Fachgebiet Kommunikationstechnik
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TECHNISCHE UNIVERSITÄT DARMSTADT

Bachelor/Master Thesis

Deep Learning for Wireless Communications Networks

Next-generation wireless networks must support ultra-reliable, low-latency communication and intelligently manage a massive number of Internet of Things (IoT) devices in real-time, within a highly dynamic environment. This need for stringent communication quality-of-service (QoS) requirements as well as mobile edge and core intelligence can only be realized by integrating fundamental notions of artificial intelligence (AI) and machine learning across the wireless infrastructure and end-user devices.

While the main ingredients for 5G – such as dense small cell deployments, millimeter wave (mmWave) communications, and device-to-device (D2D) communications – have been identified, integrating them into a truly harmonious wireless system that can meet the IoT challenges requires instilling intelligent functions across both the edge and core of the network. These intelligent functions must be able to adaptively exploit the wireless system resources and generated data, in order to optimize network operation and guarantee, in real-time, the QoS needs of emerging wireless and IoT services. Such mobile edge and core intelligence can only be realized by integrating fundamental notions of AI across the wireless infrastructure and end-user devices.

Deep learning has proven its ability to solve complex problems in many fields such as computer vision, robotics and finance. In communications and in particular, at physical layer, it is not clear on how the machine learning can be exploited.

In this work, we identified several potential problems in which deep learning can be designed and applied. For instance, learn to optimize, system identification and distributed deep learning.

Prerequisites:

- Familiar with programming in python and preferable TensorFlow.

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