00357 AI Empowered High-accuracy Prognosis for Triple-negative Breast Cancer Using Immunofluorescence Images

Yeong Poh Sheng Joe[1], *Frank Guan*[2], *Zhang Jinyan*[2], *Cai Yiyu*[2], *Tan Puay Hoon*[1]

[1]Singapore General Hospital, [2]Nanyang Technological University

Aims: We aim to develop a novel methodology towards accurately predicting disease-free survival for patients with triple-negative breast cancer through analysing multiplex immunofluorescence images with Artificial Intelligence techniques particularly deep learning.

Methodology:
There are four steps in the methodology:
Data Collection and Preparation,
Neural Network Training,
Validation, and
Application.
In the first step, two different types of data, including disease-free survival data and multiplex immunofluorescence image data, were collected from a group of patients with triple-negative breast cancer, representing the training dataset. Next, the training dataset acts as input to train a neural network with algorithms to derive the relationship between detected features from the immunofluorescence images and the survival rate data of the patients. Similar data from another group of patients (testing dataset) were used to validate and improve the trained neural network. Upon completion of the neural network training, disease-free survivals of new patients can be predicted by analysing their breast cancer immunofluorescence image data with the trained neural network as a data-driven approach.

Result: The medical and breast cancer immunofluorescence image data for 92 patients were used as training data, and the dataset for another 8 patients were used as testing data. With the trained neural network, >=96% evaluation accuracy was achieved on the testing dataset.

Conclusion: Our results show that by analysing the multiplex immunofluorescence image data with deep learning techniques, the disease-free survival rate of patients with triple negative breast cancer can be predicted at high accuracy. The systematic methodology developed in the research can be further extended to enhance diagnosis and prognosis for other diseases.