Medical Image Analysis and Its Clinical Application Based on Data Science

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In the clinical field, information related to numerous pathological states and injuries is acquired on a daily basis in the form of biological, specimen, and imaging data. However, for clinicians and technologists is to diagnose and understand this huge amount of data to more effectively about it, it required them hard work and time-consuming too. This is especially difficult/complex cases, which are assumed to require additional other data, too. To overcome and efficiently understand and analyze data from such a huge amount of data, data analysis, data visualization, and database construction based on data science are very important and expected. Thus, it can be expected a more powerful tool for the computer aided clinical system by AI, which is focused on these days, since it can provide more efficient data analysis and interpretation based on data-Science.

Our laboratory has some project which are focus on the support clinical field based on combine with data-Science and AI, as following:

1. 3D facial morphology analysis and database based on data science and its application for computer aided diagnosis/surgery of oral and plastic surgery fields:

It is well known in clinical field that 3-dimensional facial changes mainly make after oral or plastic surgery due to surgery peering caused by removal or dissection of a part of the face. However, for patients, the changes in their usual facial morphological shape can lead to strong anxiety.

To alleviate this anxiety, it is need for physicians to provide thorough explanations of the approach treatment methods and processes. On the other hand, the way of the explanation is currently subjective and differs from each doctor. If it can be established visualization and data analysis regarding the treatment process of facial changes can be showed, it is highly expected that this will contribute to resolving the above issues. In this study, we are aiming for objective visualization and analysis of facial morphology changes during the treatment process, through data mining, database creation, and data analysis.

2. Automatic extraction of Cardio Thoracic Ratio (CTR) from chest X-ray images and its application for morphometric analysis in pathological diseases:

Cardio Thoracic Ratio (CTR) is an important measure to determine the treatment plan for patients on dialysis therapy, as it is obtained from monthly X-ray PA images. CTR is an obtained measured value from chest x-ray image, is a simple obtained to evaluate the heart size on chest radiographs. However, since the width of the heart and chest is usually measured on the basis of observation in the medical field, there is an important issue of variation in the evaluation of the CTR between measurers. Also, in some cases, there may be a problem that it is difficult to observe key measurement points due to the effect of pleural effusion depending on the radiographic images. In our laboratory, we are developing a database of CTRs measured by physicians and technologists on obtained Chest-X-Ray images, so that the CTRs can be objectively measured by computer and are developing an automatic CTR extraction system.

In this session, we will discuss the role of data science in the medical field and the two items we have described above.