**3GPP TSG-SA5 Meeting #142eS5-222033**

**04 - 12 April 2022, E-meeting**

**Source: Nokia**

**Title: pCR 28.105 Add requirements for AI/ML selection**

**Document for: Approval**

**Agenda Item: 6.6.5**

# 1 Decision/action requested

***The group is asked to discuss and agree on the proposal.***

# 2 References

[1] 3GPP TS 28.xxx-100 “Management and orchestration; AI/ML management”.

# 3 Rationale

The AI/ML model training needs to support the capabilities that enable the consumers to select AI/ML models and functions. This pCR presents the corresponding requirements.

# 4 Detailed proposal

|  |
| --- |
| **Start of modifications** |

## 6.2 AI/ML model training

### 6.2.1 Description

In operational environment before the AI/ML model is deployed the AI/ML-enabled function (i.e., Inference Function) to conduct inference, it needs to be trained (e.g., by an external entity of the Inference function).

The AI/ML model is trained by the AI/ML Model Training (AIMLMT) MnS producer, and the training can be triggered by the request(s) from one or more AIMLMT MnS consumer(s), or initiated by the AIMLMT MnS producer (e.g., as result of model evaluation).

### 6.2.2 Use cases

#### 6.2.2.1 AI/ML model training requested by consumer

The AI/ML model training capabilities are provided by an AIMLMT MnS producer to one or more consumer(s).



Figure 6.6.2.1-1: AI/ML model training requested by AIMLMT MnS consumer

The AI/ML model training may be triggered by the request(s) from one or more AIMLMT MnS consumer(s). To trigger an AI/ML model training, the AIMLMT MnS consumer requests the AIMLMT MnS producer to train the AI/ML model. In the AI/ML model training request, the consumer should specify the inference type which indicates the function or purpose of the model, e.g., CoverageProblemAnalysis. The AIMLMT MnS producer can perform the model training according to the designated inference type. The consumer may provide the data source(s) that contain(s) the training data which are considered as inputs candidates for training. To obtain the valid AI/ML model, consumers may also designate their requirements for model performance (e.g., accuracy, etc) in the training request.

The AIMLMT MnS producer provides a response to the consumer indicating whether the request was accepted.

If the request is accepted, the AIMLMT MnS producer decides when to start the AI/ML model training with consideration of the request(s) from the consumer(s). Once the training is decided, the producer

- selects the training data, with consideration of the consumer provided candidate training data. Since the training data directly influences the algorithm and performance of the trained model, the AIMLMT MnS producer may examine the consumer provided training data and select none, some or all of them. In addition, the AIMLMT MnS producer may select some other training data that are available.

- trains the AI/ML model using the selected training data , and

- provides the training result (including the location of the trained model, etc) to the AIMLMT MnS consumer (s).

#### 6.2.2.2 AI/ML model training initiated by producer

The AI/ML model training may be initiated by the AIMLMT MnS producer, for instance as result of evaluation of performance of the AI/ML model, based on the feedback received from the consumer, or when new training data describing the new network status/events are available.

When the AIMLMT MnS producer decides to start the AI/ML model training, the producer

- selects the training data,

- trains the AI/ML model using the selected training data, and

- provides the training result (including the location of the trained model, etc) to the AIMLMT MnS consumer(s) who have subscribed to receive the AI/ML model training results.

#### 6.2.2.n Selecting AI/ML models and Functions

For a given machine learning-based use case, different entities that apply the respective ML model or AI/ML enabled function may have different inference requirements and capabilities. For example, one consumer may be responsible and wish to have an AI/ML enabled function trained for city central business district where mobile users move at speeds not exceeding 30Km/hr. On the other hand another consumer for the same use case may support a rural environment and as such wish to have a model fitting that environment. The different consumers need to know the available versions of AI/ML enabled functions and to select the appropriate AI/ML enabled function for their respective conditions.

Besides there is no guarantee that the available AI/ML enabled functions have been trained according to the characteristics that the consumers expect. As such the consumers need to know the conditions for which the models or AI/ML enabled functions have been trained to then enable the consumers to select the models that are best fitted to their conditions.

The models that have been trained may differ in terms of complexity and performance. For example, a generic large complex model may have been trained in a cloud environment but when such a model cannot be used in the gNB. Instead a student model trained as a derivative of this generic model could be a better candidate. Moreover multiple student models could be trained with differences in complexity and performance which would then allow different student models to be delivered to different network functions depending on operating conditions and performance requirements. The network functions need to know the alternative students models available and interactively request and replace student models depending on the observed inference-related constraints and performance.

### 6.2.3 Requirements for AI/ML model training

|  |  |  |
| --- | --- | --- |
| **Requirement label** | **Description** | **Related use case(s)** |
| **REQ-ML\_Training-FUN-1** | The AIMLMT MnS producer shall have a capability allowing the consumer to request AI/ML model training. | AI/ML model training requested by consumer (clause 6.2.2.1) |
| **REQ- ML\_Training-FUN-2** | The AIMLMT MnS producer shall have a capability allowing the consumer to specify the data sources containing the candidate training data for AI/ML model training. | AI/ML model training requested by consumer (clause 6.2.2.1) |
| **REQ- ML\_Training-FUN-3** | The AIMLMT MnS producer shall have a capability allowing the consumer to specify the inference type of the model to be trained. | AI/ML model training requested by consumer (clause 6.2.2.1) |
| **REQ- ML\_Training-FUN-4** | The AIMLMT MnS producer shall have a capability to provide the training result (including the location of the trained model) to the consumer. | AI/ML model training requested by consumer (clause 6.2.2.1), and AI/ML model training initiated by producer (clause 6.2.2.2) |
| **REQ-ML\_SELECT-01** | 3GPP management system shall have the capability for authorized consumer to discover the characteristics of available models including the contexts under which the model was trained.  | Selecting AI/ML models and Functions (clause 6.2.2.n) |
| **REQ-ML\_ SELECT-02** | 3GPP management system shall have the capability to enable an authorized consumer to select an AI/ML model. | Selecting AI/ML models and Functions (clause 6.2.2.n) |
| **REQ- ML\_ SELECT-03** | 3GPP management system shall have the capability to enable an authorized consumer to request for a model to be trained to satisfy the consumer's expectations.  | Selecting AI/ML models and Functions (clause 6.2.2.n) |
| **REQ- ML\_ SELECT-04** | 3GPP management system shall have the capability to enable an authorized consumer to request and get the available alternative models of differing complexity and performance  | Selecting AI/ML models and Functions (clause 6.2.2.n) |
| **REQ- ML\_ SELECT-05** | 3GPP management system shall have the capability to enable an authorized consumer to request one of the known or available alternative models of differing complexity and performance to be used for inference | Selecting AI/ML models and Functions (clause 6.2.2.n) |
| **REQ- ML\_ SELECT-06** | The 3GPP management system shall have a capability to provide a selected AI/ML enabled function to the consumer. | Selecting AI/ML models and Functions (clause 6.2.2.n) |

|  |
| --- |
| **End of modifications** |