



## Project Proposal

### Deep Hybrid Analog-Digital Beamforming

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Massive MIMO systems are considered as one of the leading enablers of 5G wireless communication. In this technology, the transmitter and receiver are equipped with a very large number of antennas. This can potentially allow for higher data rates and better spectral efficiency.

One of the main challenges in a massive MIMO system is the hardware complexity. When considering hundreds of antennas, a dedicated RF chain per antenna like in traditional MIMO systems is no longer possible. Hence, it is desirable to reduce the number of RF chains in the system while still benefiting from the large number of antennas. To this aim, a hybrid analog-digital architecture is suggested, where some of the processing, traditionally performed in the digital domain, are shifted to the analog domain. This technique is called hybrid analog-digital beamforming. Therefore, an efficient design method for the hybrid beamformer is required.

The goal of the project is to develop a deep learning framework for hybrid beamformer design: to define a cost function, produce a learning set of efficient beamformers, and develop the deep algorithm to produce such beamformers given a new system setting. The project will include research next to MATLAB implementation.

Required background: Introduction to Digital Signal Processing (044198), Introduction to Machine Learning (046195) (or a similar course)

