

Research Project Description

The project aims at investigating channel code design techniques based on deep learning tools. Part of the activity will also address the decoder design based on deep neural networks, with a focus on energy efficiency. The advantages and disadvantages with respect to traditional error correction code design and traditional decoding techniques should be assessed. Decoding strategies for non-standard channels (e.g., channels with interference caused by partial or complete packet collisions) can also be considered.

Activity Plan

The activity should start with a critical review of the scientific literature about AI-based error correction coding. The most innovative papers should be selected and for each such paper the most innovative elements should be reported, along with their pros and cons in terms of performance, complexity, latency, implementation. Some of the surveyed results should be reproduced independently. Next, elaborating on the state of the art, new AI-based approaches to channel coding should be developed, with a focus on short codes for use in machine-type communications. A first level of investigation should consist of applying AI tools to improve decoding of existing codes (for example, to reduce latency for the same reliability, to reduce energy efficiency for the same reliability, etc.). A second and more ambitious level of investigation should address the search of new short codes, along with their decoding algorithms, by exploiting tools in the AI domain. A detailed numerical performance analysis by software simulation, also at low error rates (error floor region), is part of the activity.