Flourier Series

$$x(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} a_n \cos\left(\frac{2\pi n t}{T_p}\right) + b_n \sin\left(\frac{2\pi n t}{T_p}\right)$$

$$\frac{a_0}{2} = \frac{1}{T_p}\int_{-T_p/2}^{T_p/2} x(t)\,dt, \quad a_m = \frac{2}{T_p}\int_{-T_p/2}^{T_p/2} x(t)\cos\left(\frac{2\pi m t}{T_p}\right)dt,$$

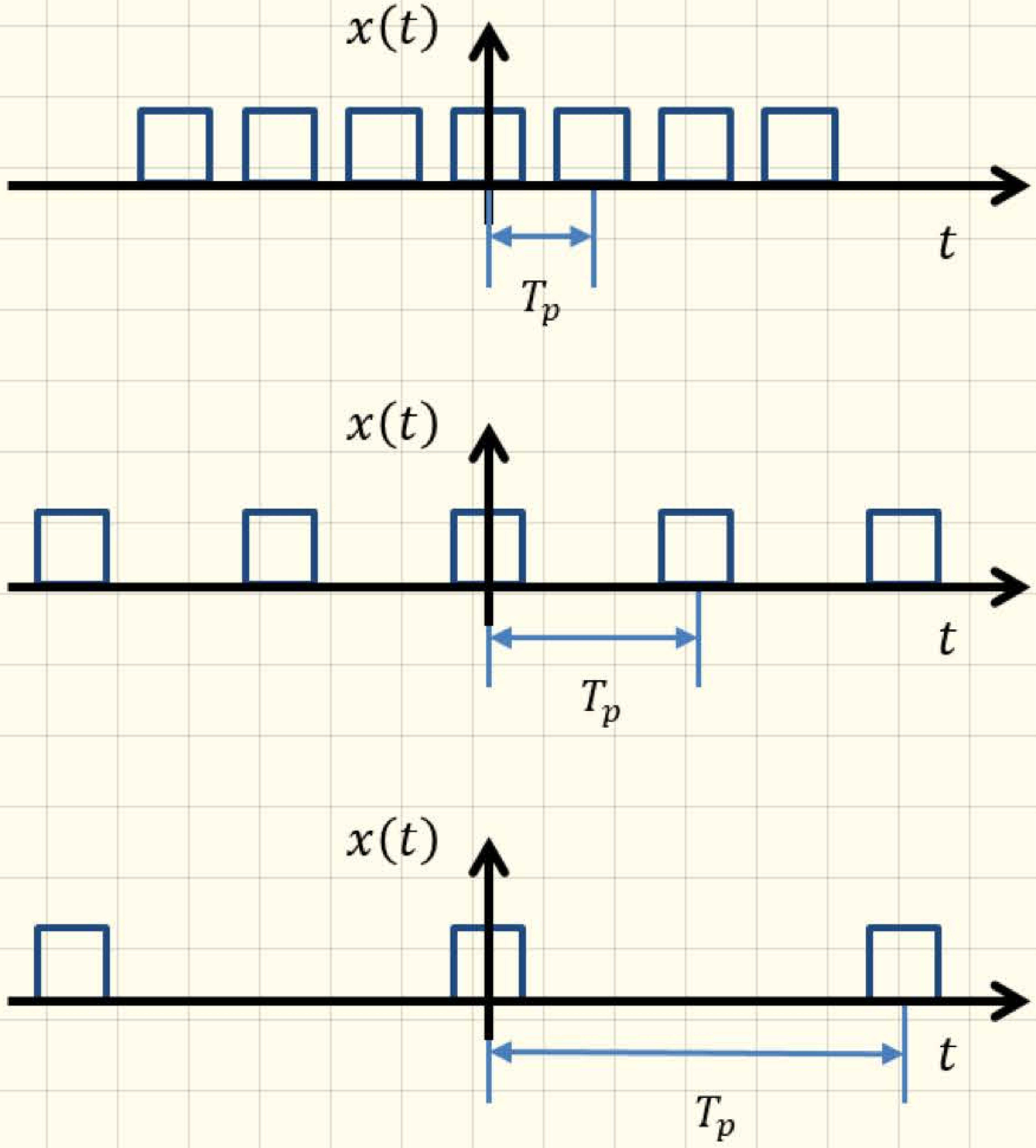
"general form"

$$b_m = \frac{2}{T_p}\int_{-T_p/2}^{T_p/2} x(t)\sin\left(\frac{2\pi m t}{T_p}\right)dt.$$

$$x(t) = \sum_{n=-\infty}^{\infty} C_n e^{i\omega n t} \qquad C_n = \frac{1}{T_p}\int_0^{T_p} x(t)\, e^{-i\omega n t}\,dt \qquad \omega = \frac{2\pi n}{T_p}$$

analytic vs numeric ??

" Complex form "



What happen When $T_p \to \infty$??

① non-periodic.

②

$$x(t) = \frac{a_0}{2} + \sum_{n=1}^{\infty} \underline{a_n \cos\left(\frac{2\pi n t}{T_p}\right)} + \underline{b_n \sin\left(\frac{2\pi n t}{T_p}\right)}$$

- DAQ : Digitizing analogue signal & its acquisition
  - Aliasing
  - Quantization
  - Clipping.

- Fourier Series : Representation of periodic signal using infinite sum of sine and cosine.

- $T_p \rightarrow \infty$: Transformation of non-periodic signal using fourier integral.

- What if we truncate the signal ??

$\longrightarrow \quad x(t)\,w(t)$

- What if we sample the signal ??

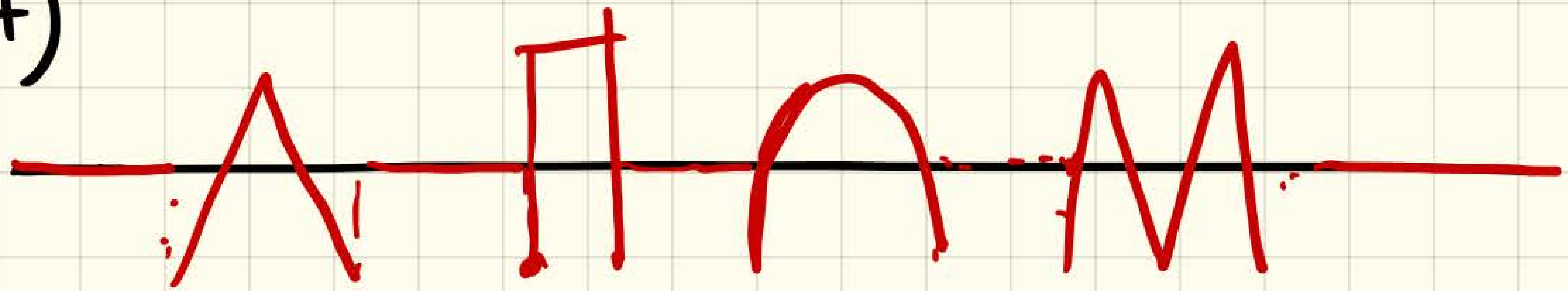
$\longrightarrow \quad x(t)\,i(t)$

- What if we digitize the signal in frequency as well ?

$\longrightarrow$ Discrete fourier transform

Convolution

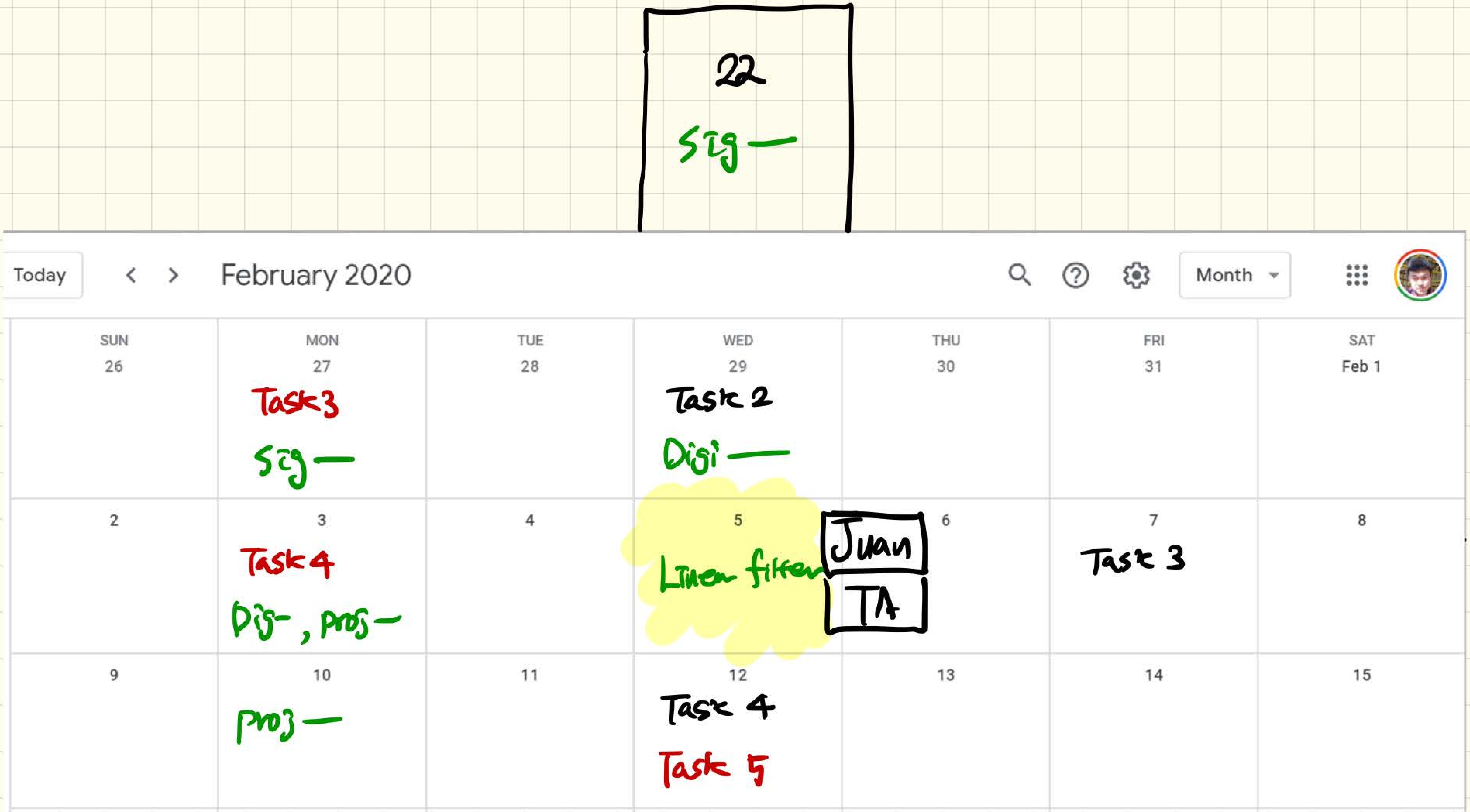
$x(t)$



$h(t)$

$x(t) * h(t)$?

- image filter
- CNN.



Please don't submit the report without solving problems.

Ask me extending the due date!!