**Medical Image Analysis**

Computer Vision has not only given us a great surveillance, but it has also done wonder in the field of medical science. In today’s era, AI can diagnose, provide treatment plans and give patient care in ICU. Due to significantly advanced medical image analysis, we can provide patient care in areas where physical doctor cannot reach or there is shortage of doctors in the area.

Image Analysis which is done through Convolutional Neural Networks (CNNs) that is part of deep learning has enhanced the way AI is viewing the CT scan, MRI or ultrasound. Due to the maturation of deep learning (DL), AI can now learn about very complex functions from raw data. This deep learning has help to identify the type of object that is in an image, and the location of it simultaneously. The challenges set forth by ImageNet from 2010 open the door for visual object recognition software. ImageNet created a large community of deep learning researchers to compete and cooperate to improve the techniques of visual recognition. During this period, image classification achieved human-level accuracy. This accuracy often matches or exceeds the level of expert physician with ample amount of data.

The Convolutional Neural Network works like neurons in our brain. They use deep learning algorithms from millions of raw data images to analyze and categorize the images, find data and make diagnosis or prognosis. At first, it was not easy to make AI understand image variance. For example, if the cat in a picture slightly appears on the left rather than middle, the unstructured network will interpret it as completely different pattern or image. Even with little distortion and lighting, the unstructured network needed extensive training with vast amount of data. Due to CNN structed network, these problems are in the past. Now Computer Vision can analyze the Medical Image, along with other features like image registration, image retrieval and image reconstruction and enhancement.

Computer Vision has been applied to many medical fields, such as cardiology, pathology, ophthalmology and dermatology because of the visual pattern-recognition characteristics of diagnosis in these specialties. In recent years, data-efficient echocardiogram algorithms have been developed, such as semi-supervised GANs that are successful in predicting left ventricular hypertrophy. EchoNet-Dynamics – a video based deep learning algorithm was successful in predicting the ejection fraction with a mean absolute error of 6.0% and identifies heart failure with reduced ejection fraction with an area under the curve of 0.96.

Improvements in tissue scanning technologies and CV have promoted AI-driven digital histopathology. It increases the efficiency of discovering new diseases signature and combine pathology with radiology and genomics for better diagnosis and prognosis. Automating morphological feature has given large gigapixel images with limited annotations to deep learning for staining the molecular biomarkers.

Computer Vision have shaped the medical field for better diagnosis. Thes evolution can make prediction about the future of disease. With large-scale detection of malignancies on patients, on time care can be provide for patient. Even with Geno mapping and vast availability of data, which genetic trait will be passed on to offspring can be found. All of this does not come without risks and consequences. Many countries in the world are way behind in keep data and records of local disease and images. Without efficient data to work on, many conditions and factors affecting the specific population cannot be helped through AI. Also, trust is necessary for AI to collect data hand on. From patient to physician, computer scientist, everyone participation is necessary to for success.

Moreover, Image Analysis technique largely rely on raw data and sometime gathering this data is not easy. Due to HIPPA privacy law and patient confidentiality, many time, raw data is not widely available for specific medical condition. Also, due to increasing number of cybercrimes, in near future, if the criminals can reidentify such data, then the patient privacy will jeopardize. Due to the open source of data, the information and study in medical field can be manipulated regarding certain drug or treatment. Many smaller businesses may neglect the metadata and only work with small cluster of data which give them promising outcome to leverage investment. All these raises question, if Medical Image Analysis through CV is necessary for medical purpose or we can rely on old school diagnosis from Physicians.

Many wonders have been done in healthcare due to Computer Vision and more advancement is on its way. With all the achievements, we also must overcome the shortcomings.

Work Cited

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