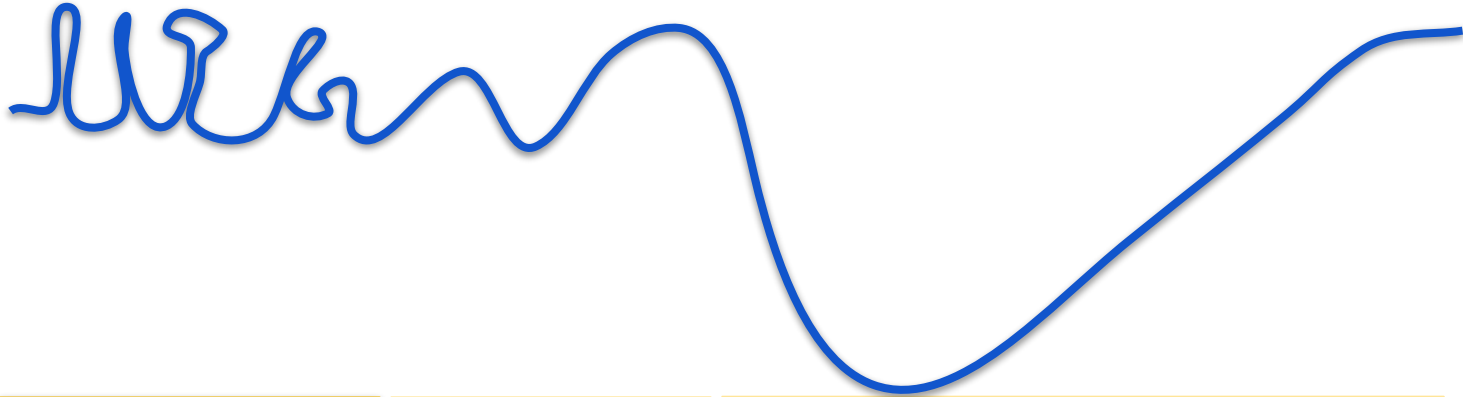


Computing with Signals



DA 623

Jan - May 2023

IIT Guwahati

Instructors: Neeraj Sharma

Lecture-21-[13-Mar]

Recap - topics covered so far

- Signals
- Types of Signals:
 - continuous, discrete, random (stochastic), deterministic
 - Physical domains: audio, image/video, temperature, neuronal signals, heart signals, body signals, text, etc.
- Signal modeling/ representation
 - Polynomials
 - Fourier series
 - Fourier Transform
- Operations on signals
 - Convolution, scaling, addition
 - Impulse (Dirac delta, Shah function)
- Sampling signals
 - Intuitive idea - how many samples to take - Nyquist rate
 - Uniform sampling - Shannon sampling theorem - sinc representation
 - Lagrange interpolation
- Discrete signals - Discrete Fourier Transform

Discussion on some project ideas

Project Ideas

- Physiological disorder analysis using varied kinds of body signals available as open-access datasets
- Temperature prediction
 - Exploring factors quantifying temperature variation
- Signal separation from a mixture of signals
 - $y(t) = x_1(t) + x_2(t) + \dots + x_N(t)$
 - Vocal separation from music, Signal and noise (denoising, or signal enhancement)
- Signal generation - signal synthesis
 - Speech synthesis - big topic
 - Music synthesis
- Signal compression
 - Signal modeling - storing the parameters - quantization - transmission loss - reconstruction
- Image/video/audio watermarking - forensics
- ... and more