

Title: Modular conception of software and hardware components for service quality data acquisition and analytics in evolving mobile communication network systems.

Abstract:

With network complexity increasing and the emergence of new cellular use cases with more demanding subscribers and by the rollout of technologies such as IoT and 5G, it becomes even more crucial to understand the current network situation and pinpoint areas for development that will efficiently deliver the required performance.

For accurate network engineering, benchmarking, monitoring and optimization, it is necessary to process a large quantity of complex data and produce clear and easy-to-understand intelligence on a network in order to make better decisions. Correct decisions can only be made based on reliable and accurate data that is processed quickly and appropriately.

New technological requirements will be defined for such parameters as ultra-low latency, coverage in terahertz range, terabit per second speeds, jitter and phase noise, spatial bandwidth, etc. Cost is an important factor in any technical work and that, if new technological requirements are to be considered for the future communication networks, transfer of technology would also need to be taken into account. There is opportunity for modular conception of software and hardware components for service quality data acquisition and analytics, that can be refocused to reflect the rapid technological development. For ultimate flexibility hardware probes is interchangeable. The probe can be replaced, depending on the required communication technology, and modular system is ready to support different devices with new standards.

There is a demand for an efficient calculation method of an overall score that reflects the perceived technical performance of a network or of one of its subsets, such as a region, a period of time, or a technology. The score considers and weights the main key performance indicators (KPIs) for a wide range of services that are essential and exemplary for the service quality and combines them into an overall performance score.

We would need to perform many tests. One has to collect 100 calls to find one problem (100 calls x 2min avg duration = >3hrs of testing). In addition, driving same route multiple times, calls might fail or drop at different locations, which makes it difficult to troubleshoot or to improve.

We have and we are using deep learning here to get more value out of each test. We introduce the binary test scoring: we develop and train a deep learning model that based on a lot of past tests, it learns the relation of the behavior of certain parameters (signal level, interference, signaling, and much more) over time (parameters may change over time, i.e. a timed series) to the call drop rate. The model learns to classify and where to locate one call test in a hyperplane.

The idea is to train a deep learning model such as a feed-forward neural network to predict the probability of the binary result for a given test. This probability becomes a score of the test. Using this score, we can estimate the drop call rate with fewer number of calls (tests).