deploy the system on the Emergency Department and Covid-19 clinic of Hippokration Hospital in Thessaloniki.

ISTAS21 TECHNOLOGICAL STEWARDSHIP & RESPONSIBLE INNOVATION

Virtual Event, hosted by the University of Waterloo and University of Guelph (Ontario, Canada)

28-31 October 2021

IEEE SSIT SOCIETY ON SOCIAL IMPLICATIONS OF TECHNOLOGY

The IEEE International Symposium on Technology and Society (ISTAS) is the flagship conference of the **IEEE's Society on the Social Implications of Technology (SSIT)**—the oldest Society and conference of its kind. ISTAS is a multi/inter/trans-disciplinary forum for engineers, policy makers, entrepreneurs, philosophers, researchers, social scientists, technologists, and polymaths to collaborate, exchange experiences, and discuss the social implications of technology.

The 2021 IEEE ISTAS Conference Committee invites you to be part of this year's conference, a **virtual event** hosted by the University of Waterloo and University of Guelph (Ontario, Canada) from **28-31 October 2021**.

The overall conference theme for **ISTAS21** is **Technological Stewardship and Responsible Innovation**. Through partnerships with several organizations in the Waterloo/Guelph region, ISTAS21 will feature programming related to the following conference subthemes:

- **Health Systems**
- **Privacy & Security**
- **Technology Policy & Governance**
- **Sustainable Cities & Communities**
- **Artificial Intelligence & Automation**
- **Ethical and Human Values in Emerging Technology**

Please make note of an important upcoming deadline: **Paper Proposals for all full-length, short-length, and abstract-only submissions are due July 13.**

We hope you will join the ISTAS21 email list to receive periodic updates (your email address will not be shared further).

In addition, be sure to visit the ISTAS21 website for additional details about the Call for Papers, submission deadlines, speakers, registration, sponsorship/patronage opportunities, and more. Website content will be updated regularly over the coming months.

We hope to see you virtually at this year's conference.

-Rozita Dara and Heather Love, ISTAS21 Conference Co-Chairs

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