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	Deep Learning Based User Intent Recognition	
Application domain	Retail	
Deployment model	On-premise systems	
Status	In operation	
Scope[1]	Recognizing users' intent to solve their problems in e-commerce fields	
Objective(s)[2]	To recognize and understand users' intent by AI and deep learning technologies and apply such technologies to build chat bot systems to further reduce labor cost and to be applied in various fields.	
Narrative	Short description (not more than 150 words)	Intelligent customer service chat bot is mainly used to categorize users' questions, recognize users' intents and answer users' questions intelligently for different business jobs. Currently, this chat bot has been used to handle 90% of online customer service and has enabled JD.com to save over 100 million labor costs every year.
	Complete description	JD.com has been committed to using technology to drive business growth and improve user experience in all customer service fields. Based on the improvement of customer consulting experience and the developing trend of artificial intelligence technology, as early as 2012, JD had decided to develop intelligent chat bots to fulfill the needs of continuous expansion of business, to save customer service costs and increase service capability.

[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?.

		Intent recognition is a key and core technology to build such an intelligent customer service chat bot. By applying natural language processing technologies, deep learning technologies, traditional machine learning algorithms, intent recognition accuracy has reached to 95%. Based on accurate intents, and a series of solution finding algorithms, our chat bot can solve the user's problems to a great extent and give the user a high quality consulting experience. Finally, in order to provide diversified and personalized customer services, we are continuously improving the accuracy of intent recognition, personalized solution generation, sentiment recognition, and image recognition. So far, intelligent customer service has revolutionized the traditional customer service consulting business.

Stakeholders[3]	users			
Stakeholders' assets, values[4]	Users' experience			
System's threats & vulnerabilities[5]	high semantic ambiguity, Multiple language expressions in one sentence			
Key performance indicators (KPIs)	ID	Name	Description	Reference to mentioned use case objectives
	1	Accuracy	The number of correctly recognized users' intent over total number of users. Currently, accuracy reaches 95%.	Improve accuracy of recognizing users' intent
	2	Resolution	The number of answers solved over total number of questions asked	Improve the resolution of questions from users
	3	Satisfaction	The number of users who are	Improve user experience

[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.

[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.

			satisfied with customer service over total number of users	
AI features	Task(s)	Natural language processing		
	Method(s)[6]	Machine learning and deep learning		
	Hardware[7]	GPU and CPU		
	Topology[8]	TensorFlow		
	Terms and concepts used[9]	Natural language processing, deep learning, CNN, HAN, logistic regression		
Standardization opportunities/ requirements	Process Standardization will Improve Quality and Productivity			
Challenges and issues	Current challenges of deep leaning and intent recognition: 1. high semantic ambiguity, similar sentences can deliver different meanings. 2. Unclear classification rules caused by complicated business logics 3. Hard to answer reasoning questions			
Societal Concerns[10]	Description	1. Solve problems intelligently to increase efficiency 2. Free labors from repetitive work to save large amount of resources for the society		
	SDGs[11] to be achieved	Decent work and economic growth		

[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	Question answering data from the JD.com online dialogue log
Source[12]	Customer's dialogue log at JD.com
Type[13]	Text
Volume (size)	Millions
Velocity[14]	Real time
Variety[15]	various scenarios, various business, various categories of products
Variability (rate of change)[16]	Non-linear
Quality[17]	good

[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	Based on millions of labeled streaming data, train a model using diversified algorithms, such as a deep learning neural network or a traditional machine learning algorithm	The training sample is ready		
2	Evaluation	Evaluate the performance of the model on online dialogue data	The training procedure has been finished		Each requirement must be satisfied or exceeded to reach the condition of 'success' (e.g. the accuracy should be more than 95%)
3	Execution	Apply the trained model to predict user's intent	Require user's query		
4	Retraining	Take a training sample from online dialogue to retrain the model and compare it with the old one by AB test	bad cases are feed back to update the training dataset		The requirement is that the new model must be better than the old one

[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 stored in the database	Data extraction	Database engineer	Extract related data from the database to generate the raw dataset	
2	Completion of Step 1	Generating training samples	Data labeling team	Label the raw dataset of step one with 300 categories	
3	Completion of Step 2	Pre-process	AI engineer	Segment the sentence into words and convert those words into vectors	
4	Completion of Step 3	Model training	AI engineer	Based on vectors generated on step 3 to train a model using diversified algorithms, such as a deep learning neural network or a traditional machine learning algorithm	

Specification of training data	After manual verifying, the accuracy of labelling should be more than 95%

[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	Certain period of time has passed since the last training/retraining	Data Extraction	Database engineer	Randomly take a sample from streaming data to form a test sample	
2	Completion of Step 1	Prediction	AI engineer	Predict the test sample in step 1 by the trained model	
3	Completion of Step 2	Evaluation	Data labeling team	Compare the result of predicted with the result of labeling	

Input of evaluation	the result of labeling and the result of prediction
Output of evaluation	The accuracy and recall rate

[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
1	Acquire the user's query	pre-process	AI engineer	Segment the sentence into words and convert those words into vectors	The trained model has been in operation
2	Completion of Step 1	Text classification	AI engineer	Predict the label of user's query	
3	Completion of Step 2	Response	AI trainer	Answer the query based on the result of intent classification	

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
1	Certain period of time has passed since the last training/retraining	Data extraction	Database engineer	Randomly take a sample from streaming data to from a training sample	
2	Completion of Step 1	Labeling the sample	Data labeling team	Manually label the sample data	
3	Completion of Step 2	Model training	AI engineer	Combine the new training sample with the old and train a model (deep learning and machine learning)	
4	Completion of Step 3	AB Test	AI engineer	Compare the predicted results of the new model with the results of the old one	The performance of the new model is better than results of the old one
5	Completion of Step 4	Online active of new model	AI engineer	The new model is been active online at JD.com	

Specification of retraining data	After the calibration, the accuracy of labelling should be more than 95%

[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	Paper	Convolutional Neural Networks for Sentence Classification			New York University	https://arxiv.org/abs/1408.5882
2	Paper	Hierarchical Attention Networks for Document Classification			Carnegie Mellon University, Microsoft Research, Redmond	http://www.aclweb.org/anthology/N16-1174
3	Paper	LIBLINEAR: A library for large linear classification Journal of Machine Learning Research			National Taiwan University	http://www.jmlr.org/papers/volume9/fan08a/fan08a.pdf

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.