AI for (B)5G Network Automation

Abstract:

With Self Organizing Networks, the Mobile RAN in 4G has a strong legacy in Network Automation (NA). There, mostly rule-based functions are deployed to cope with complexity of a heterogeneous network. In 5G additional service types (critical Machine Type Communications (cMTC) and massive MTC) are introduced which are realized by concepts like URLLC and multi-connectivity within a virtualized, sliced mobile network. This leads to additional operational complexity, e.g., the need to jointly optimize physical and virtual resources and address intra- and inter-slice management in a highly automated way.

In parallel, due to the increased availability of network data as well as the identification of suitable AI/ML methods for existing as well as the new 5G operational use cases, AI/ML-enabled NA functions are explored. Such functions are able to autonomously adapt to different network deployment environments and their respective context as well as different operating points for a given deployment. As an example, building block for the described characteristic, we show network state prediction in a sliced 5G trial network (Hamburg seaport) which can be used for several different use cases.

Towards “Beyond 5G” (B5G) the academic and industrial research community is considering, e.g., the more intense and combined use of cMTC, mMTC and eMBB (evolved Mobile Broad Band) which results in more emphasis on the autonomous operation of the network edge. Another focus area is non-public (campus) networks which on the one hand even further increases the need for autonomous network operations due to the deployment scenario (no/fewer operational personnel than for CSP deployments). On the other hand, also due to the deployment scenario (small deployment with full access to network and production data), there is also a higher potential for autonomous network operations exploiting AI/ML methods.

For B5G it is anticipated that AI/ML techniques are heavily used within the network functions as well as for NA functions. Hence AI/ML will be a much more integral part of the network as well as the management architecture. Thus, e.g., ML models and their respective training need to be managed as part of network operational procedures, and their use wrt. location and time has to be orchestrated / coordinated in a multi-vendor way.

In summary, AI/ML-enabled NA functions, which are able to exploit the measurement and context data generated within the network infrastructure and the corresponding deployment environment,

are required to deal with the complexity of the (B)5G network infrastructure. The functions are executed within an AI-enabled network and management architecture.