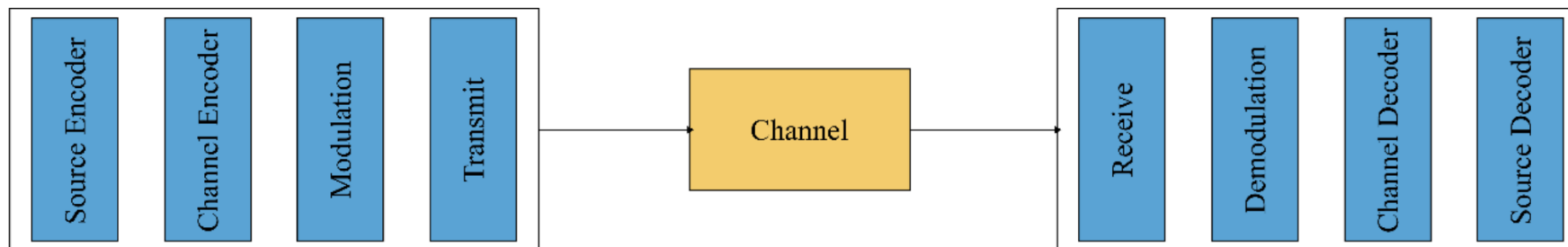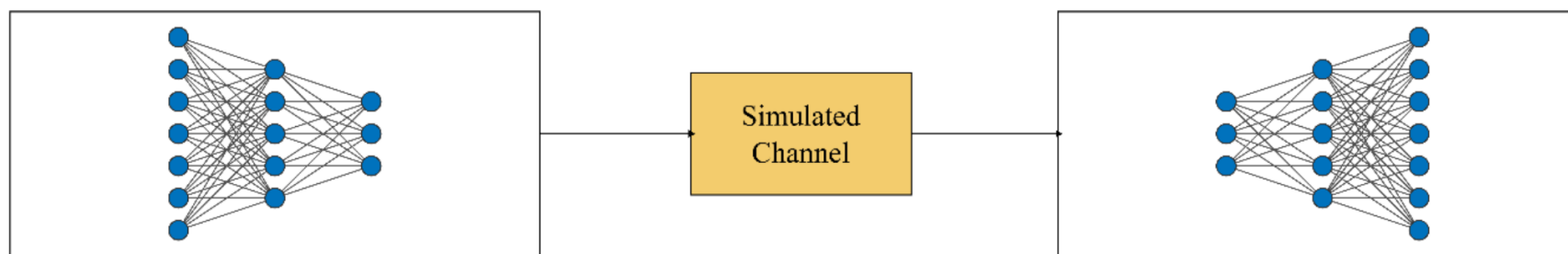# Deep Learning for End-to-End Over the Air Communication

Conventional
Comm. System

Step 1: AI based end-to-end system implementation on a simulation environment - Autoencoders

T. O'Shea and J. Hoydis, "An Introduction to Deep Learning for the Physical Layer," *IEEE Transactions on Cognitive Communications and Networking,* vol. 3, no. 4, pp. 563-575, 2017, doi: 10.1109/tccn.2017.2758370.

Step 2: AI based end-to-end system implementation in the real environment using SDRs – need to account for ISI, synchronization, phase/frequency offsets etc.
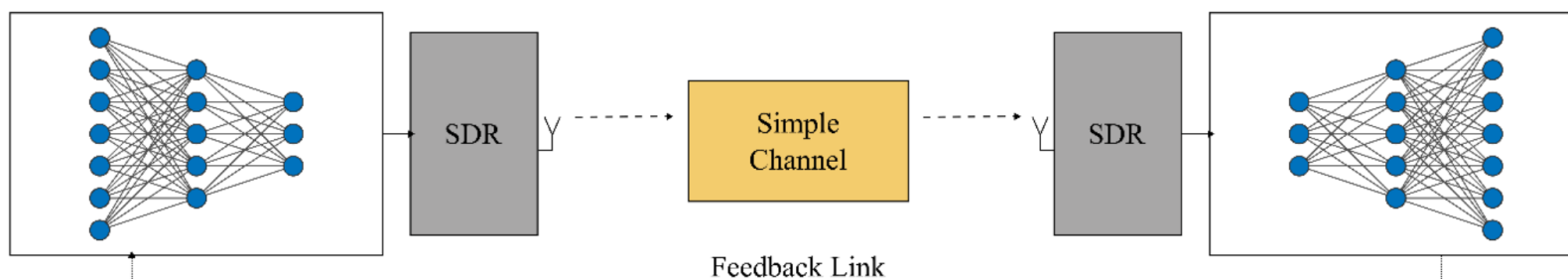
S. Dorner, S. Cammerer, J. Hoydis, and S. T. Brink, "Deep Learning Based Communication Over the Air," *IEEE Journal of Selected Topics in Signal Processing,* vol. 12, no. 1, pp. 132-143, 2018, doi: 10.1109/jstsp.2017.2784180.

What will you learn?

- You will get an in-depth understanding of a digital communication system, and its over the air implementation, which brings in many complexities associated with synchronization and offsets.

- Applications of ML in communications.

- Implementation of an end-to-end communication system on software defined radios (SDRs).

- On successful completion of Step 2, the setup can be used as a test bed for research and publication opportunities.