Title: “Machine learning tools for highly dynamic wireless environments”

Abstract: Machine learning (ML) tools, and, in particular, deep learning techniques, have been increasingly gaining attention because of their immense success in solving, for example, computer vision and speech recognition problems. One of the main reasons for the recent success of ML in these traditional tasks is the large availability of data and computational power to train the learning algorithms. Unfortunately, bringing those tools to communication systems, especially to the lower layers of the communication stack, may be challenging because the wireless environment is highly dynamic. In more detail, the statistical properties of raw signals in wireless systems may change dramatically within seconds. By the time enough data is acquired to train traditional learning tools, the environment may have changed so significantly to render the training set useless for the current propagation conditions. As a result, in some applications, learning has to be performed locally, possibly in mobile devices, and with very few samples. Against this background, in this talk we review recent efforts to obtain signal features that are stable for long periods of time and that are independent of some system parameters such as the transmit frequency. With these features, we argue that we may be able to increase the availability of training data and to decrease the training time of traditional ML tools. We also discuss recent online learning techniques that can cope with relatively small training sets. Potential applications in MIMO systems such as localization and beamforming will be shown.