

AI/ML for Air Interface in Release 19

The Nokia logo is displayed in white, uppercase letters within a large white arrow graphic that points to the left. The arrow is composed of two parallel lines that converge to a point on the left side of the slide.

Taipei, June 15-16, 2023

Agenda Item: 5

Source: Nokia, Nokia Shanghai Bell

AI/ML for Air Interface in Release 19

Proposals for overall directions

1

Finalize Rel-18 study and TR for all the involved RAN WGs. Initiate Rel-19 work item based on the completed study and TR conclusions and recommendations

2

Study robustness of AI/ML enhancements in dynamic cellular radio environments for mobility use case(s)

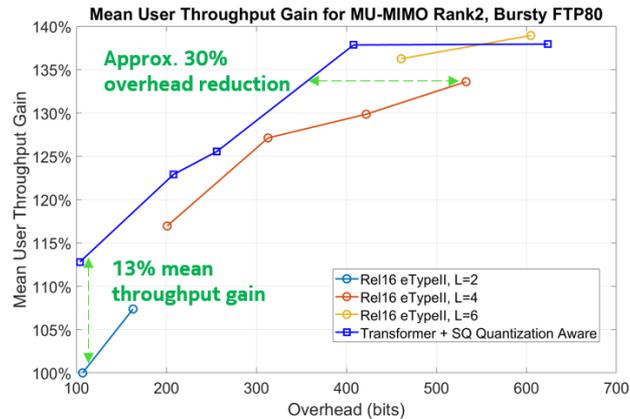
3

Study extensions to the AI/ML framework to enable reinforcement learning based AI/ML enhancements for air-interface in selected use case(s)

AI/ML for Air Interface

Finalize Rel-18 and Initiate follow-up Rel-19 work item

Turning RAN1-observed ML gains into practical gains



System-level results for
ML- based CSI compression

Finalize Rel-18 Study and TR

- Finalize Rel-18 study and TR for all the involved RAN WGs, especially RAN2 and RAN4 studies are expected to require additional time for their studies
- Define Rel-19 work item based on the completed study and TR conclusions and recommendations

Scope for normative work in Rel-19

- ML framework derived from the studied use cases
 - Life-cycle management
 - Support for one-sided and two-sided models
 - Ensure NW control over ML features, incl. functionality/model management, (de)activation/switching, perf. monitoring
 - Ensuring continuity of ML operation during UE handover
 - Ensure robust and improved performance and predictable UE behavior through UE requirements and test cases
- Understanding the use case specific specification impact
- Future-proof ML general framework, ready to evolve with further releases towards 6G

Further AI/ML studies for Air Interface

Motivation to study new mobility use cases

AI/ML enables mobility optimizations through mobility event prediction

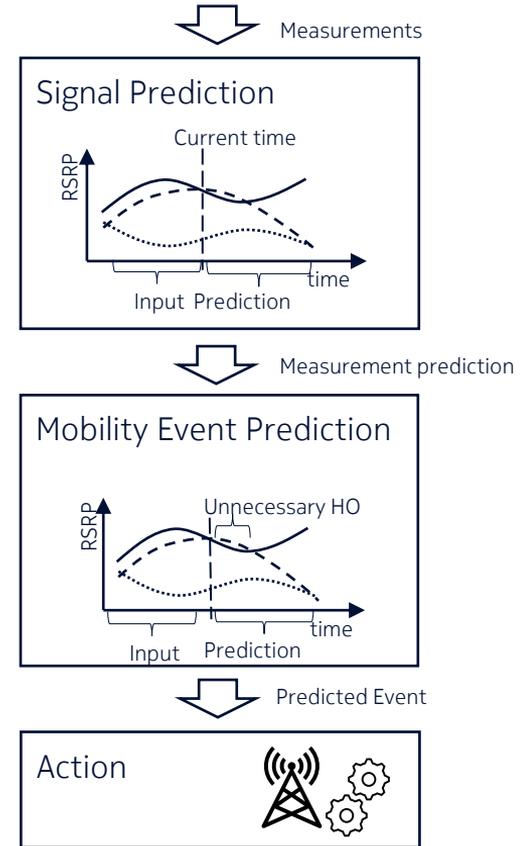
- E.g., by predicting radio measurements and deriving the events from the prediction or direct prediction of mobility related events.

Mobility robustness needs to be guaranteed while enabling AI/ML based mobility optimization

- Mobility robustness is critical for practical deployments in dynamic cellular environments and network KPIs

Study AI/ML-enabled mobility optimization use cases in Rel-19:

- Study AI/ML enabled mobility optimization in different deployments and use cases and their impact on the AI/ML framework from Rel-18, including for example collaboration modes
- Study mobility robustness, scalability etc. for selected deployment scenarios and use cases
- Apply mobility event prediction e.g., to:
 - Mobility KPI optimization
 - Reduce the measurement and reporting overhead
 - Network resource reservation optimization



Further AI/ML studies for Air Interface

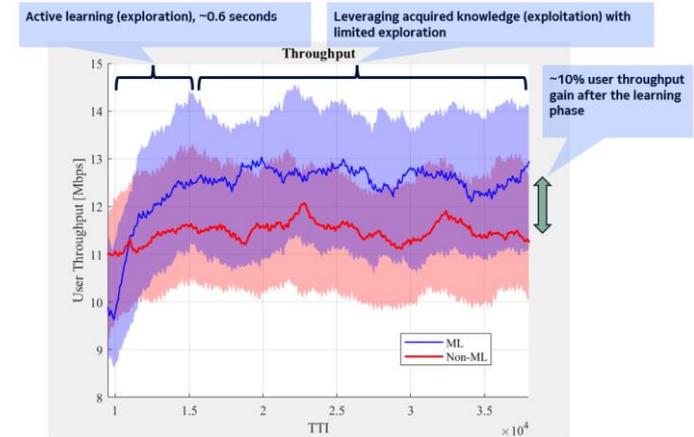
Motivation to AI/ML framework extension for enabling RL based enhancements

Benefits of (deep) Reinforcement Learning (RL) studies:

- Future-proof ML general framework, ready to evolve towards 6G
- Enables goal-based online decision-making use-cases where labeled training data is not available
- RRM functions can be finetuned and adapted to the local environment with unique tailored solutions

Study of Reinforcement Learning enablers:

- Performance of RL-based beam management (UE-sided or NW-sided) as extension of Rel18, but other new use-cases are not precluded (e.g., scheduling, uplink power control, link adaptation)
- Potential specification impact
 - Data collection enhancements for RL use cases
 - Framework enhancements for monitoring and management of RL-based features
 - RAN4/5 requirements and test specifications incorporating trials and errors of RL algorithm, but ensuring its performance



Example - beam management

- Improved user throughput around 10% after the initial learning phase

Study how beam management and other use cases could benefit from Reinforcement Learning (RL)

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