3GPP TSG RAN Rel-19 Workshop

15th – 16th June 2023

RWS-230454

AI/ML for air interface in Rel-19

Agenda Item: 5

Source: Intel Corporation

Document for: Discussion

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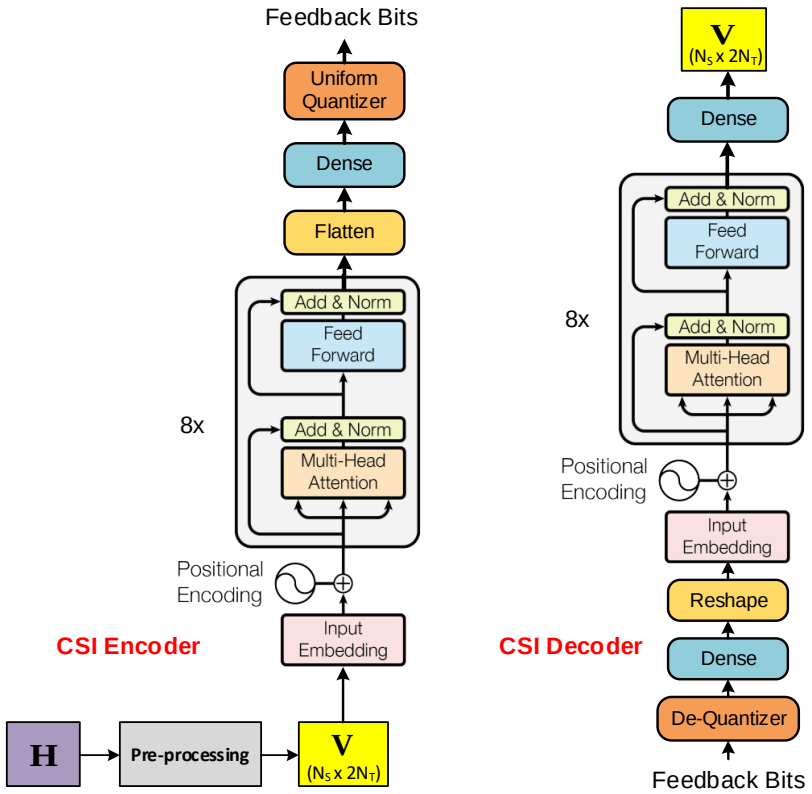
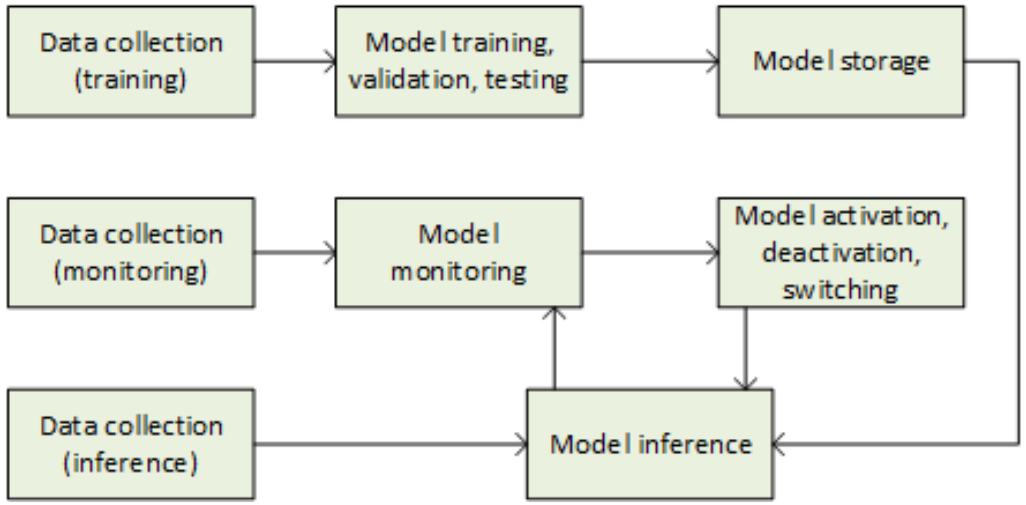
Introduction

- Rel-18 AI-ML for air-interface SID is on-going
  - 3 use-cases: CSI, beam-management, positioning
  - CSI compression use-case based on 2-sided AI-ML model – CSI encoder and CSI decoder (shown in figure)
- Overall views and observations from Rel-18
  - A lot of enthusiasm and evaluation results
  - More convergence and work is needed for specifications
  - Unclear whether an open format model can be downloaded and deployed at the UE in Rel-19 time-frame
  - Unclear whether proprietary format models can be practically supported in specifications for large scale deployment and usage
  - Concerns on disclosing model structure
  - RAN4 feedback (performance requirements) not available yet



Specifications for general aspects

- Support specifications for LCM that is forward compatible to future L1 use-cases
  - focus on offline training
  - keep specifications effort reasonable - in many use-cases (e.g. UE side prediction) most of the LCM operation can be handled transparently at UE
  - generalization studies may continue - to reduce the burden of maintaining a multitude of models at the NW or at the UE
- Enable NW side involvement for model training - particularly after an initially developed model is acquired. This allows customization of a model to the local environment

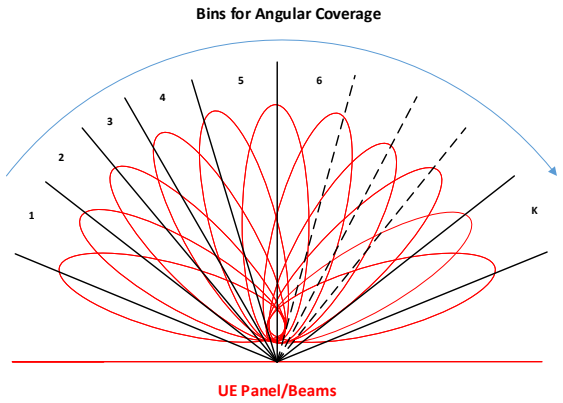


- Support assistance information from NW to UE and UE to NW to facilitate data collection for training at the UE and at the NW
- Support proprietary and open-format model transfer

AI-ML for Beam Management

- Spatial domain prediction
- Temporal domain prediction
- UE and network side models with model transfer and/or delivery
  - Models can be configured or downloaded based on UE capability with proprietary or open model format
- Model Life Cycle Management (LCM) for UE and/or network side models
  - Model update or re-tuning with new data collection based on enhanced measurement/reporting
  - Model performance monitoring

- Support beam-pair prediction with NW-side or UE-side models

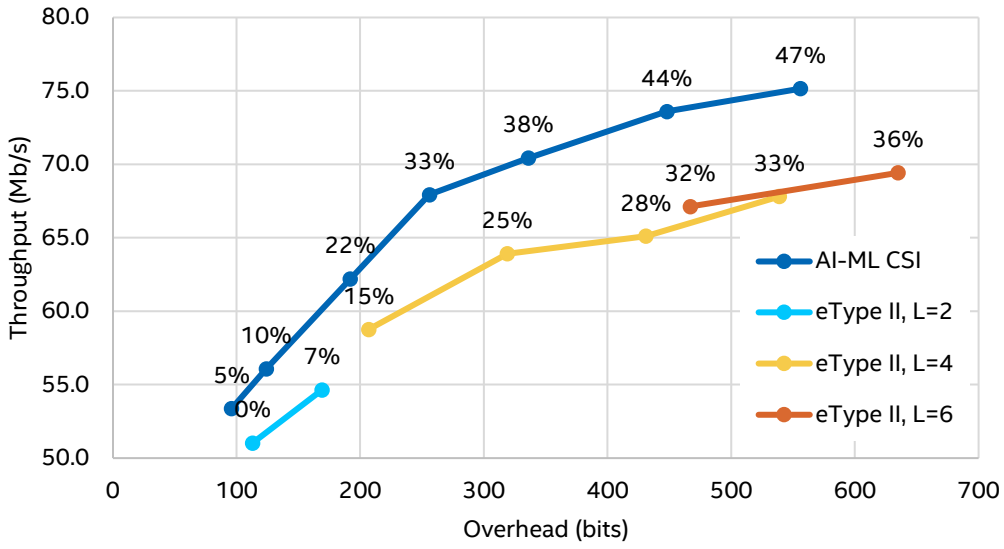


  - abstract beams to directions of angular coverage (multiple beams may map to each direction or multiple directions may map to each beam)
  - for NW-side model, UE measures on specific directions of angular coverage (see figure), for UE-side model, gNB transmits in specific directions of angular coverage

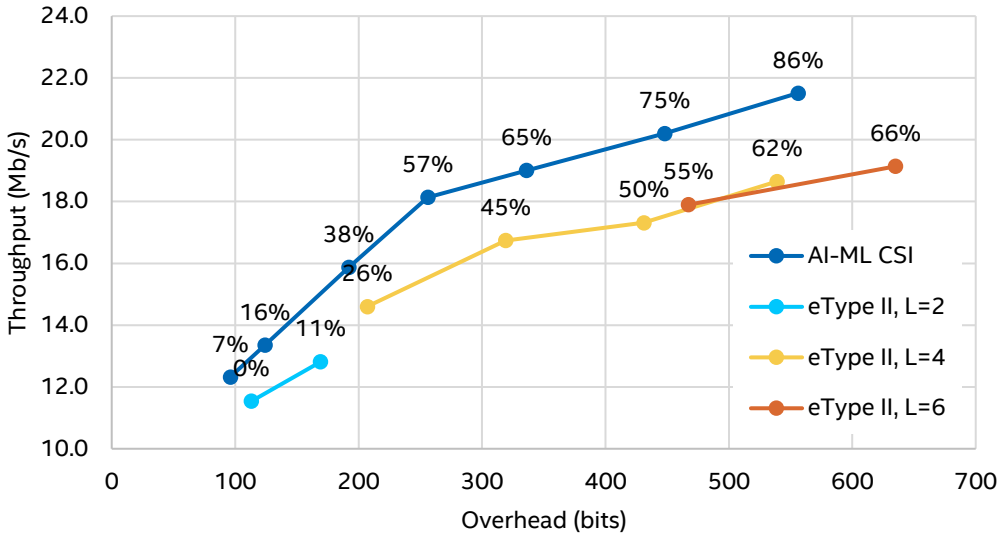
AI-ML for CSI feedback

- Two possible cases:
  - Autoencoder – potentially significant spec impact, gains require significant model complexity in statistical channel models (both at gNB and UE)
  - Prediction – single sided model, enhancements can be based on or integrated with Rel-18 MIMO prediction framework
- Model transfer
  - Model transfer based on proprietary and open formats
- Model Life Cycle Management (LCM) specifications for UE and/or two-sided models
  - Data collection
  - Model performance monitoring
  - Model update/switching/fallback

Average UE throughput [R1-2304813]



Cell-edge UE throughput [R1-2304813]



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