

COMMUNICATION THEORY & INFORMATION THEORY

Systems Analysis

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Outline

1 Communication

2 Information Theory



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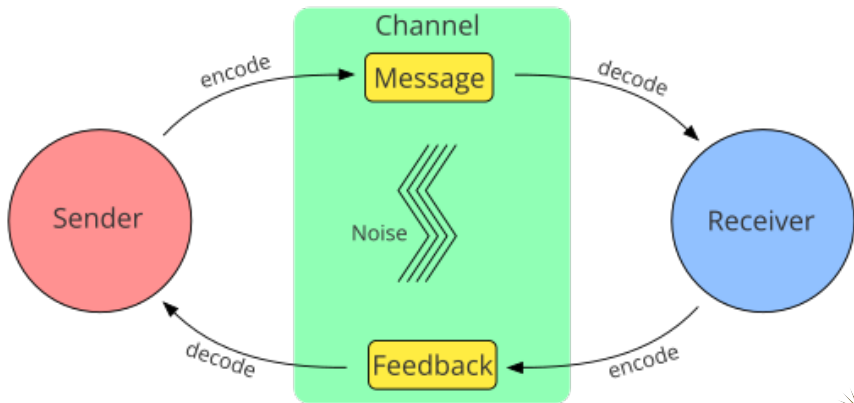
1 Communication

2 Information Theory



Communication Theory

Communication theory defines the amount of **transmitted information** in terms of the **conditional probabilities**.



Communication Model

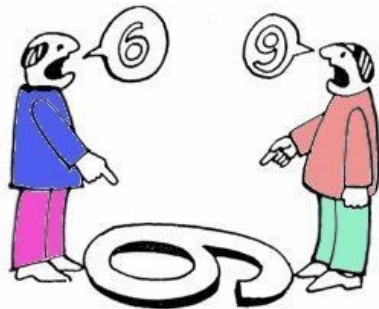
The **communication model** involves next elements:

- **Sender:** the source of the message.
- **Receiver:** the destination of the message.
- **Channel:** the medium used to transmit the message.
- **Message:** the information to be transmitted.
- **Noise:** the interference in the communication process.
- **Feedback:** the response from the receiver.
- **Context:** the situation where the communication occurs.
- **Code:** the language used to encode the message.



Misinformation

The **false information** is a problem due to the **lack of verifications**.



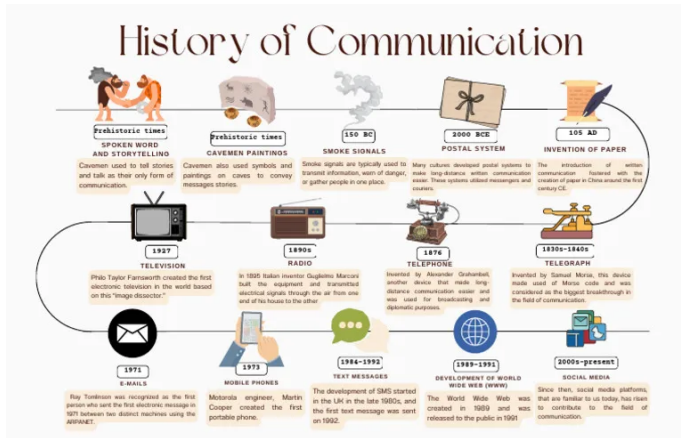
What if ... ?

The **probability** of failures is pretty tricky.



History

S.F. Scudder proposed **Communication Theory** in 1980. The main idea is: *all living beings existing on the planet communicate.*



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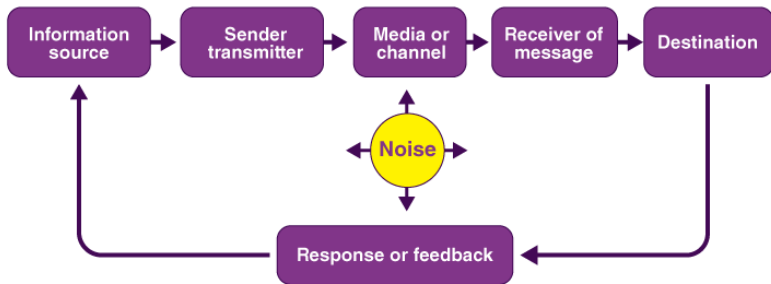
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Definition

Information theory is a mathematical point of view related to quantification, storage, and transmission of information. It supports the **communication theory**.



Entropy

- **Entropy** is the measure of the **uncertainty** of a random variable.
- It is the **average amount of information** produced by a random variable.
- It is the **measure** of the **disorder of a system**.



Use Cases of Entropy in Information Theory

- **Data Compression:** the entropy is used to compress data efficiently without losing information.
- **Cryptography:** the entropy is used to generate secure keys for encryption.
- **Machine Learning:** the entropy is used to measure the uncertainty of a model.
- **Signal Processing:** the entropy is used to measure the information in a signal.



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Thanks!

Questions?



Repo: <https://github.com/EngAndres/ud-public/tree/main/courses/systems-analysis>

