ISO/IEC JTC 1 SC 42 Artificial Intelligence – Working Group 4

Use Case Submission Form

The quality of use case submissions will be evaluated for inclusion in the Working Group's Technical Report based the application area, relevant AI technologies, credible reference sources (see References section), and the following characteristics:

— Data Focus & Learning: Use cases for AI system which utilizes Machine Learning, and those that use a fixed *a priori* knowledge base.

— Level of Autonomy: Use cases demonstrating several degrees (dependent, autonomous, human/critic in the loop, etc.) of AI system autonomy.

— Verifiability & Transparency: Use cases demonstrating several types and levels of verifiability and transparency, including approaches for explainable AI, accountability, etc.

— Impact: Use cases demonstrating the impact of AI systems to society, environment, etc.

— Architecture: Use cases demonstrating several architectural paradigms for AI systems (e.g., cloud, distributed AI, crowdsourcing, swarm intelligence, etc.)

1. General

ID	(leave blank, for internal use)	
Use case name	AI solution to quality control of Electronic Medical Record(EMR) in real time	
Application domain	Healthcare	
Deployment model	Cloud services	
Status	In operation	
Scope[1]	Detecting defects in EMR by inspecting unstructured data based on Natural Language Processing(NLP) ability	
Objective(s)[2]	To insure the completeness, consistency, punctuality and medical-compliance of EMR written by physicians	
Narrative	Short description (not more than 150 words)	This AI solution in ET Medical Brain Medical service support system was developed that could simultaneously detect mistakes while physicians wrote EMR（Electronic Medical Record）. Using NLP（Natural Language Processing） ability, it can process a large amount of unstructured text and judge the accuracy according to recognized medical reference. It achieved 80% coverage of all the EMR quality control requirements issued by Chinese government, and human

[1] The scope defines the intended area of applicability, limits, and audience.
[2] The intention of the system; what is to be accomplished?; who/what will benefit?.

		labour of EMR QC （Quality Control） was reduced 60%, which translated into cost savings, and enhanced physician education.
	Complete description	Medical records are the records of the occurrence, development and prognosis of patients' diseases, as well as the medical activities such as examination, diagnosis and treatment. A high-quality medical record has great value at medical and legal level. When medical records are converted from handwritten to electronic input, delayed, uncompleted writing and copying are endangering the quality of medical records. Once the medical record data does not meet the requirements, it will greatly affect the health of patients, the development of medicine and the judgment of responsibility in medical accidents. Nowadays, hospital has a Medical Records Department to control medical records quality manually. However, as the number of medical records increases, the inspection requirements become more complex, and the medical professional knowledge requirements are improved, so the medical records quality inspection becomes harder. The intelligent electronic medical record quality control system is based on NLP. When a doctor writes medical records, it can analyze unstructured medical record text, and control the quality based on government requirements, ensure the integrity, consistency, timeliness and compliance of medical records. ET（Evolutionary Technology） Medical Brain Medical service support system has learning ability to learn more medical knowledge including clinical pathway, drug compatibility taboo etc. it can learn the habits and rules of doctor’s manual review to inspects records profoundly. The current system has covered 189 medical records quality inspection requirements, saved 60% review time for medical record department, which greatly saved the cost of the hospital, reduced the inspection time and repeated work, and will help doctors put more energy into the education and training.
Stakeholders[3]	Doctor, Hospital, Patient	
Stakeholders’	Safety, privacy, fair treatment, trustworthiness	

[3] Stakeholder are those that can affect or be affected by the AI system in the scenario; e.g., organizations, customers, 3rd parties, end users, community, environment, negative influencers, bad actors, etc.

assets, values[4]				
System's threats & vulnerabilities[5]	New privacy threats, new security threats			
Key performance indicators (KPIs)	ID	Name	Description	Reference to mentioned use case objectives
	1	Coverage	Ratio of EMR QC requirements done in the solution/all issued EMR QC requirements in China. Ideal target is 100%.	Improve accuracy
AI features	Task(s)	Natural language processing		
	Method(s)[6]	SimHash		
	Hardware[7]	ECS		
	Topology[8]	Cloud Service		
	Terms and concepts used[9]	Jaccard index		
Standardization opportunities/ requirements				
Challenges and issues	Challenges: Achieve all EMR QC requirements in different disease areas Issues: 1) Lack of medical reference data 2) Lack of medical knowledge graph			
Societal Concerns[10]	Description	Achieved 80% coverage of all the EMR quality control requirements issued by Chinese government, and human labour of EMR QC （Quality Control） was reduced 60%, which translated into cost savings, and enhanced physician education.		
	SDGs[11] to be achieved	Good health and well-being for people		

[4] Stakeholders' assets and values that are at stake with potential risk of being compromised by the AI system deployment – e.g., competitiveness, reputation, trustworthiness, fair treatment, safety, privacy, stability, etc.

[5] Threats and vulnerabilities can compromise the assets and values above - e.g., different sources of bias, incorrect AI system use, new security threats, challenges to accountability, new privacy threats (hidden patterns), etc.

[6] AI method(s)/framework(s) used in development.

[7] Hardware system used in development and deployment.

[8] Topology of the deployment network architecture.

[9] Terms and concepts used here should be consistent with those defined by Working Group 1 (AWI 22989 and AWI 23053) or to be recommended for inclusion.

[10] To be inserted.

[11] The Sustainable Development Goals (SDGs), also known as the Global Goals, are a collection of 17 global goals set by the United Nations General Assembly. SDGs are a universal call to action to end poverty, protect the planet and ensure that all people enjoy peace and prosperity.
URL: http://www.undp.org/content/undp/en/home/sustainable-development-goals.html

Data (optional)

Data characteristics	
Description	EMR text data
Source[12]	EMR system
Type[13]	Text data from EMR system vendor
Volume (size)	
Velocity[14]	Real time
Variety[15]	Multiple datasets
Variability (rate of change)[16]	Static
Quality[17]	High (depending on EMR system)

[12] Origin of data, which could be from customers, instruments, IoT, web, surveys, commercial activity, simulations, etc.
[13] Structured/unstructured text, images, voices, gene sequences, numbers, composite: time-series, graph-structures, etc.
[14] The rate of flow at which the data is created, stored, analysed, or visualized. Could be in real time.
[15] Domains and types of data employed including formats, logical models, timescales, and semantics. Could be from multiple databases.
[16] Changes in data rate, format/structure, semantics, and/or quality.
[17] Completeness and accuracy of the data with respect to semantic content as well as syntax of the data (such as presence of missing fields or incorrect values).

Process scenario (optional)

Scenario conditions					
No.	Scenario name	Scenario description	Triggering event	Pre-condition[18]	Post-condition[19]
1	Training	Train a model (deep neural network) with training samples	Sample raw dataset is ready		
2	Evaluation	Evaluate whether the trained model can be deployed	Completion of training/retraining		
3	Execution	Detect defects (regions including defects) using the trained model	Completion of deployment in EMR system	The trained model has been evaluated as deployable	
4	Retraining	Retrain a model with training samples	Certain period of time has passed since the last training/retrainig		

[18] Describes which condition(s) should have been met before this scenario happens.

[19] Describes which condition(s) should prevail after this scenario happens. The post-condition may also define "success" or "failure" conditions

Training (optional)

Scenario name	Training				
Step No.	Event[20]	Name of process/Activity[21]	Primary actor	Description of process/activity	Requirement
1	Raw data preparation	Raw data to cloud	AI solution provider	Transform sample raw data from EMR system to server on cloud	The software for data transform has to be provided by the AI solution provider.
2	Completion of Step 1	Training sample creation	AI solution provider	Create training samples by labelling the output of Step 1 with "defective"/"non-defective"	
3	Completion of Step 2	Model training	AI solution provider	Train a model (deep neural network) with the training samples created by Step 2	

Specification of training data	

[20] The event that triggers the step. This might be completion of the previous event.
[21] Action verbs should be used when naming activity.

Evaluation (optional)

Scenario name	Evaluation				
Step No.	Event[22]	Name of process/Activity[23]	Primary actor	Description of process/activity	Requirement
1	Completion of training/retraining	Preparation	AI solution provider	Transform sample raw data from EMR system to server on cloud	
2	Completion of Step 1	Detection	AI solution provider	Given the image data from Step 1, detect defects (regions including defects) using the deep neural network trained in the scenario of training	
3	Completion of Step 2	Evaluation	Manufacturer	Compare the result of Step 2 with that of human inspection	

Input of evaluation	
Output of evaluation	

[22] The event that triggers the step. This might be completion of the previous event.
[23] Action verbs should be used when naming activity.

Execution (optional)

Scenario name	Execution				
Step No.	Event[24]	Name of process/Activity[25]	Primary actor	Description of process/activity	Requirement

Input of Execution	
Output of Execution	

[24] The event that triggers the step. This might be completion of the previous event.
[25] Action verbs should be used when naming activity.

Retraining (optional)

Scenario name	Retraining				
Step No.	Event[26]	Name of process/Activity[27]	Primary actor	Description of process/activity	Requirement

Specification of retraining data	

[26] The event that triggers the step. This might be completion of the previous event.
[27] Action verbs should be used when naming activity.

References

References						
No.	Type	Reference	Status	Impact on use case	Originator/organization	Link
1						https://et.aliyun.com/brain/healthcare?spm=a2c17.92424.1146454.87.254f1a43dCNCpb
2	Patent	A medical symptom knowledge base classification system construction algorithm and device based on lexical cluster similarity	In application			100424310
3	Patent	Electronic medical record named entity recognition method and device combining Section feature information	In application			100557465
4	Patent	Algorithm and device for recognizing nested medical named entities based on two-layer recurrent	In application			100609063

		neural network				
5	Patent	Algorithm and device for unsupervised keyword-based medical image report key information extraction	In application			100619640
6	Patent	Medical record text structure analysis algorithm and device based on pseudo corpus generation	In application			100558223
7	Patent	Algorithm and device for improving accuracy of medical record quality assurance system by using doctor behavior log	In application			100558228
8	Patent	Medical record text structure analysis algorithm and device based on context-	In application			100549098

		free grammar parsing technology				
9	Patent	Algorithm and device for structural analysis of medical records combined with visual features	In application			100605377
10	Patent	Method and device for Chinese medical record named entity recognition by using Iterated Dilated CNN with condition random field model based on Chinese character structure	In application			100554136
11	Patent	Method and device for Chinese medical field relationship extraction by using residual convolution attention network model	In application			100558469

12	Patent	Method and device to detect similar electronic medical records	In application			

Acceptable Reference Sources of Use Cases

— Peer-reviewed scientific/technical publications on AI applications (e.g. [1]).
— Patent documents describing AI solutions (e.g. [2], [3]).
— Technical reports or presentations by renowned AI experts (e.g. [4])
— High quality company whitepapers and presentations
— Publicly accessible sources with sufficient detail

This list is not exhaustive. Other credible sources may be acceptable as well.

Examples of credible sources:

— [1] B. Du Boulay. "Artificial Intelligence as an Effective Classroom Assistant". IEEE Intelligent Systems, V 31, p.76–81. 2016.
— [2] S. Hong. "Artificial intelligence audio apparatus and operation method thereof". N US 9,948,764, Available at: https://patents.google.com/patent/US20150120618A1/en. 2018.
— [3] M.R. Sumner, B.J. Newendorp and R.M. Orr. "Structured dictation using intelligent automated assistants". N US 9,865,280, 2018.
— [4] J. Hendler, S. Ellis, K. McGuire, N. Negedley, A. Weinstock, M. Klawonn and D. Burns. "WATSON@RPI, Technical Project Review".
URL: https://www.slideshare.net/jahendler/watson-summer-review82013final. 2013.