研究集会題目：「人工知能の現在と、次世代への実用化」
ーー医療画像に対する有効な解析手法の開発に向けてーー

日時：2018年8月29日（水）10時00分～17時00分
場所：明治大学先端数理科学インスティテュート　6階603室

Abstract

中根　和昭「病理画像に対する位相幾何学的概念を用いた解析法」

ホモロジーとは位相幾何学という数学分野の重要な概念のひとつである。現在は高度に抽象化されており、初学者が全てを理解するのには非常に困難である。しかし、二次元の場合（画像解析）に応用する場合は、非常に単純である。この概念の源流は「ケーニヒスベルクの橋の問題」（一筆書き）に端を発しており、接触の状態を定量評価する指標とも解釈できる。今回、ホモロジーを用いた画像解析法を紹介し、病理画像をはじめ多くの医療画像への応用を示す。

Kazuaki Nakane “Analytical method using topological concepts on pathological images”

Homology is one of the important concepts of mathematics field called topology geometry.
Currently it is highly abstracted and very difficult to understand everything to the person not specialized in mathematics.
However, in the case of two dimensions (apply to the image analysis), it is very simple.
Because the origin of this concept comes from "Konigsberg's bridge problem" (A stroke of writing), we can interpret as an index for quantitatively evaluating the state of contact.
This time, image analysis method using homology will be introduced and several applications to medical images.

小林　泰之　　（聖マリアンナ医科大学）

Imaging Now in Kanagawa

Luis Diago　(Meiji　Univ.)

A study on data acquisition and its processing to construct a rating system of diagnosis ability

藤田　広志　（岐阜大学）

Current status and future of computer-aided diagnosis (CAD) in clinical

imaging in the new era of artificial intelligence (AI)

Computer-aided detection/diagnosis, so-called "CAD", is rapidly entering the radiology mainstream. It has already become a part of the routine clinical work especially for the detection of breast cancer with mammograms/ultrasound, chest nodule with radiography/CT images, and polyp with CT colonography, in which the computer output is used as a "Second Opinion" in assisting radiologists' image interpretations. Recent powerful AI technology such as deep learning technology advances the development and improving the performance of CAD to the next stage, and sometimes it is called as "AI-CAD". In my talk, current status and its future of AI-CAD will be introduced and some issues to be solved will be also be discussed.

Jun Xu (Nanjin Unv.)

Computational Pathology for Precision Medicine

Computational pathology is the integration of digital pathology with advanced artificial intelligence (e.g., machine learning) technology. Its goal is to use a combination of primary sources of data (e.g., pathology, radiology, clinical electronic medical records, laboratory data, etc.) to achieve more accurate disease diagnosis and optimal clinical care. My talk comprises the following four aspects: 1) what is the computational pathology and how this technology will change the pathologists' role in clinical care; how computational pathology will contribute to precision medicine. 2) our recent works in developing advanced deep learning based approaches for the histopathological image analysis in the cells and tissues level computation; 3) Based on the cells and tissues level computation, PathOmics were developed towards tumor quantification and precision disease diagnosis and prognosis; 4) Our recent work on the fusion of radiological and pathological data for more accurate diagnosis and prognosis.

Nasir Rajpoot (Warwick Univ.)

Histology Footprint Analytics

The human brain is fantastic at recognizing people and objects and building an understanding of the natural world around us. However, the visual cortex is not ideal at objectively measuring

what we see and complex spatial patterns hidden in plain sight cannot sometimes be deciphered by the naked eye. Computational Pathology is an emerging discipline concerned with the study of computer algorithms for understanding disease from the analysis of digitised histology images. I will show some snippets of computational

pathology research in my group to demonstrate the value of analytics of information-rich, high-resolution whole-slide images (WSIs, the so-called Big Cancer Image Data) for cancer diagnosis and prognosis. I will show examples of how histological motifs extracted from digital pathology image data are likely to lead to patient stratification for precision medicine. I will then discuss some of the main challenges in digital pathology and opportunities for exploring new unchartered territories.