

Smart Medicine Platform and Applications Using Deep Machine Learning and Big Data Analytics Techniques

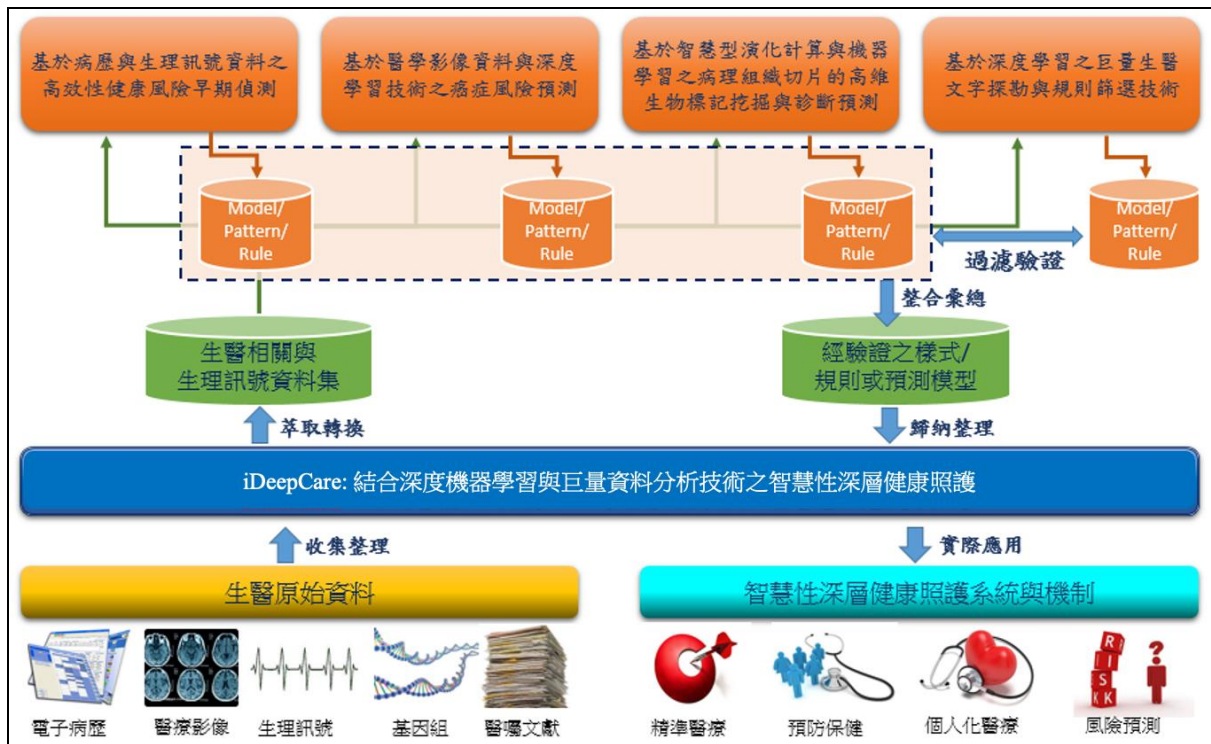
This research aims to apply the innovative techniques of deep learning and big data analysis methodologies to develop an Intelligent Deep-level Healthcare system and mechanisms named iDeepCare. We collaborate with various medical institutions focusing on the extremely vital disease of chronic diseases, cancers, and spasmodic diseases. Also, explore the clinical physiology, medical imaging, genomics, and medical advice literature to find the risk models of the early lesions and biomarkers. This timely warning system with high accuracy of early detection of health risks will greatly reduce mortality rates and medical costs. We build prediction models for chronic diseases and spasmodic health risks using deep learning and high-efficient early prediction methods with the clinical history and the physiological signal.

- **Early health risk prediction based on the clinical history and vital sign data**
We build prediction models for chronic diseases and spasmodic health risks using deep learning and high-efficient early prediction methods with the clinical history and the physiological signal.
- **Cancer risk prediction based on medical images and deep learning techniques**
This research is based on the image analysis techniques of Convolution Neural Network's (CNN) implementation of cancer ultrasound and positron tomography angiography, combined with patients' clinical data to help physicians predict the recurrence and the treatment outcome, cancer staging and do the diffusion prediction.
- **High-dimensional biomarker mining and diagnostics prediction of cell-level images based on the intelligent evolutionary algorithm and machine learning**
We use the innovative computer-aided diagnosis system for staining pathological images to predict the lesions of cancer patients to reach the goals of a precise medicine.
- **Medical textual pattern mining based on deep learning techniques**
We use deep learning methods to solve the modeling problem of past model construction in text mining. The intercept style rule will be obtained through deep learning directly from a large number of medical literature and then optimize the recognition results.

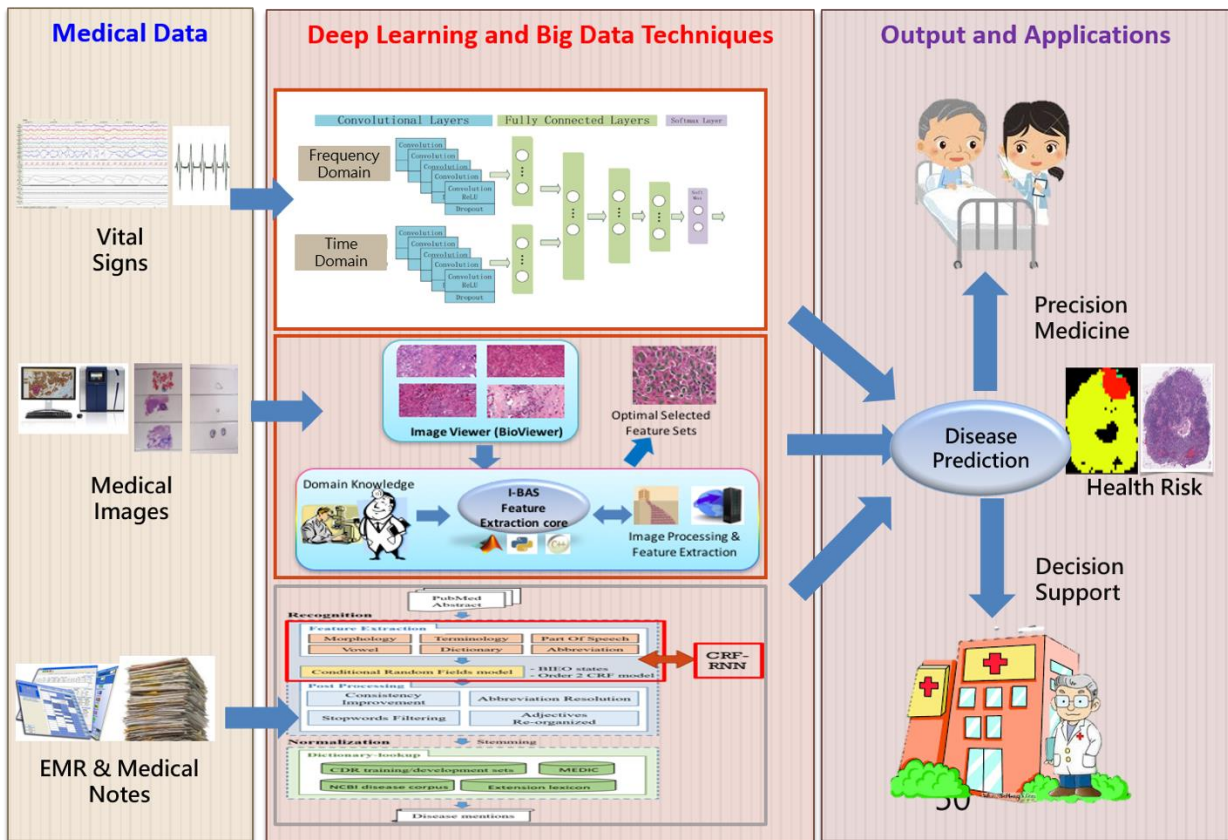
結合深度機器學習與巨量資料分析技術之智慧醫療系統平台與應用

本研究為運用創新之深度學習及巨量資料分析技術，發展具智慧性之智慧醫療系統平台稱為 iDeepCare，並與國內多家醫療院所合作，針對慢性病、癌症、突發性疾病等三類極重要疾病，由臨床生理、醫療影像、醫囑文獻等面向探勘疾病早期病灶/生物標記以及突發性風險模型，建立兼具高準確性及即時性之早期健康風險偵測與警示系統，將可大幅減少疾病致死率及醫療耗費，本研究包含以下核心技術：

- **基於病歷與生理訊號資料之高效性健康風險早期偵測**：發展以深度學習(Deep Learning)為基礎及平行化之高效率早期預測(Early Prediction)技術，由臨床病歷及生理訊號資料中探勘出慢性疾病之早期病灶以及突發性健康風險預測模型。
- **基於醫學影像資料與深度學習技術之癌症風險預測**：運用深度、機器學習分類器發展高準度之醫學影像的辨識技術，並探討診斷癌症腫瘤是否發生轉移及患者預後相關性分析等議題。
- **基於智慧型演化計算與機器學習之病理組織切片的高維生物標記挖掘與診斷預測**：研發病理組織切片 HE 染色影像的自動通適化影像分析技術，包含染色影像的生物特徵擷取程式庫、切片影像生物標記挖掘方法、最佳化的高維資料機器學習方法，達到癌症疾病的最佳化分類預測目的。
- **基於深度學習之巨量生醫文字探勘與規則篩選技術**：發展高準度及自動化之深度文字探勘技術，並建構醫病社群資料集收集系統，達到自動化疾病標記之功能。



iDeepCare Framework.



Applications of iDeepCare.