

**Lecture Title:** Digital Twins for Communications: How to Create and Use Them

**Lecture Abstract (250 words):** A possible vision for 6G networks is that they can autonomously specialize to the radio environment in which they are deployed. I will discuss two key tools that are required to make this happen, namely differentiable ray racing for the creation of digital twin networks and machine learning. Differentiable ray tracing allows for gradient based optimization of many scene parameters and enables data-driven calibration of ray tracing models to measurements. Such digital twins can then be used as “gyms” for training of environment-specific communication schemes and applications. As examples, I will show how one can learn radio material parameters from channel measurements and present the architecture and performance of a recently developed 5G-compliant neural receiver which is not only compatible with different bandwidth allocations and number of layers but could possibly be implemented in real-time.