Use of AI techniques for risk factor estimation and diagnosis of cardiovascular disease from ECG and chest radiograph

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Background

ECGs and chest radiographs (CXRs) are inexpensive, non-invasive, front-line examinations conducted daily in many clinical specialties and, thus, are available in large volumes in the hospitals archives. Both have an extremely high information content which can be exploited by AI techniques to estimate risk factors and diagnose cardiovascular disease. The latter is the leading cause of mortality globally, according to many studies.

Objectives

The main objectives of my research are the development of an AI system exploiting ECGs to predict the risk of relapses following ablation surgeries and the study of how ECGs and chest radiographs can contribute to the prediction of risk of developing acute coronary disease.

Methodologies

The project is divided into phases. The first one comprises the collection of a large quantity of ECGs and CXRs from multiple sources and the identification of possible benchmarks. The second phase involves the identification, or ex novo creation, of AI models suitable for the tasks and, possibly, the design of new methodologies. The third phase concerns the analysis of the obtained results, a comparison with the identified benchmarks and a study on how the developed system/technology can be useful to medical equips.
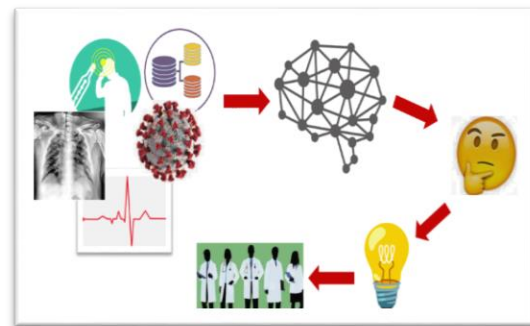

FIGURE 1: PROJECT PHASES

Expected Results and Impact

Having an AI system able to predict the risk of recurrence following ablation surgery would allow the creation of a complete new methodology to stratify operated patients according to their risk of relapse. Consequently, more attention can be paid to the postoperative monitoring and utilization of health care resources of high-risk patients than of low-risk patients.

Moreover, since ECG and CXRs are front-line examinations and are conducted before most interventions, it is possible to develop an opportunistic screening that evaluates various risk factors and returns them to the physicians independently of the diagnostic question. In this way, for example, a patient could be given a warning in case of possible acute coronary artery disease.