

# Lab 2

*Signals, Instruments and Systems*

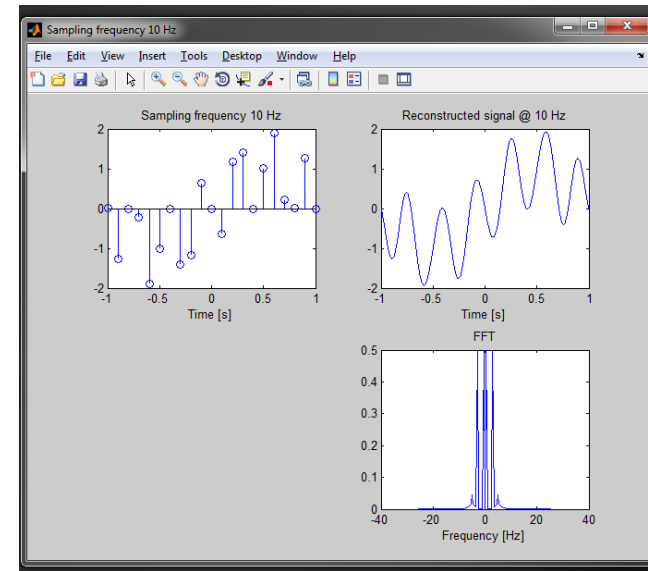
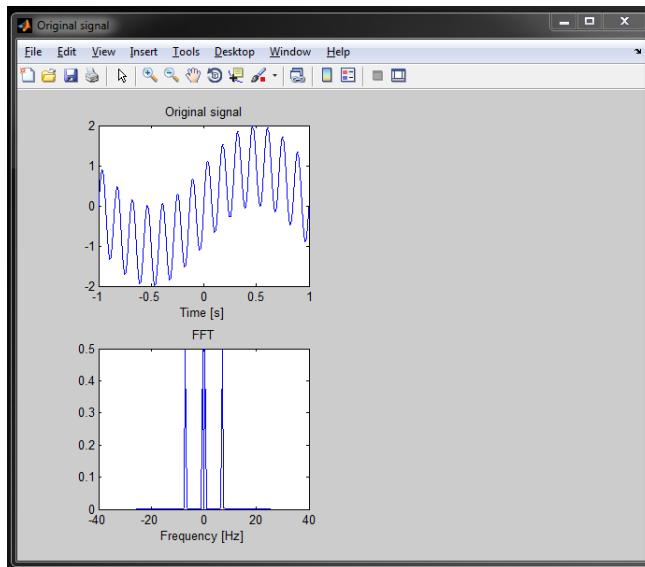
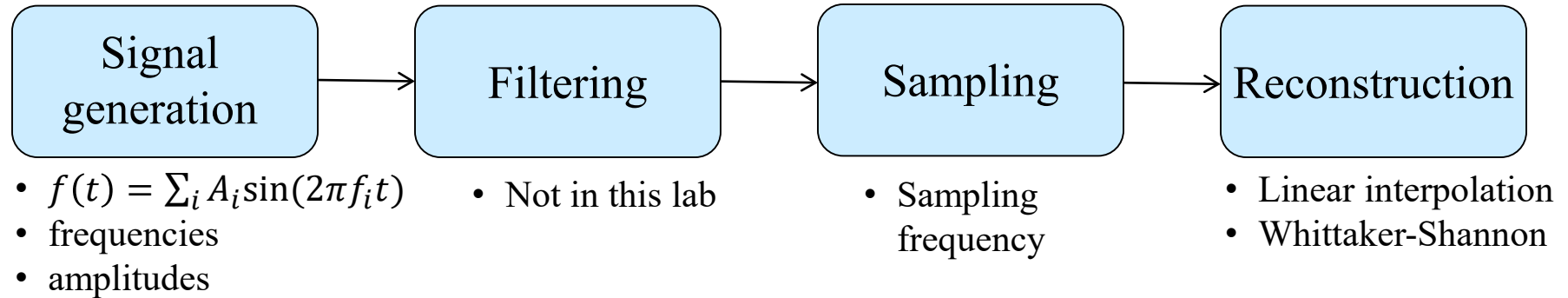
*School of Architecture, Civil and  
Environmental Engineering*

[http://disal.epfl.ch/teaching/signals\\_instruments\\_systems/](http://disal.epfl.ch/teaching/signals_instruments_systems/)

# Lab 2 Outline

- Concepts:
  - Sampling
  - Aliasing
  - Reconstruction
- Tools:
  - Matlab

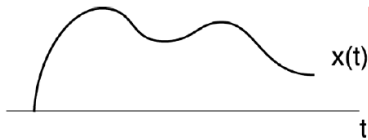
# Part 1: Sampling and reconstruction



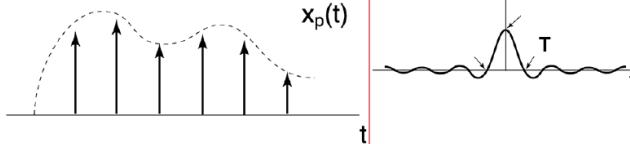
# Part 1: Reconstruction: Wittaker-Shannon vs. Linear

## Graphic Illustration of Time-Domain Interpolation

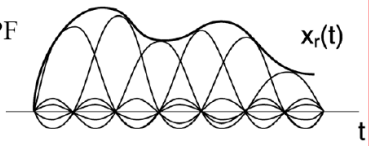
Original  
CT signal



After sampling

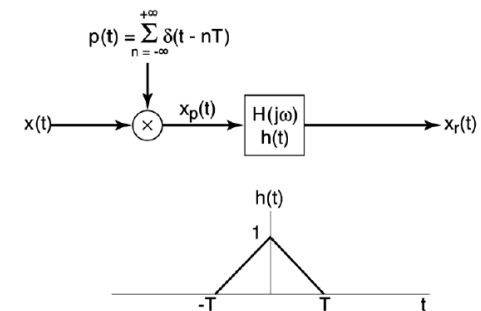
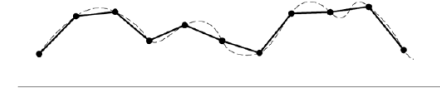


After passing the LPF



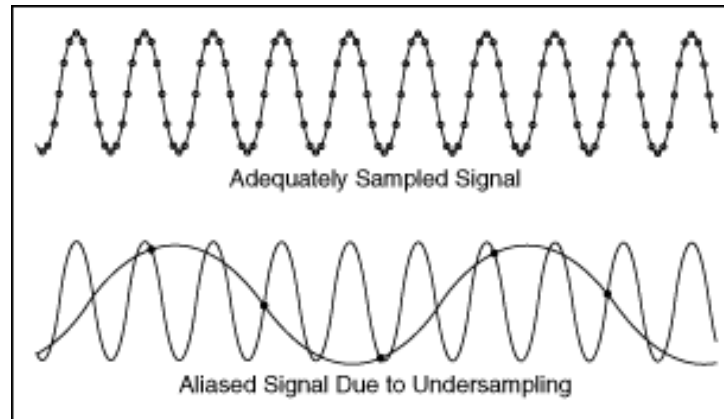
## Interpolation Methods

- Bandlimited Interpolation
- Zero-Order Hold
- First-Order Hold — Linear interpolation



# Part 2: Aliasing

- An effect that causes different signals to become indistinguishable when sampled



- Nyquist rate:  $f_s > 2B$

Sampling frequency  $f_s$  must be at least two times greater than the maximal signal frequency  $B$

# Part 3: Applications

- You will work with real data.
- Use DFT to extract the presence of lighthouses
- Separate the signals in the frequency domain

