FRIEDRICH-ALEXANDER
UNIVERSITÄT
ERLANGEN-NÜRNBERG

TECHNISCHE FAKULTÄT

Elektrotechnik-Elektronik-Informationstechnik

EEI KOLLOQUIUM

Machine learning techniques for next generation optical fibre communication systems

Darko Zibar, Ph.D.
DTU Fotonik; TU of Denmark

Dienstag, der 23.02.2016, 14^{00} Uhr
SAOT Lecture Room, Paul-Gordan-Str. 6

Currently, we are witnessing a data explosion as the world is connected more than ever. Enormous connectivity of humans and machines through global communication systems has led to an explosive growth of data, so called the big data. In the near future, global data traffic is expected to exceed Exabit/s (1018 bit/s). The big data is expected to open up a number of fundamentally new opportunities for significant breakthroughs in science, health-care, engineering and economy. Even though potentially, the big data can revolutionize our modern society there are several challenges that need to be tackled before we can benefit from the big data.

The challenges associated with the big data are not only limited to analytics; it also includes transport of big data. The transport of big data is enabled by using optical fibre as the transmission medium. However, current fibre-optic communication systems are rapidly approaching their fundamental capacity limits imposed by the Kerr nonlinearity of the fibre. There is therefore a clear need for radically different methods for information encoding, transmission and detection over the nonlinear fibre-optic channel. The challenge of overcoming the limitations imposed by optical fibre nonlinearity is of interdisciplinary nature and requires expertise within various scientific disciplines such as: nonlinear optics, machine learning and optical fibre communication. In this talk, we will demonstrate how we can explore the field of machine learning and nonlinear optics to go beyond the state-of-the-art and design next generation optical communication systems resilient to optical fibre nonlinearities. Especially, the talk will focus on the benefits of applying machine learning for optical signal detection and tracking of nonlinear interference. Finally, the talk will address how machine learning methods can be applied to other areas of optical technology, such as optical sensing, for making model inference and predictions from measured data. This is especially useful for optical measurement systems with many input parameters and where the coupling between the input parameters and noise is complex.