Medical Decision Science Association of Taiwan

Meeting minutes （organize by the International Affairs Committee & Issues Committee & Strategy Committee)

Topic	Taiwan-Mongolia International Collaboration on Liver Cancer
Location	Online Zoom Meeting
Date	15 March, 2023
Time	Taiwan time 13:30-14:30pm
Moderator	Prof. Chi-Chang Chang
Recorder	Ms. Chih-Han Huang
Attendees	Prof. Hao-Yun Kao, Prof. Chi-Jie Lu, Prof. Hsi-Chieh Lee, Prof. Yi-Ju Tseng, Chun-Ju Chiang PhD, Prof. Gin-Den Chen MD. PhD
absence	Dr. Chun-Chia Chen, Wen-Chien Ting MD. PhD

Discussion

1. For Dr Bolormaa's proposal, some suggestions provide by International Affairs Committee Prof. Hsi-Chieh Lee, Prof. Yi-Ju Tseng, Chun-Ju Chiang PhD, and Wen-Chien Ting MD, see Appendixes (Ⅰ).
2. Prof. Hao-Yun Kao: In the three-year cooperation proposal, it is proposed to adopt a traditional three-sections and five-level public health system. These three sections are prevention, treatment and rehabilitation (continuous care)
3. Prof. Yi-Ju Tseng: The feasibility of presenting the data and the mastery of the time will avoid delaying the progress of the data implementation.
4. Chun-Ju Chiang PhD: Mongolia's liver cancer incidence is high. What are the risk factors for liver cancer? Does Mongolia want to focus on the concept of prevention to reduce mortality? How long can clinicians live to predict? How long can they live after receiving treatment?
5. Prof. Chi-Chang Chang: It is recommended that data from the Mongolian Statistical Center be included in this project for analysis.

Decision

1. Prof. Chi-Chang Chang provided the structure of the previous cooperation project in Thailand, using the frame filling method, please fill in Mongolia appropriately。

Appendixes (I)

1. Introduction by Prof. Chi-Chang Chang

Indeed, I am surprised that Mongolia has the highest incidence and mortality of liver cancer. In 2020, 85.68% of people were diagnosed and 80.58% died from liver cancer. Meanwhile, the Ministry of Science and Technology (MOST) of Taiwan has signed a technological cooperation agreement with Mongolia's Ministry of Education, Culture, Science and Sport of Mongolia (MECSS) and the Mongolian Foundation for Science and Technology (MFST) to promote bilateral academic exchange and development, as bellow information. In the long-term development policy, "Vision-2050" (the Parliament resolution no 52, 2020), it may be possible for us to contribute to this issue. Considering your experience at the National Cancer Center, I would appreciate hearing what your thoughts on this. And I will be pleased to share some experiences about cancer control, if necessary. Just let me know.

~ email to Prof. Dr. Erdenekhuu Nansalmaa (Director General, National Cancer Center of Mongolia),

January 31, 2023

https://www.nstc.gov.tw/folksonomy/rfpDetail/e7688e16-1a3c-4787-b809-fa0f2ec8ae1d

A. This announcement is made in accordance with the official document of the National Science and Technology Council.

B. Introduction

(1) The National Science and Technology Council has signed a technological cooperation agreement with Mongolia's Ministry of Education, Culture, Science and Sport of Mongolia (MECSS) and the Mongolian Foundation for Science and Technology (MFST) to promote bilateral academic exchange and development.

(2) Cooperation field:

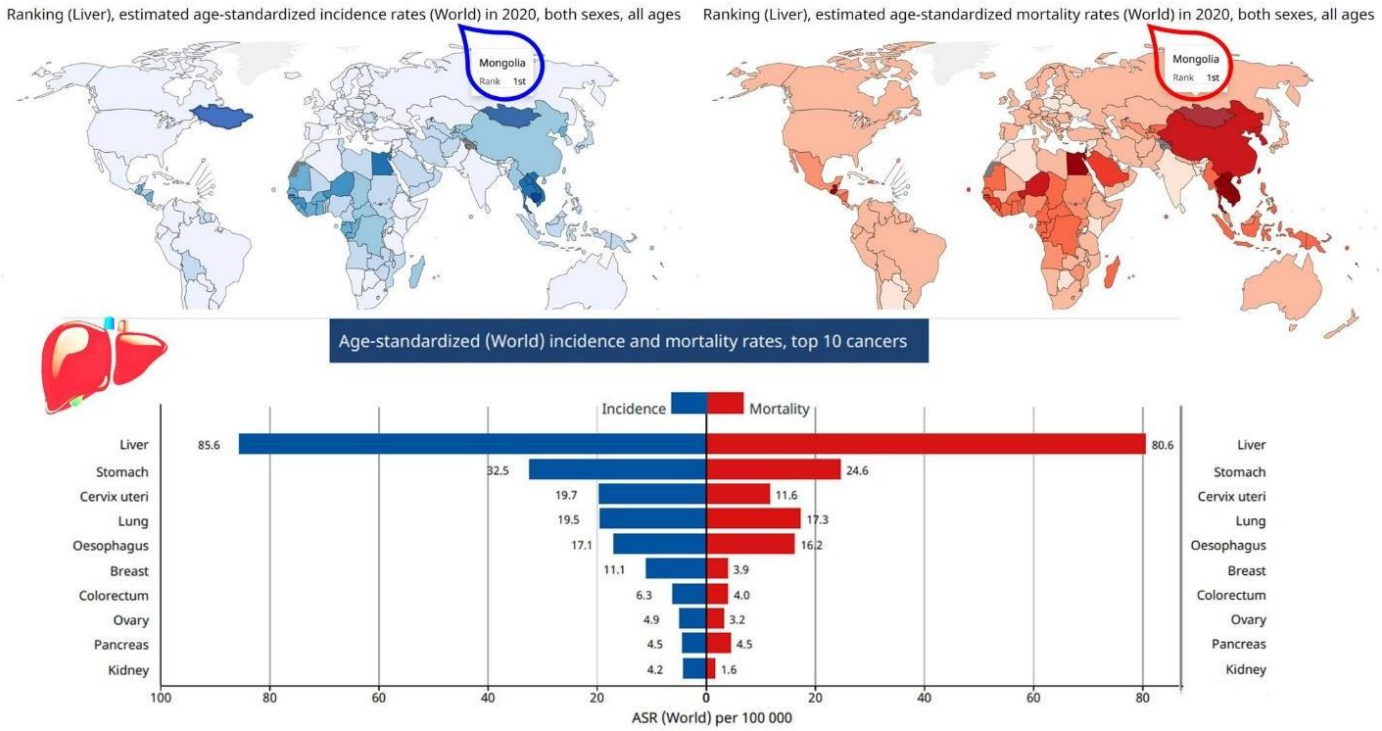
- Biotechnology, Bio-medical Science and Traditional Medicine
- Artificial Intelligence, Internet of Things, Smart Machines
- Innovative Science Education and Entrepreneurship
- Green Energy and Ecology
- New Agriculture and Recycling Economics
- Afforestation, Forest Restoration

(3) Qualifications of principal investigators from Taiwan: Only principal investigators currently implementing MOST-funded research-category projects are eligible. The projects referred to in the preceding do not include the planning of promotion projects, international cooperation projects under bilateral agreements, or industrial-academic cooperation projects. These projects should be relevant to the research topics of the proposed international cooperation projects.

(4) If it is necessary to allocate budget for administrative expenses, please refer to the relevant National Science and Technology Council procedure.

C. Application instructions and deadline applicable

Please be sure to log in to the National Science and Technology Council Research Personnel Portal, complete the form and upload all required documents in both English and Chinese by Wednesday,2023/4/20. As requiredby National Science and Technology Council regulations, make sure that the uploaded documents are consolidated into a single file. Please note that no late applications will be accepted.



2. Research concept by Dr. Bolormaa

Title: Concept Paper on Liver Cancer Issues in Mongolia

~ provide by Dr. Bolormaa March 9, 2023

Background/Rationale

AI can perform a combined analysis of radiological, clinical, and histological data, producing information that can aid in diagnostic accuracy, tumor staging, treatment planning using segmentation methods, and assessing the presence of microvascular invasion, in addition to providing a prognostic estimate[1].

The adaptation of artificial intelligence algorithms to various tumor prognosis models is in high demand.[2]

Objective

Aiming to contribute for the liver cancer prognosis by using machine learning models.

Method

The following machine learning methods can be applied which used in the study by the Wang et al 2021[2].

Machine Learning the decision tree (tr) is a graphical method for supervision learning. It employs probability analysis to compute the expected value of a net present value, assess project risk, and determine feasibility based on the probability of occurrence among various cases[2].

A well-known machine learning technique is logistic regression (lr). Its main use is to solve the two-category problem. In the regression, an eigenvector is fitted to the category label, converting the classification problem to a regression problem. This is typically achieved by introducing a logistic smoothing function.[2]

A random forest (forest) is a classifier that contains multiple decision trees and categorizes its output based on the number of individual tree outputs[2].

LightGBM (gbm) is a machine learning algorithm that ascends. It's useful for sorting, categorizing, regression, and a variety of other machine learning tasks. Decision on Gradient Boosting Tree Classification (Gbdt): Each tree can be fitted to the negative gradient of the loss function of the model.[2]

Data Analysis

The data were processed in R and the measured data are

expressed as “mean±SD”.A t-test was performed, and the count data are expressed as (n), percent (%), and a chisquare test. A difference with p<.05 was considered statistically significant. Machine learning modeling was done with python. A Pearson correlation analysis was also performed. The machine learning models were based on the following models: Decision Tree, Logistic Regression, Random Forest, LightGBM and GBDT.

Data Availability

We will use main cancer registration database plus selected ward/department clinical database and patient history paper forms.

The database must be include patients’ clinicopathological parameters recorded,

including basic demographic data, HCC etiology, liver function, tumor characteristics, tumor morphology and expansion, serum AFP levels and portal vein thrombosis etc.

References

1. Pérez, M.J. and R.G. Grande, *Application of artificial intelligence in the diagnosis and treatment of hepatocellular carcinoma: A review.* World journal of gastroenterology, 2020. **26**(37): p. 5617.
2. Wang, Y., et al., *Predicting postoperative liver cancer death outcomes with machine learning.* Current Medical Research and Opinion, 2021. **37**(4): p. 629-634.

Appendix 1

Proposed Team from Mongolia

PI		
Co-PI		
Co-PI		
Researcher		
Researcher		

3.some suggestions provide by International Affairs Committee

Provide by Prof. Lee March 12, 2023

How can AI help in solving (alleviating) Mongolia's liver cancer problem?

AI can play a significant role in helping to address Mongolia's liver cancer problem in several ways:

1. **Predictive modeling:** AI can also help in predicting the risk of liver cancer in patients with chronic liver disease, such as hepatitis B or C, by analyzing various risk factors and patient data. Such predictive modeling can assist in identifying high-risk patients who may require more intensive surveillance or intervention.
2. **Early Detection:** AI algorithms can analyze medical imaging data, such as MRI and CT scans, to detect signs of liver cancer at an early stage when treatment is more effective. AI can also analyze medical records and other data sources to identify patients who may be at high risk of developing liver cancer, allowing for early interventions to prevent the disease.
3. **Diagnosis:** AI-powered diagnostic tools can analyze biopsy samples and other medical data to accurately diagnose liver cancer. This can help physicians make more informed decisions about treatment and improve patient outcomes.
4. **Telemedicine:** AI-powered telemedicine can help connect patients in rural areas of Mongolia with doctors and specialists in urban areas. This can improve access to care for patients with liver cancer who may live far from medical centers.
5. **Treatment Planning:** AI can help develop personalized treatment plans for patients with liver cancer by analyzing large amounts of patient data to identify the most effective treatment options based on individual patient characteristics.
6. **Drug Development:** AI can be used to identify new drug targets and develop more effective treatments for liver cancer. By analyzing large amounts of genomic and molecular data, AI can identify specific genes and proteins that are involved in liver cancer and develop targeted therapies to inhibit their activity.
7. **Public Health Planning:** AI can help public health officials in Mongolia to identify high-risk populations, predict disease outbreaks, and develop targeted interventions to prevent the spread of liver cancer.

Provide by Dr. Chiang March 13, 2023

Data items should be accompanied by a codebook that specifies their meaning and code in the proposal. For instance, HCC etiology could be coded as HBV+/-, HCV+/-, NBNC, or other codes.

Do they have the AJCC stage or BCLC stage for liver cancer patients?

Provide by Prof. Yi-Ju Tseng March 13, 2023

I am not sure about the word limit or any other requirements of this proposal, but I think the following details should be added:

1. The definition of "cancer prognosis". We should clearly define the target of prediction.
2. Based on the definition, the expected number of patients in the registration database and cynical database.
3. The period of data.
4. How to convert data to digital format from the "history paper forms"
5. The clinical impact of predicting "liver cancer prognosis".
6. Model evaluation strategy. Do they have data from multiple hospitals?

Provide by Dr. Wen-Chien Ting March 15, 2023

I am not sure about the word limit or any other requirements of this proposal, but I think the following details should be added:

1. 第一點: 肝癌的預測，在台灣已經有很多資料了，不太需要用人工智慧，可能不需要列入，直接用台灣資料即可
2. 肝癌的診斷主要是在影像上(CT, Sonography) 並不是在病理上，故第三點病理切片的判讀可能沒有那麼需要

