# 1: Introduction

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## I. What is a signal

- A function of one or more variables representing data
- Represented by a physical aspects e.g. voltage
- Measured by observing physical aspects

## II. Types of signals

### A. Continuous-time and discrete-time

- Continuous:
  - Signal defined for all time $t$
  - E.g. sound
- Discrete:
  - Signal defined only at discrete instants of time $nT_s$
  - E.g. Digital music

### B. Even and odd

- All signals composed of even and odd components

$$x(t) = x_e(t) + x_o(t)$$

- Even:

$$x_e(t) = \frac{1}{2}[x(t) + x(-t)]$$

  - Positive and negative are the same

$$x_e(t) = x_e(-t)$$

- Odd:

$$x_o(t) = \frac{1}{2}[x(t) - x(-t)]$$

  - Positive and negative are different

$$x_o(t) = -x_o(-t)$$

### C. Periodic and non-periodic

- Continuous-time periodic $T_0$ signal:

$$x(t) = x(t + T_0)\ \forall t$$

- Discrete-time periodic $N_0$ signal:

$$x[n] = x[n + N_0]$$