
CAIRO UNIVERSITY

Information and Coding Theory

- What is Information?

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- What is Information Theory?
  - How to *efficiently* represent information sources
  - How to transmit and store information with almost zero errors
    - » What is almost?

Coding Theory

- **Source Coding**
  - **Having a source of information, how many bits do I need to represent this source ? And How?**
  - **For exact reproduction**
  - **For acceptable reproduction**

Coding Theory

- **Channel Coding**
  - **Usually communications "channels" do not output what you input into them**
  - **A probabilistic mapping between input and output**
  - **Two questions:**
    - » **What is the maximum rate at which I can transmit information**
    - » **and how?**

Syllabus

- Introduction to Information theory
  - Entropy, mutual information, etc…
- Source Coding
  - Lossless source codes (Huffman coding, etc…)
  - Rate Distortion Theory (briefly)
- Channel Coding
  - Capacity
  - Block Codes (Galois fields, vector spaces, examples of block codes, etc..)
  - Convolutional Codes (State and trellis diagrams, Viterbi decoding, etc..)
  - Turbo and LDPC codes (time permitting)

Grading

- 10-15% reports + quizzes + sheets etc…
- 15-20% mid-term
- 70% final

Who should attend?

- **Who *likes* Communications**

And/Or

- **Wants to work in Communications**

And/Or

- **Wants to perform research in Communications**

And/Or

- **Wants to understand more about Communications**