

Error Correction over Deletion Channels

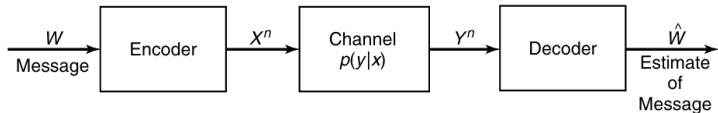
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Channels

Information is sent from a sender to a receiver over a communication channel [1].



[1]

Modern technology (the Internet, smartphones) relies on being able to obtain X^n given Y^n .

Deletion Channels

Deletion: When a bit is dropped from a binary string.

For example:

$$X = 1010$$

$$Y = 110$$

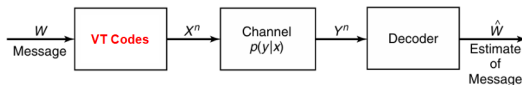
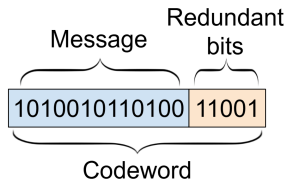
Deletion channel: Each transmitted bit is dropped in an i.i.d manner; positions of the dropped bits are unknown.

Recovering X from Y is in general an open problem.

Single Deletions

Correction via VT codes [2]

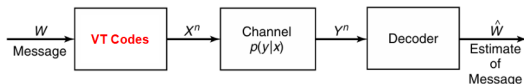
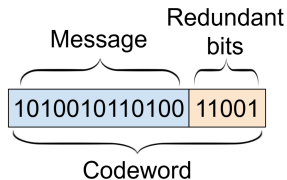
Message is encoded into a series of codewords.



Single Deletions

Correction via VT codes [2]

Message is encoded into a series of codewords.



VT codes: set of codewords where each codeword x satisfies

$$\sum_{i=1}^n i \cdot x_i \equiv a \pmod{n+1}$$

VT codes can correct deletions of at most 1 bit.

Multiple Deletions

Goal is to create an encoding scheme that can handle up to ϵ deletions.

What does this say?

“DIACS REUis th coolesresearch pogam ver ceatd!”

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Answer:

“DIMACS REU is the coolest research program ever created!”



Redundancies in a language can be explored with the aid of LLMs to design an encoding scheme that handles multiple deletions.

Acknowledgments

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References

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-  K. Tatwawadi and S. Chandak, “Tutorial on algebraic deletion correction codes,” 2019.