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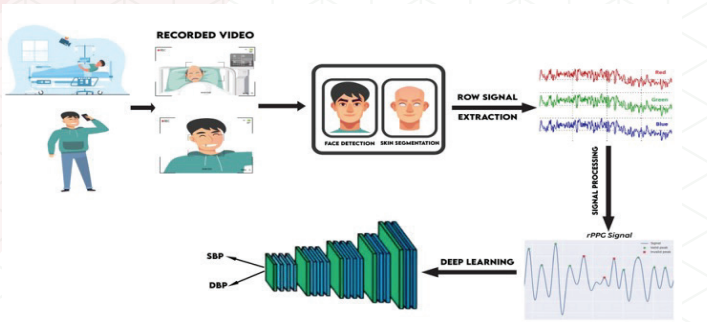
Contactless Instantaneous Blood Pressure Monitoring for The Intensive Care Unit (CIBPM)

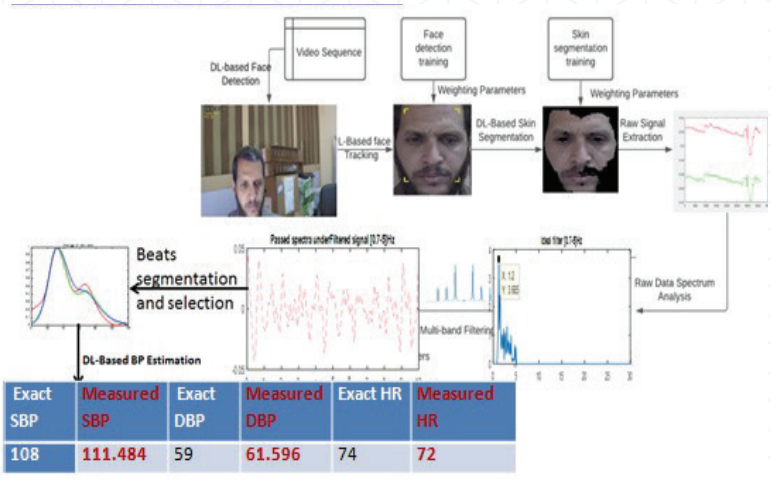
Aswan University

Researches from Aswan University designed and implemented a camera-based blood pressure (BP) monitoring system with the aim to overcome the problem of the conventional contact-based BP devices. Monitoring BP is a critical to prevent chronic diseases such as heart disease. The high BP (hypertension) can be silent for years without any symptoms; however, it can damage blood vessels and heart. Uncontrolled high BP increases risk of serious health problems, including heart attack and stroke. A few people with high BP may have headaches, shortness of breath or nosebleeds, but these signs and symptoms aren't specific and usually don't occur until high BP has reached a severe or life-threatening stage. Normally, BP is measured in hospitals, pharmacies or at home which is measured in discrete times. "Measuring BP with conventional method has two main drawbacks; namely, it requires special devices which aren't always available with slum dwellers and sometimes it is not convenient for young babies and elderly people. Also, it measures BP in discrete times not in a continuous time' says Dr. Osama Ahmed – Professor at Aswan University, and the project principal investigator.

In this project, researchers presented a camera-based continuous BP monitoring prototype that can be available with slum dwellers as well as hospitals, pharmacies and as a mobile app. The presented project is based on extracting photoplethysmography (PPG) from videos; therefore, by extracting the color signature issued to separate reemitted light containing BP information. The presented prototype is based on the detection of PPG using photographic cameras. BP can be extracted from PPG, using deep learning.



Prototype sequential steps



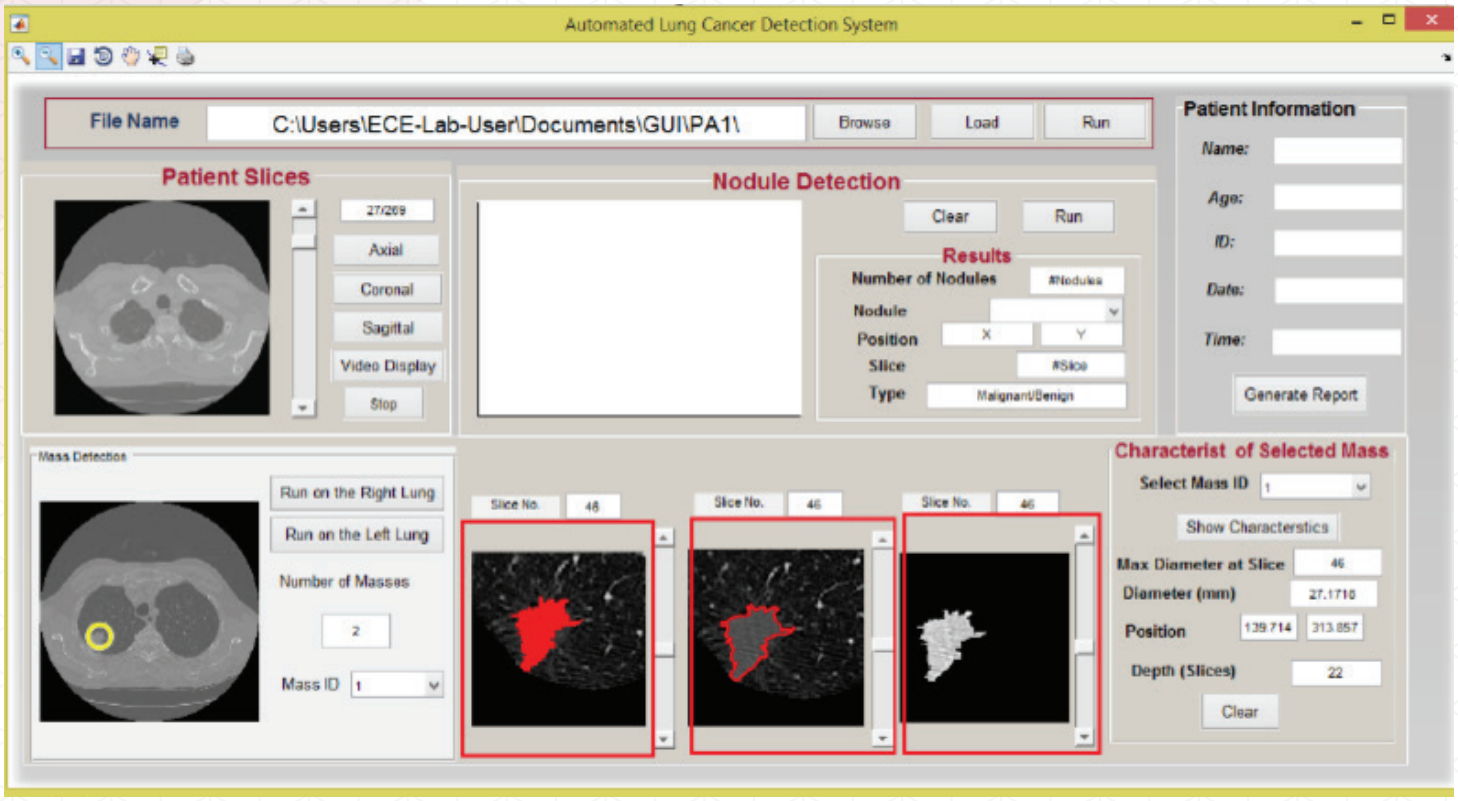
Exact SBP	Measured SBP	Exact DBP	Measured DBP	Exact HR	Measured HR
108	111.484	59	61.596	74	72

A pilot example for the camera-based BP monitoring system

Classification and prediction of lung cancer using both Genomic and CT scan Image Analyses

Egypt Japan University for Science and Technology

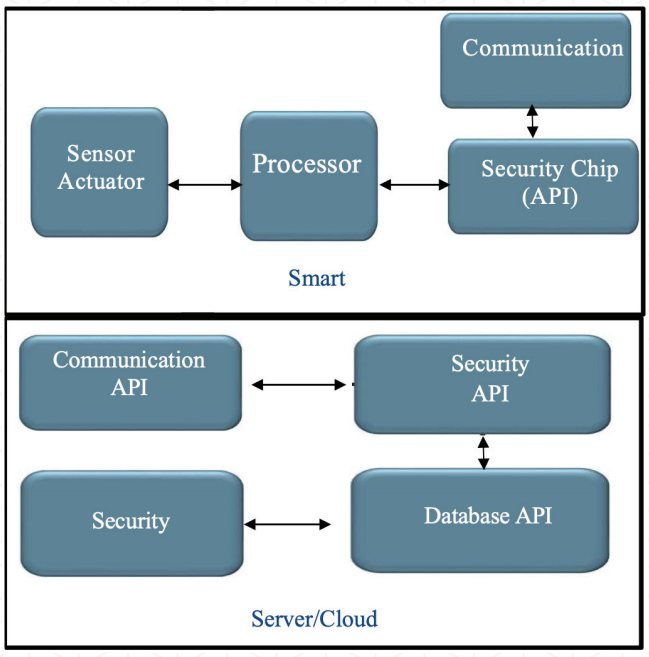
Researchers from Egypt Japan University for Science and Technology developed a classification and prediction method of lung cancer using both Genomic and CT scan Image Analyses, where a fully automated approach for lung tumor segmentation and recognition based on image processing techniques on CT Images, as an alternative approach for an operator-dependent based segmentation method. This approach assisted radiologists to estimate tumor diameter, cross section area, and volume to follow up the diagnosis and patient response to therapy. "CNN approaches were developed for the detection and recognition of small nodules. The analysis and feedback on the developed CAD system confirm that the outcome from the program, obtained consistent results. In addition, another goal of this research is to detect the mutation in the EGFR gene' says Dr. Moataz Abdelwahab – Professor at Egypt-Japan University of Science and Technology, and the project principal investigator. There are four hot spots (exons) that have mutations correlated to the lung cancer. These mutations are present in Exons 18, 19, 20, and exons 21. Each amplified exon was cut from the gel and purified using PCR/Gel extraction kit. The DNA was sent to be sequenced. EGFR mRNA in non small cell lung cancer (NSCLC) vs. small cell lung cancer (SCLC) group, the qPCR analysis unveiled a significant upregulation ($p < 0.05$) of EGFR mRNA in carcinoma tissues of NSCLC relative to their matched normal lung tissues. On the other hand, carcinoma tissues of SCLC compared to the corresponding normal tissues showed significantly decreased levels of EGFR mRNA ($p < 0.05$), as determined by qPCR.



Design and Implementation of hardware Internet of Things (IoT) Adaptive Security Supporting System

Zewail City of Science and Technology and INNOVA

A research team from Zewail City of Science and Technology and INNOVA have implemented an adaptive security level for different applications such as light security (for the Bluetooth and ZigBee connected things), medium security (for the LTE connected things), and high security (for the connected local servers and the cloud server connections). In IoT, security cannot be separated from safety. Whether accidental or malicious, hacking the controls of a pacemaker, a car, or a nuclear reactor places a big threat to human life. Accordingly, one of the major challenges that limits the expansion of the IoT technology is the security aspect. "Security can be performed either in hardware (using dedicated real time ASIC chips) or software (using software authentication API). Both hardware and software security platforms are booming up recently to pave the way for the IoT deployment to move forward. Security strength and the immunity to security attacks depend mainly on the available power budget' says Dr. Hassan Mostafa – Professor at Zewail City of Science, and the project principal investigator. There is always a Trade-off between security level, performance and available resources. In other words, some modes provide high security levels at the expense of high-power consumption and low throughput and other modes provide low power consumption with low security level and high throughput. The Team has chosen three algorithms (ASCON, ACORN, DEOYXS,) with three different security levels to be tested and implemented on ZYNQ FPGA board that is connected to IoT node. Dynamic Partial Reconfiguration (DPR) is utilized to adaptively configure the hardware security module based on the security level needed by the user to secure the data using adaptive security levels.



Meta-Cognitive Module for Optimized LTE/WiFi Coexistence

Nile University

Researchers from Nile university, Egypt University of Informatics and Newgiza university have designed an intelligent network optimization module capable of optimizing the performance of the 4G LTE and the WiFi networks when they are both using the same frequency bands. The ever-increasing demand on communication services, especially wireless connectivity, has made the spectrum scarcity problem more prominent. "The wireless spectrum, or the frequency bands used for communication services, is a limited resource that all wireless networks must share. Therefore, it is crucial to develop innovative tools for efficient spectrum management' says Dr. Amr El-Sherif – Professor at Egypt University of Informatics, and the project principal investigator. To increase its available spectrum resources, the LTE network can use the 5 GHz unlicensed spectrum band which is already used by some WiFi access points. This project tackles the LTE/WiFi coexistence and spectrum management problems by developing a machine learning-based meta-cognitive engine that controls the LTE network's access to the 5 GHz frequency band. The meta-cognitive engine developed can be deployed at the LTE base station, and operates by collecting information about the state of the LTE and WiFi networks to infer their spectrum requirements and then optimizes the LTE operating parameters to maximize the throughput of both networks. While the project has focused on the specific problem of LTE/WiFi coexistence, the developed solution can be considered as a stepping stone towards the development of other intelligent network management tools and fully self-organizing networks.