Internet of Things-enabled ultrasound scans: IIT Hyderabad

Remote access It is crucial that internet-enabled scanning devices do a preliminary classification of images, and this calls for intelligent software. | Photo Credit: ADNAN ABIDI

The algorithm can tell kidney cysts from stones

A team of researchers from IIT Hyderabad has been working to use the Internet of Things (IoT) to accurately diagnose kidney and liver disorders with the help of ultrasound scanning devices. What started off as a project to develop a system that will validate the data and do a preliminary scanning of the organ — whether the organ is normal or not — has now developed into technology that can identify kidney stones and cysts and also grade a "fatty liver" classification. The research has been published in *Ingénierie et Recherche Biomédicale* (IRBM) .

Usual handicaps

Diagnosing problems using Internet-enabled scanning systems is fraught with many disadvantages. In the traditional way of processing data, after the patient is scanned, a radiologist usually picks out the most relevant portions or even captures screenshots and makes these available for diagnosis by the specialist.

In the IoT-enabled remote scanning, if the scans are uploaded to the cloud without being first analysed, there is a possibility that the doctor sees a huge amount of data, which they may find difficult to interpret. Sometimes, as Prof. P. Rajalakshmi of the Electrical Engineering Department at IIT Hyderabad who has led the research comments, there is even no organ image within the field of view in the scans uploaded to the web. Therefore, it is crucial that internet-enabled scanning devices must work more intelligently and do a preliminary

classification of images.This was the starting point of the research in 2014. The team aimed to have software which would view the images and classify the kidney images into "normal" and "needs treatment." The research however, went beyond this goal and they now have a deep-learning algorithm which can differentiate between cysts and stones in the kidney images. In fact, they also have trained the software to look at the liver images and classify fatty livers into different grades through an automated recognition process.

"The greatest difficulty was in finding data to train the system. People do not like to share their ultrasound images, hence the data set initially available was really small and not sufficient to cover all the possible patterns [which is necessary for the software to make a good diagnosis]," says Prof. Rajalakshmi. The team was helped in this by two healthcare centres in Hyderabad.

Platform independent

The algorithm that the researchers have developed can be integrated into any platform and is flexible from the point of view of the hardware being used. They have also included a cloud-based authentication feature that allows identification of the operator by means of iris and fingerprint scans.

"There's a need to collaborate with hospitals and with the government and integrate this algorithm with devices. This will make it possible to extend medical support into the rural areas," she says.

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