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| **ITU-T Focus Group on AI for Health** |
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| **Title:** | Proposal: Applying AI to Provide Clinical Decision Support |
| **Purpose:** | Discussion |
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| **Abstract:** | This submission is in response to the ITU-T Focus Group on Artificial Intelligence for Health (AI4H)’s call for proposal on use cases and data. It presents a solution by using AI technology for clinical decision support. Clinical decision support system (CDSS) is an essential assistant tool to increase the primary healthcare level and benefit the patients, doctors and the public health management. It is a critical need and going to be deployed into thousands of primary clinics in China. However, there is still no international standards for this kind of systems, and even no well-defined interface to various hospital information systems (HIS).  |

**Overview**

*Please give a general overview of the project, and describe what health problem it is attempting to contribute to solve.*

With the development of medical disciplines, most clinicians only have the medical knowledge of their own profession, and they are very knowledgeable about the relevant and interdisciplinary clinical knowledge beyond their own professional scope. According to the patient's general condition and subjective will, clinicians could make more scientific and reasonable decisions with interdisciplinary clinical knowledge and practical experience, overall planning capability. Because in the clinical scenario, the clinical manifestations of patients is often complicated.In addition, the differences knowledge level and clinical experience of clinicians have also led to uneven medical service qualities, which means the increasing rate of misdiagnosis, missed diagnosis, and unnecessary medical expenses. These conditions indicate that we need an efficient method to inheriting the clinical experience of excellent clinicians in the aim of improving the overall medical level.

CDSS, Clinical Decision Support System could resolve the above mentioned challenges. It’s not a simply information inquiry system but a knowledge-based decision-making engines based on authoritative, professional medical knowledge network. The engine is a large auxiliary decision making capabilities container for clinical scenarios. This engine can provide multiple decision making support such as diagnosis, treatment, care, surgery, rational use of medicine, etc. to doctors, pharmacists, nurses and even patients. It will provide a variety of methods, including recommendations, reminders, alerts, and forecasts to support clinical decision making.

Traditional CDSS builds expertise and rules based on the design principles and methods of expert systems from the top-down to simulate the clinical decision-making process of medical experts. Although this method is authoritative, credible, and accurate in reasoning, it is often inefficient in knowledge construction and with limited information coverage for decision making. With the continuous increasing of investment in medical informatization by medical institutions, digital medical data has been accumulated in large scale in clinical work in recent years. Therefore, it is feasible and meaningful to explore and implement AI-based CDSS to accelerate and improve the efficiency of clinical diagnosis and treatment, improve clinical outcomes, and indirectly control medical expenses and reduce medical costs.

Figure to be added soon.

**Figure 1.** Framework AI based CDSS.

# Impact

*Please explain the significance of the problem and describe the potential impact of the project. Please also provide a brief overview of existing work in the area of the project, and describe the current state of the art of how the problem is currently addressed.*

Clinical decision support system (CDSS) is an essential assistant tool to increase the primary healthcare level and benefit the patients, doctors and the public health management. It can improve the efficiency and accuracy of clinical diagnosis with experience learnt from thousands of textbooks and millions of previous medical records. Therefore, it could help to elevate the healthcare level in a nation and even the whole world. Meanwhile, less misdiagnosis and less medicine can also reduce the cost to the patient and govement.

# Existing Work

*Does the project start from scratch, or are there preliminary experiences?*

Cooperating with healthcare experts, Baidu built an evidence-based CDSS framework and made the results interpretable which based on medical knowledge map and clinical practices. The main functions of CDSS are auxiliary diagnosis, treatment advices, 病历内涵质控提醒, rational use of medicines and other clinical assistant decision-making functions for physician and pharmacist. Take the diagnosis feature for example, after 10 million desensitization clinical data training, the training results of the feature have exceeded the level of low-grade physicians. And the feature covers more than 4,000 diseases in 27 standard departments with over 92% of diagnostic accuracy rate in 3 top diseases.

Feasibility

*Is the project feasible, based on the current state of the act?*

Relying on powerful computing power of Baidu, the accumulation of AI technology for 20 years, and the massive data covering the whole internet, as well as the deep cooperation with the top hospitals, we can build the largest, most authoritative, professional, and rapidly updated medical knowledge map in Chinese efficiently. Our AI-based evidence-based CDSS engine is supported by the largest-scale medical depth semantic representation model.

# Data Availability

*Please describe the data sets that are available for the project. In particular, please explain whether there are high quality open data sets for training purposes that are available, and / or whether you would be able to contribute to an open data set for training purposes. Please also describe what (undisclosed) test data would be available for an evaluation. For any data set, please describe briefly if and how the data have been annotated.*

*[NOTE: This is where a link to the data submission document could be made, but it is suggested that very detailed information about the data is only provided after the preliminary acceptance of the proposal for further consideration.]*

**To be discussed during the conference.**

**We have the data for training and benchmarking, however there medical data is restricted by national and international laws, we wish the FG can have a general guideline to give a common agreement on the sensitive medical data sharing.**

# Benchmarking

Please describe what you expect participants in the benchmarking process to submit. Please also describe how the submissions should be evaluated, and why.

**To be discussed during the conference.**

**We have the data for training and benchmarking, however there medical data is restricted by national and international laws, we wish the FG can have a general guideline to give a common agreement on the sensitive medical data sharing.**

# Organizer Details

Please describe why your organization is interested in this project, and if you have run similar projects / benchmarks / challenges before.

The document is proposed by Baidu, which is an international company with leading AI technology and platforms.

Since 2016, Baidu has positioned AI as a strategic driver for the development of its business. Under the strategy of “strengthening the mobile foundation and leading in AI”, Baidu has steadily improved its AI ecosystem, with productization and commercialization continuing to accelerate.

As integral components to its overall AI ecosystem, Baidu has developed two open ecosystems - the Apollo open autonomous driving platform and DuerOS, the company’s conversational AI system, which operates in two important scenarios – intelligent driving and smart homes. So far, with its latest iteration – “Apollo 3.0”, Baidu’s autonomous driving platform has brought together over 130 partners and has been granted the first batches of licenses for autonomous driving public road tests from Beijing, Chongqing and Fujian. In the smart living field, Baidu has co-launched over 160 DuerOS-powered hardware products, covering smart speakers, children’s wearables, televisions, automobiles, hotels and other vertical businesses. In September 2018, the install base of DuerOS reached 141 million devices with over 800 million voice queries. After years of commercial exploration, Baidu has formed a comprehensive AI ecosystem and is now at the forefront of the AI industry in terms of fundamental technological capability, speed of productization and commercialization, and “open” strategy. In the future, Baidu will continue to enhance user experience and accelerate the development of AI applications through the strategy of “strengthening the mobile foundation and leading in AI”.

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| **Organization Name** |  |
| **Contact Name** |  |
| **Contact Email Address** |  |
| **Contact Phone Number** |  |
| **Project Title** |  |

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