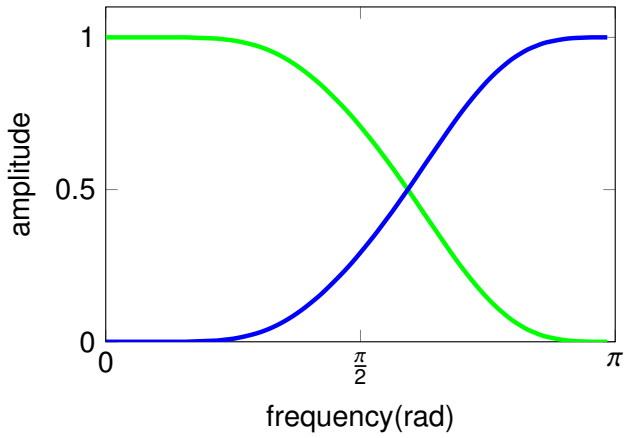
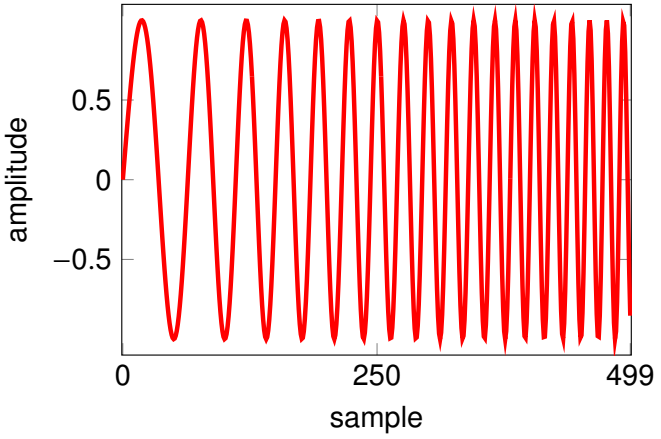
CCO50 - Digital Speech Processing

Prof Dr Eng Rodrigo Capobianco Guido guido@ieee.org http://www.sjrp.unesp.br/~guido/
São Paulo State University (UNESP), Institute of Biosciences, Letters and Exact Sciences (IBILCE), Department of Computer Science and Statistics (DCCE), 2265 Cristóvão Colombo St., Jd Nazareth, Postal Code: 15054-000, São José do Rio Preto, State of São Paulo (SP), Brazil

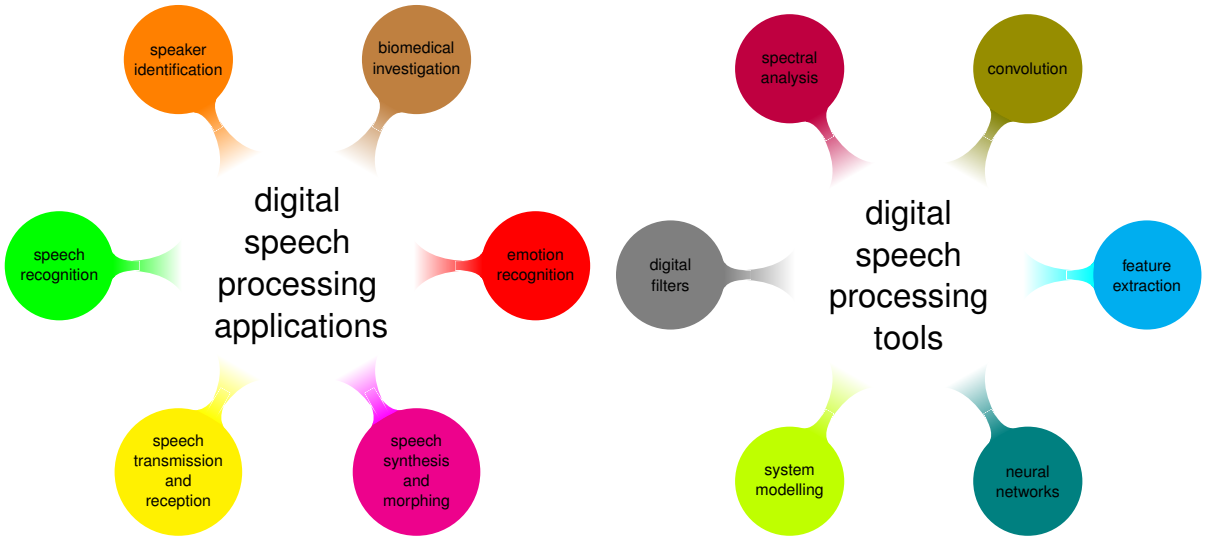
2025





- - - Introduction - - -

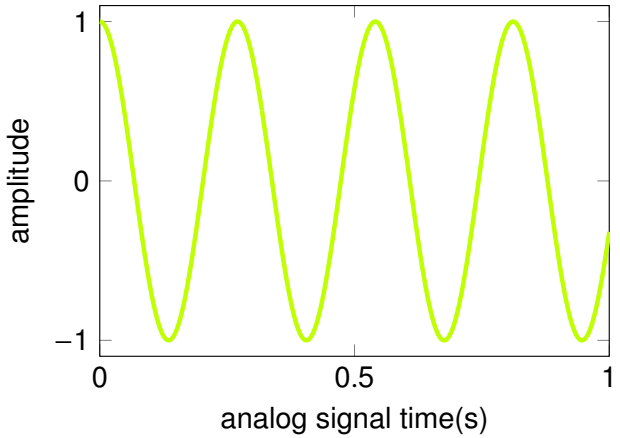
- **Introducing ourselves virtually**: opportunity to socialize! 
- **Comments on syllabus, bibliography, timetable, grades and related details**
- **Overview**

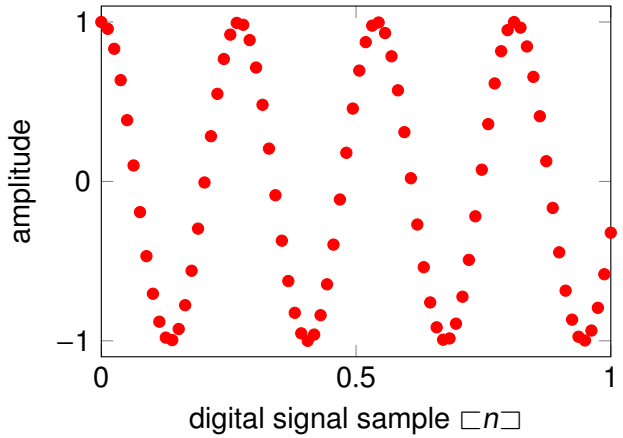


- **Classroom Activity**: feel free to discuss and comment on the impression you are having on this course introduction. Do you feel encouraged? Are you afraid of anything? What will be the main obstacle for you, in your opinion?

- - - Signal Processing Basics - - -

- Before studying speech signals, we need important information related to signals in general... What is a **signal**?
- **Analog Signal** versus **Digital Signal**

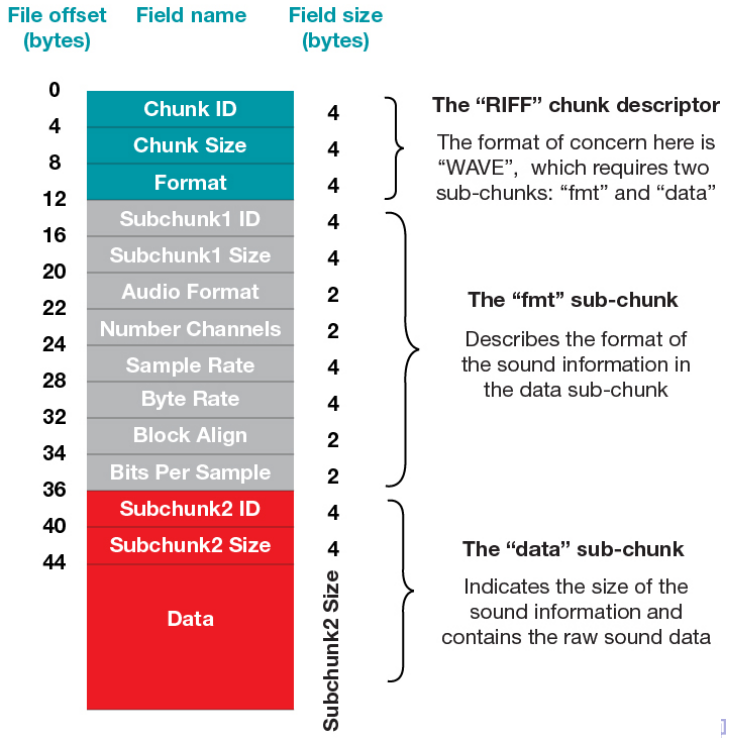




- Usually, for a better visualization, digital signals are depicted as continuous curves...
- **Computers** basically handle **Digital Signals**:
  - Sampling Theorem (Nyquist's criterion): analog signal is sampled at S_r samples per second [*this topic will be detailed later*]
  - Quantization [*this topic will be detailed later*]

- - - Signal Processing Basics - - -

- **The *Wave* File Format**
  - *Wave* (.wav) is a type of rich information file format (RIFF) regularly used to store digital signals with no compression.
  - basically, there is a header with general information such as the signal length, the sampling rate, the quantization, and so on, followed by the raw data samples.



- - - Signal Processing Basics - - -

- **Examples of Basic Time-domain Operations**
  - replace part of a signal by silence.
  - reduce amplitude by half.
  - double the amplitude.
  - amplify up to the maximum possible level.
  - time-reverse the signal.
- The example operations above are not applied to insert, modify or cut off frequencies. Instead, they are basic strategies used to perform time-related quite simple changes.
- For more significant modifications, we have to perform frequency-related processing. To do so, we can observe beforehand how a signal interacts with the "entity" used to process or modify it. Such an entity is called *system* in the field of signal processing.
- **Today's Short Test (ST1)**: Considering that the M-sample long signal $s[\cdot]$ corresponds to a speech raw data, write either an algorithm or a code in any programming language to reverse it in time.