Session 1.1 Artificial Intelligence in Medicine

Time & Location: 14:10-15:40, Nov. 30, L009

Chair: Bae-Ling Chen (陳柏淩)

(1) Using Machine Learning Algorithms in Medication for Cardiac Arrest Early Warning System Construction and Forecasting

Hsiao-Ko Chang (National Taiwan University), Cheng-Tse Wu (National Taiwan University), Ji-Han Liu (National Taiwan University), and Jyh-Shing Roger Jang (National Taiwan University)

Target—This study focuses on an establishment of drugs for cardiac arrest early warning system, it can assist physicians to early judgment state of an illness and immediately warning, increase sensitivity and decrease false positive rate and mortality rate, then greatly improve medical quality. Therefore, this study aims to establish a Medication for Cardiac Arrest Early Warning System(MCAEWS), then it based on a machine learning algorithm using five drugs as an important factor to predict cardiac arrest. In order to explore whether the influence of drug as factors also relatively increase the accuracy of prediction. Methods—In this study, the data from the emergency department of National Taiwan University Hospital. It was used as the main axis, from January 2014 to December 2015. The patients who stayed in the general emergency area for more than six hours during the two years. They were included in the retrospective cohort study. As comparative measures, we used the machine learning models, the Area Under the Receiver Operating Characteristic Curve (AUROC) and the Area under the Precision-Recall Curve (AUPRC).

Results—The data were analyzed for CPR and non-CPR groups respectively. Furthermore, we evaluated sensitivity and specificity. The Random Forest Algorithm (AUC: 0.98; AUP: 0.23) significantly outperformed a Logistic Regression algorithm (AUC: 0.94; AUP: 0.13), Decision Tree (AUC: 0.97; AUP: 0.05), and Extreme Random Tree (AUC: 0.91; AUP: 0.08). Because of increase drug factors compared with the previous without drug factors.

Conclusion—Increasing the drug factors in vital signs, it effectively improved the accuracy of predicting cardiac arrest. The results of this study, it was for emergency clinical Physicians and hospital quality management will effectively solve clinical medical resource allocation issues and improve hospital medical quality through decision support systems.

(2) Adverse Drug Reaction Post Classfication with Imbalanced Classification Techniques

Chen-Kai Wang (Chunghwa Telecom Laboratories), Hong-Jie Dai (National Taitung University), Feng-Duo Wang (National Taitung University), and Emily Chia-Yu Su (Taipei Medical University)

Nowadays, social media is often being used by users to create public messages related to their health. With the increasing number of social media usage, a trend has been observed of users creating posts related to adverse drug reactions (ADR). Mining social media data for these information can be used for pharmacological post-marketing surveillance and monitoring. However, the development of automatic ADR detection systems remains challenging because the corpora compiled from real world social media were usually highly imbalanced resulting in barriers to develop classifiers with reliable performance. In this work, we implemented a variety of imbalanced techniques and compared their performance on two large imbalanced datasets released for the purpose of detecting ADR posts. Comparing with state-of-the-art approaches developed for the two dataset, based on much less features, the developed classifiers with implemented imbalanced classification techniques achieved comparable or even better F-scores. Data collected from the real world social media is usually very large and highly imbalanced. In order to establish a classifier for data as such, applications of imbalanced strategies are required. This work is beneficial as all studied methods were used in practice for handling imbalanced data sets, and our results can provide an empirical guidance to practitioners on how to determine the most suitable imbalanced method for their textual data collected from social media and apply them to tasks such as digital pharmacovigilance.

(3) Adaptive Generation of Structured Medical Report using NER regarding Deep Learning

Cheng-Tse Wu (National Taiwan University), Hsiao-Ko Chang (National Taiwan University), Ji-Han Liu (National Taiwan University), and Jyh-Shing Roger Jang (National Taiwan University)

The structured electronic medical record is the basis for computers to process and achieve the target of precise diagnosis and treatment automatically using the knowledge and features of the techniques such as machine learning and artificial intelligence (AI). Because of the increasing demands on improving the efficiency and the flexibility during the step or phase of classification and extraction, providing the expansion mechanism for the automatic adaption of new NER (Named Entity Recognition, NER) model training during the NER model training stage anytime when the new entities/tags shall be learned and classified and hence the related knowledge database (DB) shall be expanded automatically. The proposed method includes a training stage involving the step of adaptive-improved NER model training for the chest x-ray medical reports/files and a test stage involving the step of the dependency parsing and the relation extracting to be perform sequentially, and thus the goals of automatic information extraction and structured medical report generation using the machine learning technique, and the optimization and accuracy improvement of the doctor's work and performance through referring to the structured medical report for diagnosis and treatment can be achieved.

(4) Tongue Fissure Visualization with Deep Learning

Wen-Hsien Chang (China Medical University), Hsueh-Ting Chu (Asia University), and Hen-Hong Chang (China Medical University)

Tongue diagnosis is a unique practice in traditional Chinese medicine(TCM), which can be used to infer the health condition of a person. However, different TCM doctors may give different interpretations on the same tongue. If an artificial intelligence model can be developed based on a large number of doctor-interpreted tongue images, a more objective judgment will be obtained. Deep learning in artificial intelligence has excellent performance in image recognition, and feature extraction can be done automatically by deep learning without image processing experts. This study attempts to develop a deep learning model through a large number of tongue images, especially for tongue fissures. We also visualize the fissure regions with Gradient-weighted Class Activation Mapping(Grad-cam). Therefore, the model not only try to detect tongue fissures but also localize tongue fissure regions.