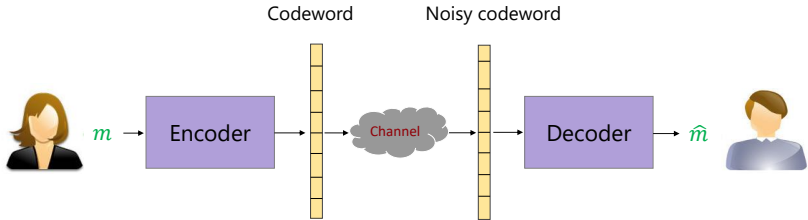


KO codes: inventing nonlinear encoding and decoding for wireless communication via deep-learning

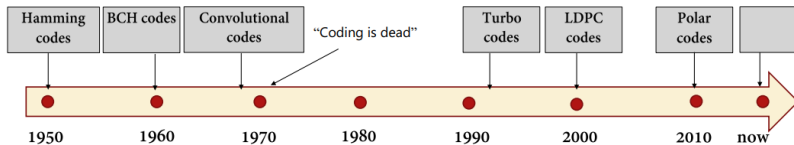
ICML 2021

Ashok Vardhan Makuva*, Xiyang Liu*, Mohammad Vahid Jamali, Hossain Mahdavifar, Sewoong Oh, Pramod Viswanath

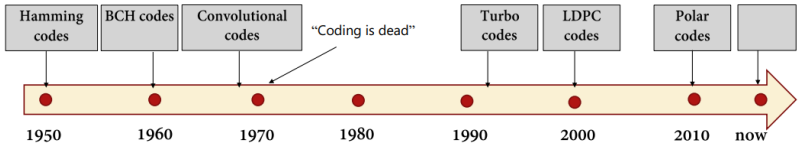
Main goal



Classical methods

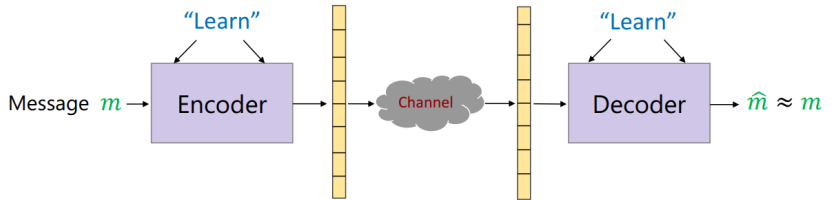


Classical methods



- Can we invent new state-of-the-art codes using deep-learning?

Inventing codes



Code Structure

- Linear: Classical codes

Code Structure

- Linear: Classical codes
- Non-linear: Neural networks

Code Structure

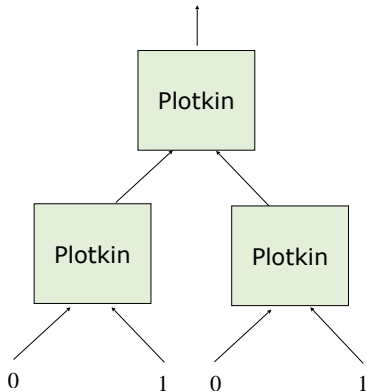
- Linear: Classical codes
- Non-linear: Neural networks
 - Fully connected networks worse than trivial codes (Jiang et. al '19)
 - **Still need a structure**

Code Structure

- Linear: Classical codes
- Non-linear: Neural networks
 - Fully connected networks worse than trivial codes (Jiang et. al '19)
 - Still need a structure
- KO neural networks \leftrightarrow KO codes

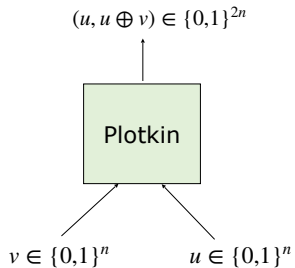
KO neural networks

- Encoding of Reed-Muller/Polar codes



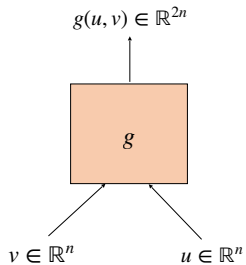
KO neural networks

- Plotkin block



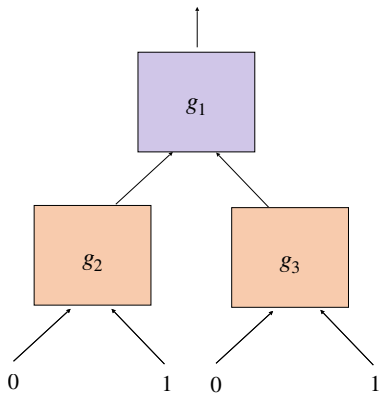
KO neural networks

- KO block



KO neural networks

- KO neural network



Performance of KO codes

Code-dimension=46, Block length = 512.

