**3GPP TSG-SA5 Meeting #155 *S5-243101***

Jeju, South Korea, 27 - 31 May 2024

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| *CR-Form-v12.1* | | | | | | | | |
| **CHANGE REQUEST** | | | | | | | | |
|  | | | | | | | | |
|  | **28.105** | **CR** | **Input to DraftCR** | **rev** | **1** | **Current version:** | **18.3.0** |  |
|  | | | | | | | | |
| *For* [***HE******LP***](http://www.3gpp.org/3G_Specs/CRs.htm#_blank)*on using this form: comprehensive instructions can be found at* [*http://www.3gpp.org/Change-Requests*](http://www.3gpp.org/Change-Requests)*.* | | | | | | | | |
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| ***Proposed change affects:*** | UICC apps |  | ME |  | Radio Access Network | **X** | Core Network | **X** |

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| ***Title:*** | Rel-18 Input to DraftCR TS 28.105 update the AI/ML overview | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Source to WG:*** | Huawei, NEC, Intel | | | | | | | | | |
| ***Source to TSG:*** | S5 | | | | | | | | | |
|  |  | | | | | | | | | |
| ***Work item code:*** | AIML\_MGT | | | | |  | ***Date:*** | | | 2024-05-16 |
|  |  | | | |  | |  | | |  |
| ***Category:*** | **F** |  | | | | | ***Release:*** | | | Rel-18 |
|  | *Use one of the following categories:* ***F*** *(correction)* ***A*** *(mirror corresponding to a change in an earlier release)* ***B*** *(addition of feature),* ***C*** *(functional modification of feature)* ***D*** *(editorial modification)*  Detailed explanations of the above categories can be found in 3GPP [TR 21.900](http://www.3gpp.org/ftp/Specs/html-info/21900.htm). | | | | | | | | *Use one of the following releases: Rel-8 (Release 8) Rel-9 (Release 9) Rel-10 (Release 10) Rel-11 (Release 11) … Rel-15 (Release 15) Rel-16 (Release 16) Rel-17 (Release 17) Rel-18 (Release 18)* | |
|  |  | | | | | | | | | |
| ***Reason for change:*** | | The last sentence is incomplete in clause 4.1. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Summary of change:*** | | Update the description. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Consequences if not approved:*** | | The content of the present document specification is incomplete. | | | | | | | | |
|  | |  | | | | | | | | |
| ***Clauses affected:*** | | 4.1 | | | | | | | | |
|  | |  | | | | | | | | |
|  | | **Y** | **N** |  | | | |  | | |
| ***Other specs*** | |  | **X** | Other core specifications | | | | TS/TR ... CR ... | | |
| ***affected:*** | |  | **X** | Test specifications | | | | TS/TR ... CR ... | | |
| ***(show related CRs)*** | |  | **X** | O&M Specifications | | | | TS/TR ... CR ... | | |
|  | |  | | | | | | | | |
| ***Other comments:*** | |  | | | | | | | | |
|  | |  | | | | | | | | |
| ***This CR's revision history:*** | |  | | | | | | | | |

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| **1st modified section** |

## 4.1 Overview

The AI/ML techniques and relevant applications are being increasingly adopted by the wider industries and proved to be successful. These are now being applied to telecommunication industry including mobile networks.

Although AI/ML techniques in general are quite mature nowadays, some of the relevant aspects of the technology are still evolving while new complementary techniques are frequently emerging.

The AI/ML techniques can be generally characterized from different perspectives including the followings:

- **Learning methods**

The learning methods include supervised learning, semi-supervised learning, unsupervised learning and reinforcement learning. Each learning method fits one or more specific category of inference (e.g. prediction), and requires specific type of training data. A brief comparison of these learning methods is provided in table 4.1-1.

Table 4.1-1: Comparison of Learning methods

|  |  |  |  |  |
| --- | --- | --- | --- | --- |
|  | Supervised learning | Semi-supervised learning | Unsupervised learning | Reinforcement learning |
| **Category of inference** | Regression (numeric), classification | Regression (numeric), classification | Association, Clustering | Reward-based behaviour |
| **Type of training data** | Labelled data (Note) | Labelled data (Note), and unlabelled data | Unlabelled data | Not pre-defined |
| NOTE: The labelled data means the input and output parameters are explicitly labelled for each training data example. | | | | |

**- Learning complexity:**

- As per the learning complexity, there are Machine Learning (i.e. basic learning) and Deep Learning.

**- Learning architecture**

- Based on the topology and location where the learning tasks take place, the AI/ML can be categorized to centralized learning, distributed learning and federated learning.

**- Learning continuity**

- From learning continuity perspective, the AI/ML can be offline learning or continual learning.

Artificial Intelligence/Machine Learning (AI/ML) capabilities are used in various domains in 5GS, including management and orchestration (e.g. MDA, see 3GPP TS 28.104 [2]) and 5G networks (e.g. NWDAF, see 3GPP TS 23.288 [3]).

The AI/ML inference function in the 5GS uses the ML model for inference.

Each AI/ML technique, depending on the adopted specific characteristics as mentioned above, may be suitable for supporting certain type/category of use case(s) in 5GS.

To enable and facilitate the AI/ML capabilities with the suitable AI/ML techniques in 5GS, the ML model and AI/ML inference function need to be managed.

The present document specifies the AI/ML management related capabilities and services, which include the followings:

- ML training.

- ML model testing

- AI/ML inference emulation

- ML model deployment

- AI/ML inference

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| **End of modified sections** |