

Title: Deep Learning for Physical Layer Communications: An Attempt towards 6G

Merging artificial intelligence in to the system design has appeared as a new trend in wireless communications areas and has been deemed as one of the 6G technologies. In this talk, we will present how to apply the deep neural network (DNN) for various aspects of physical layer communications design, including the channel estimation, channel prediction, channel feedback, data detection, and beamforming, etc. We will also present a promising new approach that is driven by both the communications data and the communication models. It will be seen that the DNN can be used to enhance the performance of the existing technologies once there is model mismatch. More interestingly, we will show that applying DNN can deal with the conventionally unsolvable problems, thanks to the universal approximation capability of DNN. With the well-defined propagation model in communication areas, we also attempt to explain the DNN under the scenario of channel estimation and reach a strong conclusion that DNN can always provide the asymptotically optimal channel estimations. In all, DNN is shown to be a very powerful tool for communications and would make the communications protocols more intelligently. Nevertheless, as a new born stuff, one should carefully select suitable scenarios for applying DNN rather than simply spreading it everywhere.