DEFIANCE: Distributed finE-tuning oF machIne-leArNing models for Cellular nEtworks

Bachelorprojekt 2023/24 – Internet Technologies and Softwarization Group

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Complex networks, e.g., cellular communication networks, run increasingly complex network functions. Examples for such functions are the handover process of mobile users integrated with radio resource management or the configuration of massive multi-antenna systems (massive MIMO), where on short times scales measurements of the radio channel need to be processed and used to adapt antenna configurations. The development of these network functions is usually laborious, requires expert knowledge, and is often limited to specific, foreseen circumstances and do not adapt well to unknown scenarios.

One idea is to replace some manually developed network functions by AI/ML-based ones. As an example, current ideas for 6G envision each base station to run multiple AI and ML models, use them for configuration decisions, and train and fine-tune them on their local data.

But when is the use of AI and ML worthwhile, how will it affect the cellular network, what is the tradeoff between the overhead incurred for training or inference such models vs. the operational benefits we hope to obtain? While it is tempting to try to answer these questions very generally, we believe that we need to be quite specific in the problems that we look at.

To answer these questions, you will:

- Investigate the efforts (e.g., computing cycles, energy consumption) during model training and finetuning
- Analyze how the distributed environment affects the training
- Investigate how a model's quality affects the cellular network

Throughout this project, you will collaborate with collogues from T-Labs, the R&D department of Deutsche Telekom. They will provide details and environment to characterize cellular environments.

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