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	A judging support system for gymnastics using 3D sensing	
Application domain	ICT	
Deployment model	On-premise systems	
Status	PoC	
Scope[1]	Skeleton recognition for gymnastics	
Objective(s)[2]	To support judgement of difficult element by high-level and high-speed.	
Narrative	Short description (not more than 150 words)	We have been developing a judging support system for artistic gymnastics to enhance accuracy and fairness in judging. We developed a skeleton recognition technique using the learned model that we trained using a large amount of depth images of gymnastics created from CG in advance. With this technology, it is possible to recognize a human 3D skeleton from depth image.
	Complete description	In gymnastics, wrong scoring is a problem, when it is difficult to judge by high-level and high-speed. Therefore, 3D sensing technology is required to reduce burden of referee by recognizing skeleton of gymnast. We

[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?.

		developed a technique to recognize heatmaps of body parts using the learned model that we trained using a large amount of depth images of gymnastics created from CG in advance. We calculate 3D skeleton position using heatmaps of body parts. With this technology, it is possible to recognize a human 3D skeleton from depth image.		
Stakeholders[3]	Federation International Gymnastics(FIG)			
Stakeholders' assets, values[4]				
System's threats & vulnerabilities[5]				
Key performance indicators (KPIs)	ID	Name	Description	Reference to mentioned use case objectives
AI features	Task(s)	Recognition		
	Method(s)[6]	Deep learning		
	Hardware[7]			
	Topology[8]	CNN		
	Terms and concepts used[9]	Deep learning, Convolution neural network, training, training data set		
Standardization opportunities/ requirements				
Challenges and issues	Challenges: Recognize skeleton of all gymnastics element. Issues: Recognize 3D skeleton in gymnastics that are complex movements from depth image.			
Societal	Description	Positive: Fairness of scoring, reducing burden of referee,		

[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.

[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.

Concerns[10]		and technical improvement of gymnast. Negative:
	SDGs[11] to be achieved	Industry, Innovation, and Infrastructure

[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	Depth images, 2D data of skeleton
Source[12]	Motion capture
Type[13]	Images
Volume (size)	
Velocity[14]	Non-real time
Variety[15]	Single dataset
Variability (rate of change)[16]	Static
Quality[17]	High

[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 with training data set.	Training data set is ready		Evaluation
2	Evaluation	Evaluate whether the trained model can be deployed cg data	Completion of training/retraining	Trainig/Retraining	Execution
3	Execution	Recognize real data gained 3D laser sensor	Get real data by 3D laser sensor	Evaluation	Retaining
4	Retraining	Retrain a model with added training data set.	Recognition accuracy of real data is low	Execution	

[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

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

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	Pressr elease				Fujitsu	http://pr.fujitsu.com/jp/news/2018/11/20.html

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.