Lecture 2: Signals & Communications

- **Announcements:**
  - Lecture 1 pdfs and video already posted on the course website in the “Lecture” link
  - HW#1 online
  - Discussions start next week
  - Labs start the week after next
    - You will need to do your prelabs for Lab 1 before your lab period
    - Lab 1 will be online soon (before Monday)
  - Will let in concurrent enrollments next week

- **Lecture Topics:**
  - Review of Signal Types
  - Motivation: Digital Communications

- **Signal Types:**
  1) **Analog Signal:**
    - The majority of physical signals are analog
    - “analog” comes from the fact that analog electronic signals and the physical signals they represent are analogous
    - Continuous time, continuous amplitude

- **Sampled-Data Signal:**
  - Discrete time, continuous amplitude

![Diagram of sampled-data signal](image_url)
If sample fast enough (i.e., at the Nyquist rate = 2 x the highest bandwidth), then can retain all the original information in the original analog signal.

If you cannot do this, then you lose information!

Advantages of Digital:
- More complex processing possible due to higher density of electronics (i.e., VLSI)
- Easier to store, e.g., mp3's more reliable than analog records
- Easier to interpret, e.g., digital vs. analog clock (with hands)

Disadvantages of Digital:
- Loss of information through quantization and sampling
- In many cases, not as fast as analog (smaller bandwidth)
- The speed disadvantage is easy to see in wireless communications, which is why analog is so important for wireless

Digital Signal
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Go to Digital Communications Example