# Predicting the Black Swan

Ludic Fallacy and Self-Healing in Future Cellular Networks

*Janne Ali-Tolppa, Nokia Bell Labs, Munich, Germany*

## Abstract:

Nassim Nicholas Taleb developed what he calls the *black swan theory* to describe the often inappropriate rationalization people have with hindsight on unexpected, unpredictable but catastrophic events, which gives rise to the demand to be able to predict them. He derives from it the concept of *ludic fallacy,* which is an argument against applying naïve and simplified, game-like statistical models on complex domains. The argument centers on the idea that predictive models are based on simplified ideal forms, which ignore the incredible complexity of reality. Because of this, what we tend to see, post hoc, as a failure of the predictive capability of a model, may very well be a Black Swan, something that was real, but unpredictable or *predictable only after the fact*.

In future cognitive mobile networks, where ultra-reliable services are required, we can engineer the networks to be robust against any known possible problems, but how to make them resilient also in case of unforeseen ones? Can more cognition in the mobile network self-healing methods help us to predict and prevent the completely unexpected and catastrophic failures? Mobile networks are definitely a very complex domain and the problems highlighted with the ludic fallacy are relevant. After a failure, when we know, which features to look at, it may seem to have been predictable, but if a similar failure has never occurred before in a given context, the system has no way of knowing which features to look at for the prediction. But there are still ways we can improve the early detection and prediction capabilities of the cognitive self-healing functions in future cognitive autonomous networks.

This talk discusses about the possibilities and challenges of self-healing functions based on the work we've done on anomaly detection and diagnosis in cognitive autonomous networks. This can require, for example, using transfer learning methods and new ways of thinking about how to share detection and diagnosis knowledge.