Imago - Medical image analysis platform

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Abstract

It´s estimated that 3.6 billion diagnostic X-ray examinations are performed annually in the world and there is a shortage of specialized and qualified professional in diagnosis. The group proposed an application to face this scenario, by identifying, in range 14 chest pathologies, the probability of an x-ray to present these pathologies. The Imago application receives an x-ray, indicates a probability (%) of a pathological condition in that image and shows the location of the regions of interest, helping the application user in analysis prioritization. The application can be used by hospitals, telemedicine companies and educational purposes.

Keywords: Artificial Intelligence, X-ray.

Context

According to Pan American Health Organization, “It is estimated that some 3.6 billion diagnostic X-ray examinations are performed every year in the world.”[i]. Only in United States, “Approximately 400 million diagnostic medical examinations and 150 million dental X-ray examinations are performed annually”[ii].

The amount of data is huge and there is a shortage of specialized and qualified professionals in diagnosis. “Some of the Latin America and Caribbean countries depend at times on outside support to provide services (x-ray), because many do not have the human resources or formal education to instruct personnel.” [iii]

Some courses of action have been identified by the group to deal with this scenario:

- Development of an application to support the x-ray analysis prioritization,
- Identification, in a range of pathologies, the probability of an x-ray to present these pathologies,
- Considering the application detects an x-ray with high probability of pathologies, give the application user the possibility to forward the exam information (or not) to a specialist for a more accurate diagnosis and
- Use of Artificial Intelligence as the background technology.

In this way, the group created the Imago application, a medical image analysis platform, to support doctors and health general practitioner with image diagnosis. The Figure 1 shows the Imago workflow.

Figure 1 – Imago Workflow

Imago application receives an x-ray and indicates a probability (%) of a pathological condition in that image. Besides saying how likely the existence of pathology is, it still shows the location of the regions of interest.

In the School of IA Health Hackathon, the Imago application was trained to identify 14 chest pathologies. During the validation application phase, the tests showed the trained algorithm returns a satisfactory percentage of correct answers. The location of regions of interest functionality showed inconsistent results, and further improvements are required. As for the AI technology, Imago used the MobileNet V2 convolutional neural network architecture, and the grad-CAM technique for visualization, which is related to Explainable AI (XAI), FAT/ML, and GDPR.

The Imago is supposed to be sold to hospitals and telemedicine companies. As the road map, the use of Imago AI technology can be extended to other medical images and bodies regions or even to educational purpose.

[i] https://www.paho.org/hq/index.php?option=com_content&view=article&id=7410:2012-dia-radiografia-dos-tercios-poblacion-mundial-no-tiene-acceso-diagnostico-imagen&Itemid=1926&lang=en
[ii] https://www.omicsonline.org/open-access/radiation-exposure-of-patients-undergoing-common-diagnostic-x-ray-examinations-in-some-major-hospitals-in-visakhapatnam,-india-2168-9784.1000101.php?aid=6363
[iii] https://www.paho.org/hq/index.php?option=com_content&view=article&id=7410:2012-dia-radiografia-dos-tercios-poblacion-mundial-no-tiene-acceso-diagnostico-imagen&Itemid=1926&lang=en