3GPP TSG RAN Meeting #102
Edinburgh, Scotland, December 11th -15th, 2023
Agenda Item: 9.1.1.1

RP-233861

Views on AI/ML for air interface for Rel. 19

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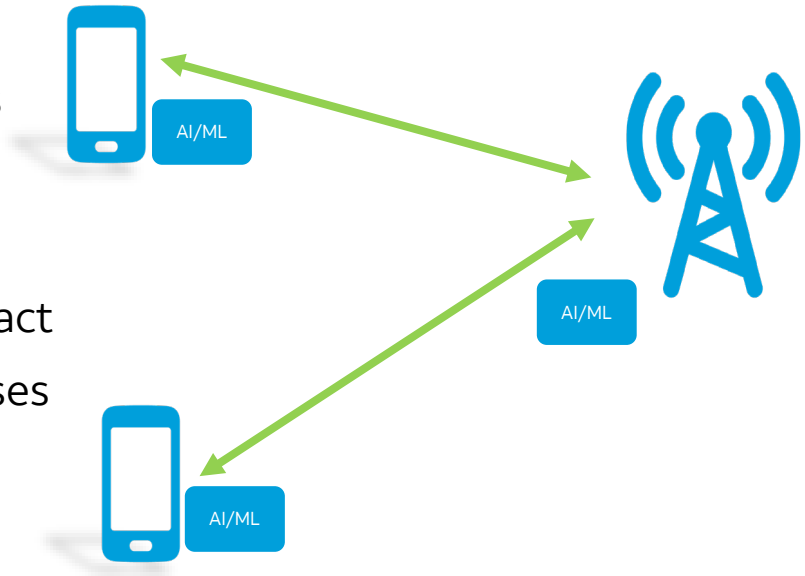
AI/ML for NR Air Interface: Summary

Key Objectives

- Support of single sided models for,
  - Beam management for DL Tx prediction in both UE-sided and NW-sided models
  - Positioning, with down-selection of some of the positioning use cases
- Support of two-sided models for CSI compression
- Support single sided model for CSI prediction, with full LCM and specification impact
- Support the necessary/recommended LCM components for selected sub-use cases
- Support non-3GPP transparent mechanisms for data collection and model transfer/delivery
- Support a common framework (when needed) across AI/ML use cases
- Consider general framework aspects that were not finalized in Rel. 18
- Consider RAN4 requirements and test cases for AI/ML enabled features



AI/ML for NR Air Interface: General Framework and LCM Aspects

Key Takeaways from SI

- The summary of the Rel. 18 SI general framework captured aspects that were discussed and/or defined in the study
- There are still various aspects of the framework that were not well discussed and/or were not agreed
- There is a lack of common understanding on the LCM flavors and their signaling framework
- A common framework was recommended, whenever possible, across AI/ML use cases
- RAN2 could not conclude on recommendations or requirements for UE-sided data collection and model transfer/delivery solutions

Recommendations

- Continue study in Rel. 19 aspects of general framework aspects including but not limited to LCM, model identification, reporting of applicable/additional conditions, model delivery/transfer, data collection for training/performance monitoring, generalization aspects, etc.
- Consider at least, a common framework across AI/ML use cases, when specifying different one-sided and two-sided AI/ML use cases

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AI/ML for NR Air Interface: CSI Compression Sub-Use Case

Background and Motivation

- CSI compression is the only representative use case for two-sided models in Rel. 18 SI
- Two-sided models are crucial to specify for AI/ML for air interface, including several aspects studied in the general framework
- No consensus was reached in SI on the recommendation of CSI compression for normative work for the following reasons
  - Trade-off between performance and complexity/overhead
  - Issues related to inter-vendor training collaboration
- Decent performance gain and overhead reduction was shown in some cases

Key Objectives

- Support CSI compression as a two-sided model in Rel. 19 WI
  - Conclude preferred training collaboration types for normative work
  - Support and specify model transfer for NW side to UE side and UE side to NW side.
  - Specify model ID based LCM for features such as model transfer, model identification (pairing information etc.), model activation/deactivation/monitoring/selection/switching/fallback
  - Specify functionality-based LCM for functionality activation/deactivation/monitoring/selection/switching/fallback
  - Necessary signaling/mechanism(s) to facilitate data collection, model inference and performance monitoring

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AI/ML for NR Air Interface: CSI Prediction Sub-Use Case

Background and Motivation

- CSI prediction is a one-sided use case that was down-scoped considerably in Rel. 18 SI
- Limited LCM and specification impact aspects were considered
- No consensus was reached in SI regarding recommending CSI prediction for normative work due to
  - Lack of results on the performance gains over non-AI/ML based approach and associated complexity
- Good performance gain over both legacy framework and non-AI/ML prediction algorithms was observed, but a large variation of results among companies was reported

Key Objectives

- In the current status, there is little added value of moving CSI prediction to normative phase
- Consider CSI prediction as a CSI use case for Rel. 19 with no limitation on LCM and specification impact aspects, including:
  - functionality-based LCM for UE side model as a starting point i.e., functionality activation/deactivation/monitoring/selection /switching/fallback
  - model ID based LCM for additional features such as model transfer, model identification, model activation/ deactivation/monitoring/selection/switching/fallback
  - Necessary signaling/mechanism(s) to facilitate data collection, model inference and performance monitoring

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Data Collection for Training and Performance Monitoring

RAN2#124 outcome for UE-sided model data collection:

Capture the following text:

The following proposals were discussed in RAN2

1. UE collects and directly transfers training data to the OTT server
   1a) OTT (3GPP transparent)
   1b) OTT (non-3GPP transparent)
2. UE collects training data and transfers it to CN. CN transfers the training data to the OTT server.
3. UE collects training data and transfers it to OAM. OAM transfers the needed data to the OTT server.

RAN2 did not study or analyze the proposals and did not agree to requirements or recommendations.

Proposal: RAN should inform SA2 of the RAN2 status for UE-sided model data collection and recommend further analysis of non-3GPP transparent solutions.

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