醫療領域未來之星 智慧醫療 iDeepCare

文／高儷玲

本校數據科學與工程研究所曾新穆教授，帶領團隊執行科技部的「iDeepCare」計畫，藉由醫療影像、生理訊號、病歷醫囑等多面向資料進行探勘分析及機器學習建模，針對慢性病、癌症、突發性疾病等重要疾病，建立兼具高準確性及即時性的早期健康風險偵測與警示系統。而此計畫不僅成功獲選為「科技部 2018 未來科技突破獎」，更在發表於醫學消化內科全球排名第一的期刊 Gastroenterology (Impact Factor: 19.233)後，榮獲美國路透社專欄越洋採訪，備受肯定。

「iDeepCare」計畫的目標是結合深度機器學習和巨量資料分析技術研發智慧型深層健康照護系統，與國內醫療機構和專家合作，收集各種生醫原始資料建立模型，能實際應用於精準醫療、預防保健、個人化醫療、風險預測等，例如：與三總合作用大腸內視鏡影像建立開發大腸息肉 AI 辨識模型，可輔助醫師辨別息肉的良惡質性，準確率可以達到 96%，判讀速度可達 0.5 秒以下的即時性；另外和北榮合作心律不整預警系統，則能預測高風險猝死的布魯蓋達氏症候群心電圖表現，一般內科訓練醫師判斷準確率只有 47.5%，透過 AI 機器卻可達 75%。

談及本次計劃與多家醫療機構合作，曾新穆教授表示，過去在軟硬體環境尚未成熟時，相關發展受限於運算速度、模型建立等問題，而如今隨著人工智慧相關技術日益進步，漸漸開始與一些國際知名的研發機構合作，並運用數據科學協助改善經營管理及提升創新應用，才有今日與多家醫療院合作的緣分。

面對外界質疑台灣相對於美國、中國等大國運算資源較不足，要如何在人工智慧領域中競爭，曾新穆教授則說：「我們能靠演算法的設計及領域知識的結合取勝，像是智慧醫療領域，台灣的醫療人才非常強，結合夠深的領域知識，搭配良好設計的演算法，我們比起其他大國也不會遜色。」

過去不少醫療診斷因為誤診或未能及早發現，不僅造成病情更為嚴重，也增加醫療資源的消耗。而 iDeepCare 系統及相關技術可整合開發為智慧醫療領域所需要的智慧型診斷輔助系統，在醫療照護端可降低誤診率及提高診斷效率。在產業應用性上，在病人端可及早發現疾病及早治療並降低醫療耗費；在資訊服務產業則可擴展開發為各種醫療分析系統，與現有的 HIS 醫院資訊系統、PACS 影像系統、CIS 臨床資訊系統等相結合及加值，並可拓展至全球之智慧醫療產業。

AI Medical's Future Star, iDeepCare

The Ministry of Science and Technology research project "iDeepCare" led by Dr. Vincent S. Tseng, the Professor of the Institute of Data Science and Engineering of National Yang Ming Chiao Tung University, aims to develop an Intelligent Deep-level Healthcare system and mechanisms based on artificial intelligence (AI) technologies through clinical physiology, medical imaging, and medical advice literature to increase the accuracy and efficiency of biomedical data analysis, such as in chronic diseases, cancer, and suddenly critical illness. The iDeepCare project was awarded with FutureTech Breakthrough Award by Ministry of Science and Technology in 2018. Furthermore, part of this work was published in Gastroenterology (Impact Factor: 19.233), the top journal in the field of gastrointestinal diseases. Dr. Tseng was later interviewed by Reuters too because of his significant achievements on this work.

Working with domestic medical care institutions and experts, the objective of iDeepCare is to combine Machine Learning and Big Data Analytics to develop a smart healthcare system. By constructing models based on big data of biomedicine, it can be applied in the field of precision medicine, healthcare prediction, personalized medicine, and disease early detection. The smart healthcare system with high accuracy of early detection for health risks is expected to result in significant contributions in the field of precision medicine. Take Dr. Tseng's project as an example, the application of AI in colorectal polyp detection established together with Tri-Service General Hospital can help doctors identify the histological type of polyps with 96% accuracy within less than 0.5 seconds. Another collaboration project his team worked together with Taipei Veterans General Hospital has developed an arrhythmia warning system. It can predict a high-risk cardiovascular disease called Brugada syndrome (BrS) with an accuracy rate of 75% through AI machines, whereas only 47.5% of an accuracy rate is estimated by licensed physicians because of the complexity. Dr. Tseng said that this project would have been limited in the past because the relevant technology was underdeveloped, and it would encounter difficulties such as computation speed and model construction. Now with the advance of AI, he and his team have started collaborating with world-renowned research institutions using data science methods to enhance management and innovations of the fields in biomedicine. That brought them the opportunities to work with many medical institutions later on.

Considering that Taiwan's computational resources are limited compared to other countries like America and China, many people have questioned our potential in the AI market. In response to that concern, Dr. Tseng held a positive view of the future. He said, "Algorithm design and domain knowledge play vital roles in Taiwan's AI future development. For instance, we have distinguished human resources in the medical field so that we can combine knowledge in medicine with well-designed algorithms to outperform in the market". In the past, patients might have been misdiagnosed from time to time. It could cause more serious conditions and more unnecessary resources are consumed in medical care. iDeepCare and the underlying technologies can lower misdiagnosis rates and enhance higher accuracy and efficiency of biomedical data analysis. This smart system can be applied in many aspects in the medical field. For example, patients are likely to be diagnosed earlier and spend less medical treatment fees. Furthermore, medical analysis systems in information services can be combined with Hospital Information System (HIS), Picture Archiving and Communication System (PACS), and Clinical Information System (CIS) to expand AI in medical development globally.