Signal Processing - 1 by One

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Signals: Analog and Digital

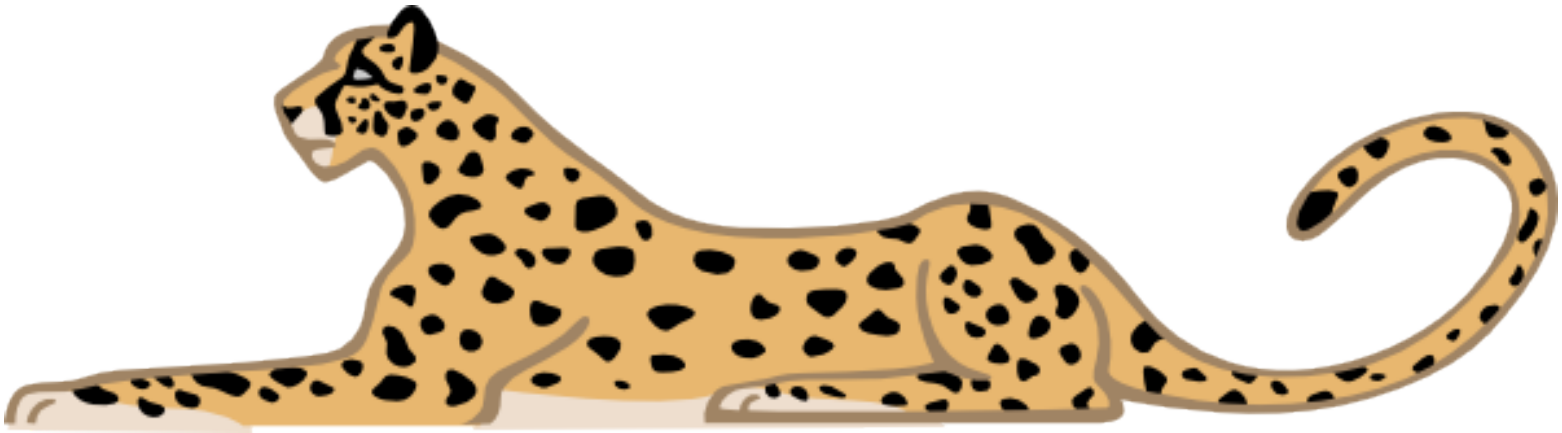

Figure: Leona the Leopard

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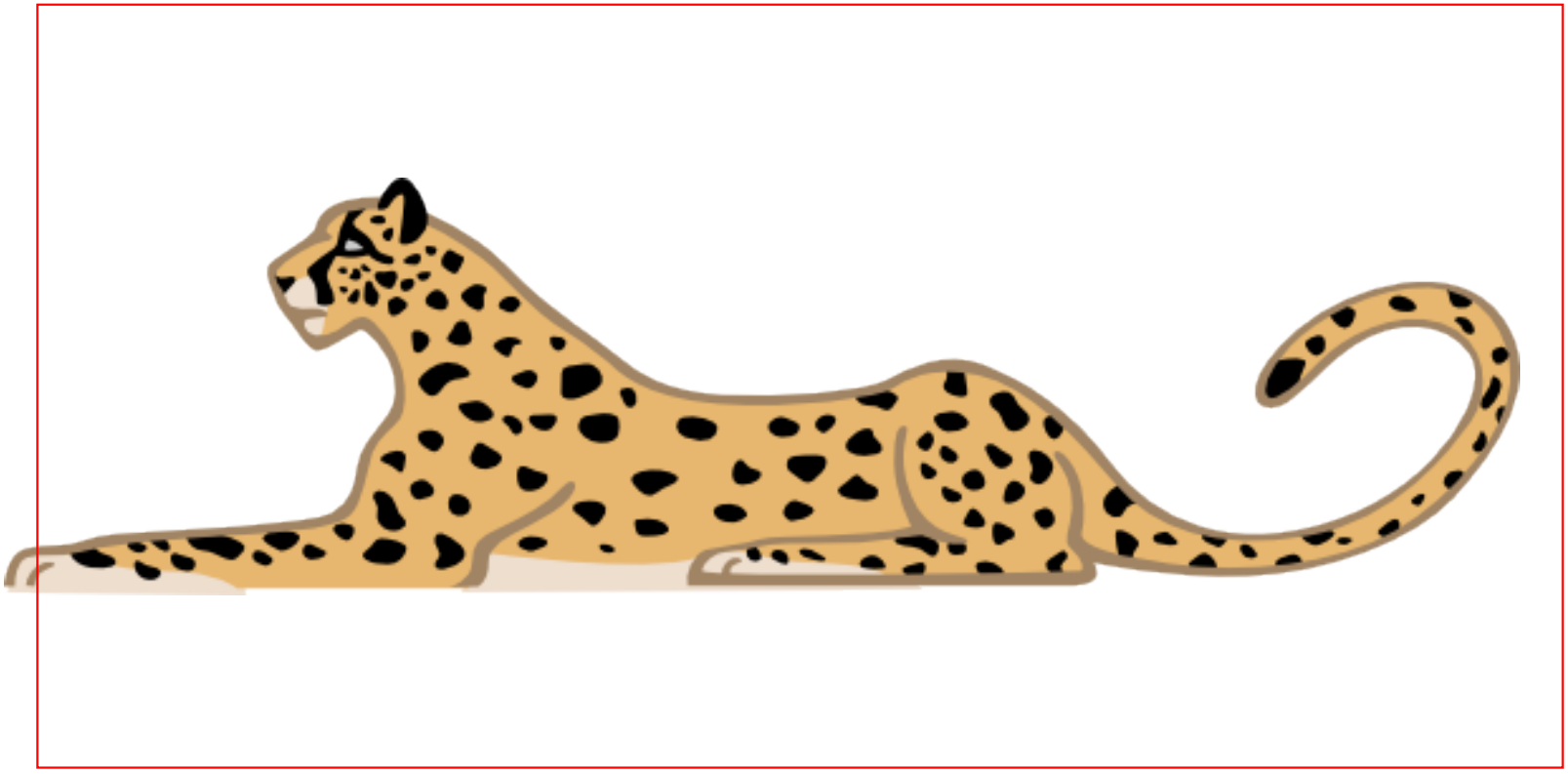

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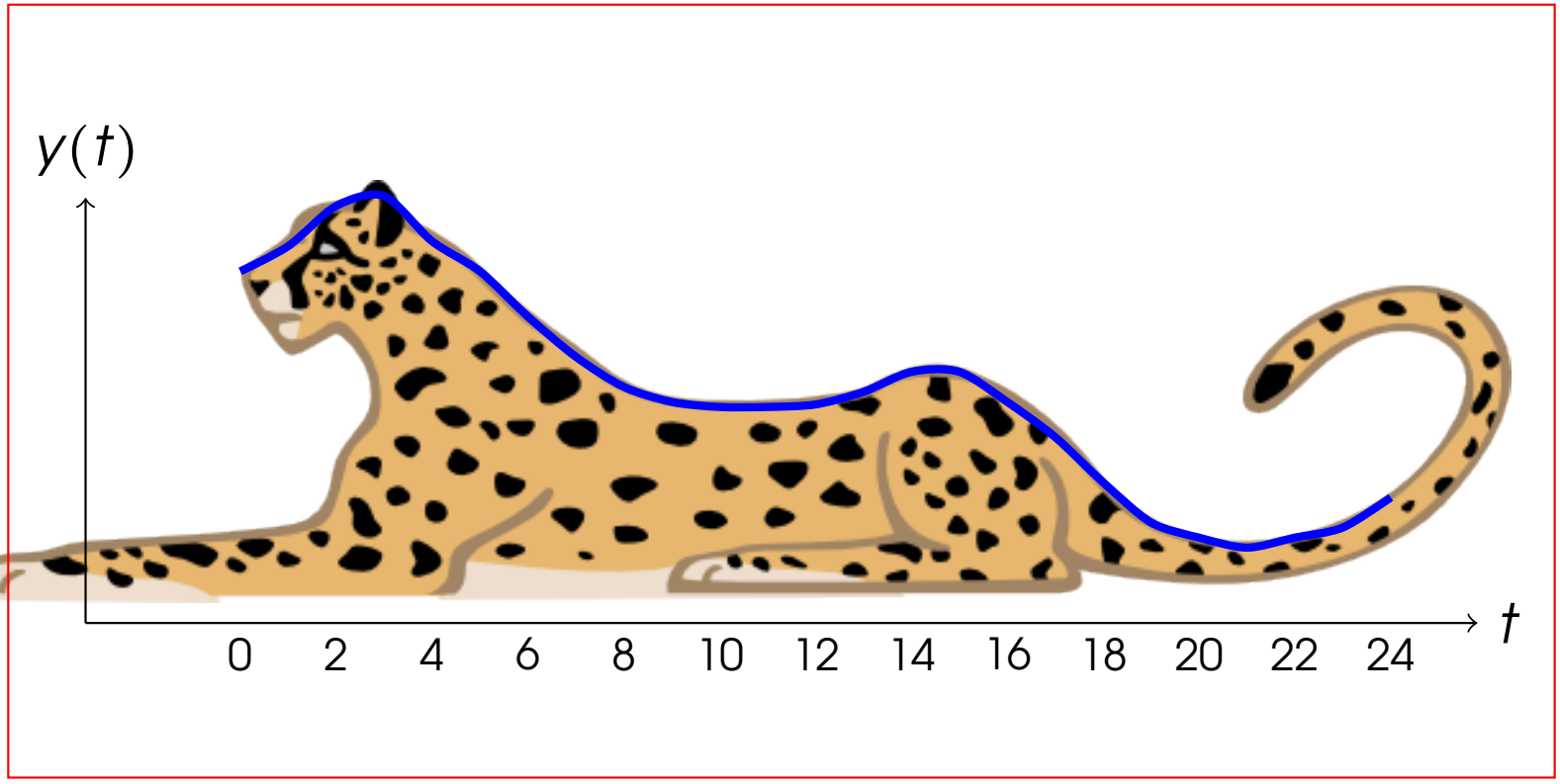

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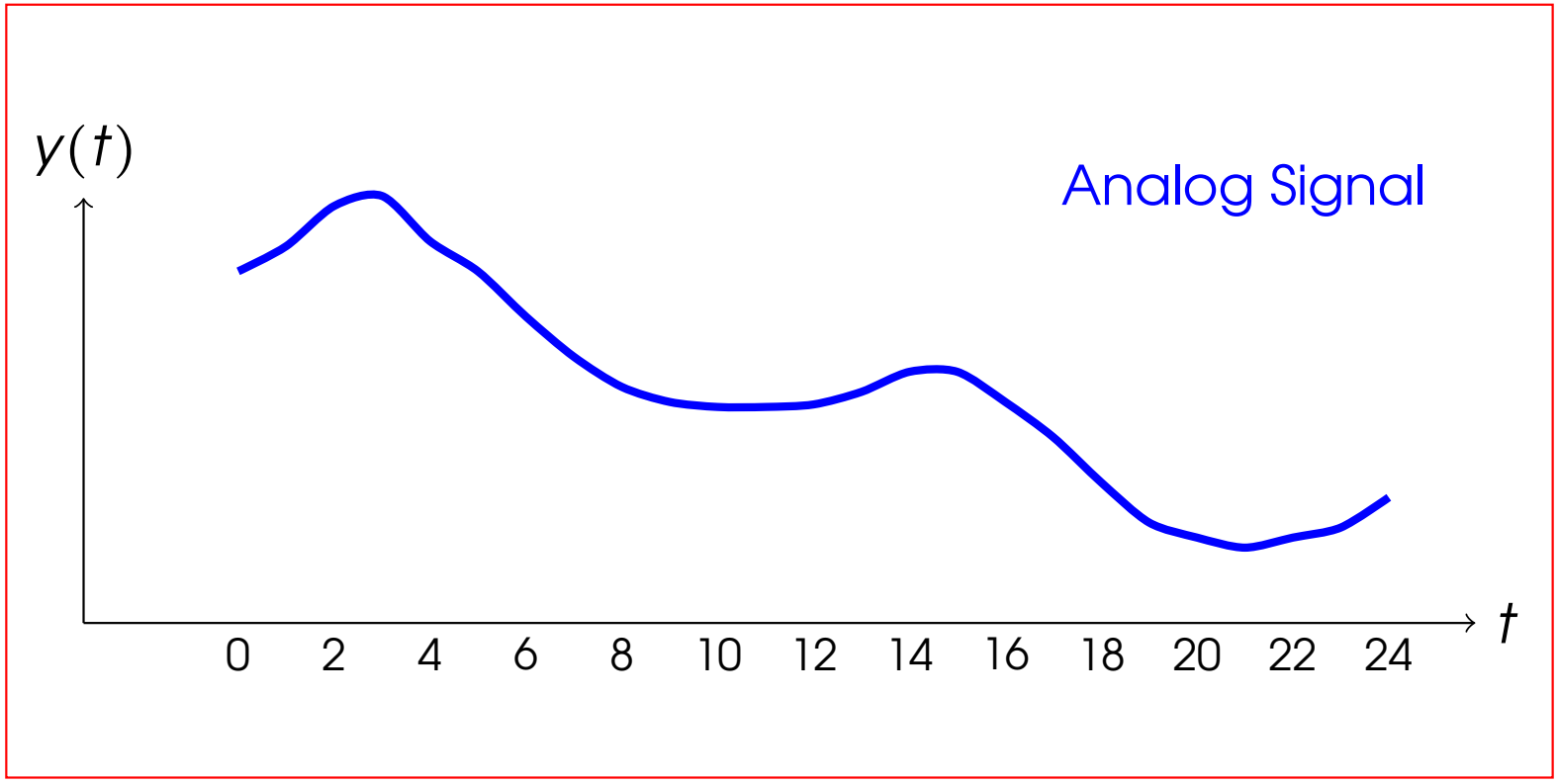

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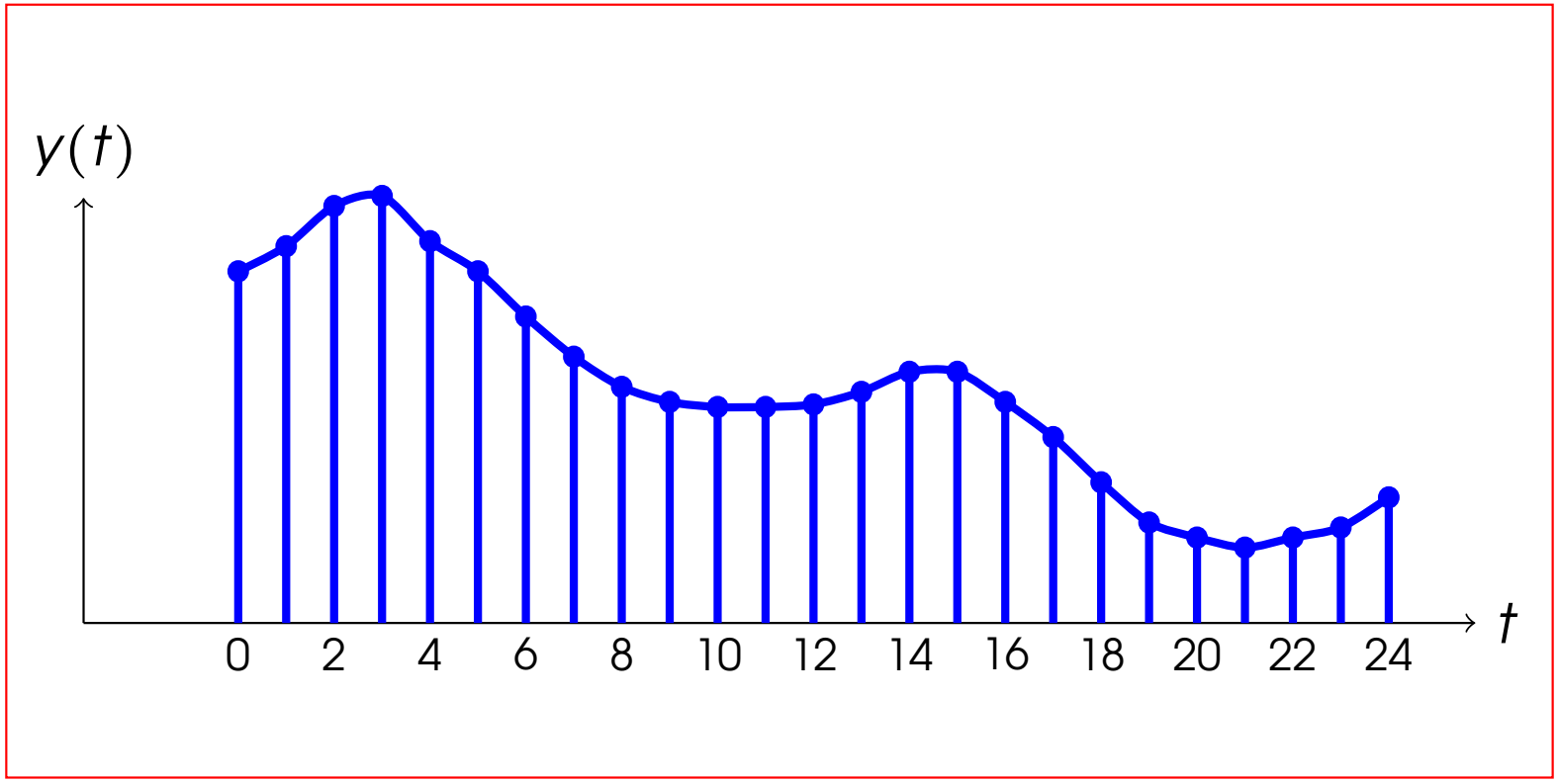

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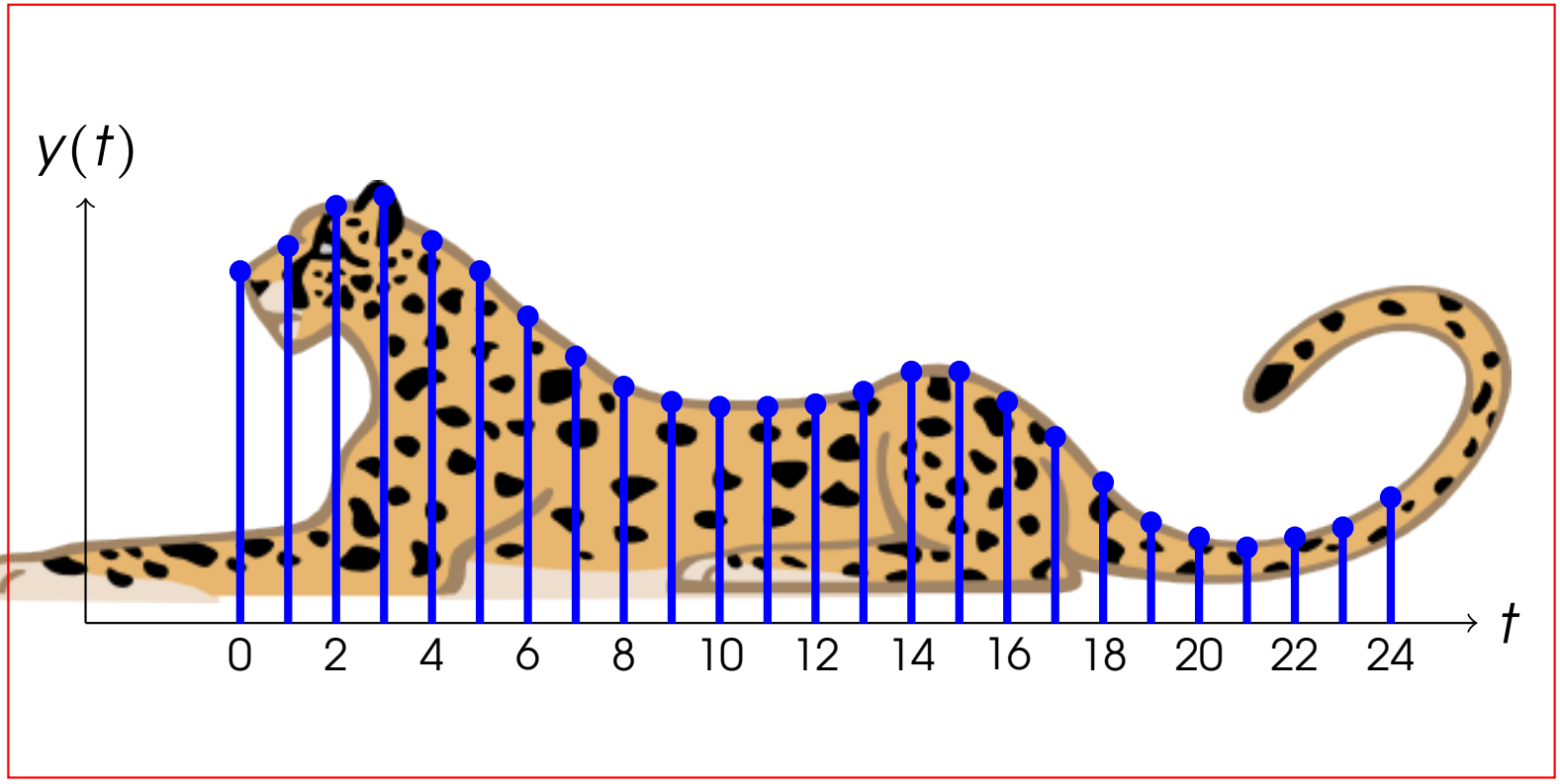

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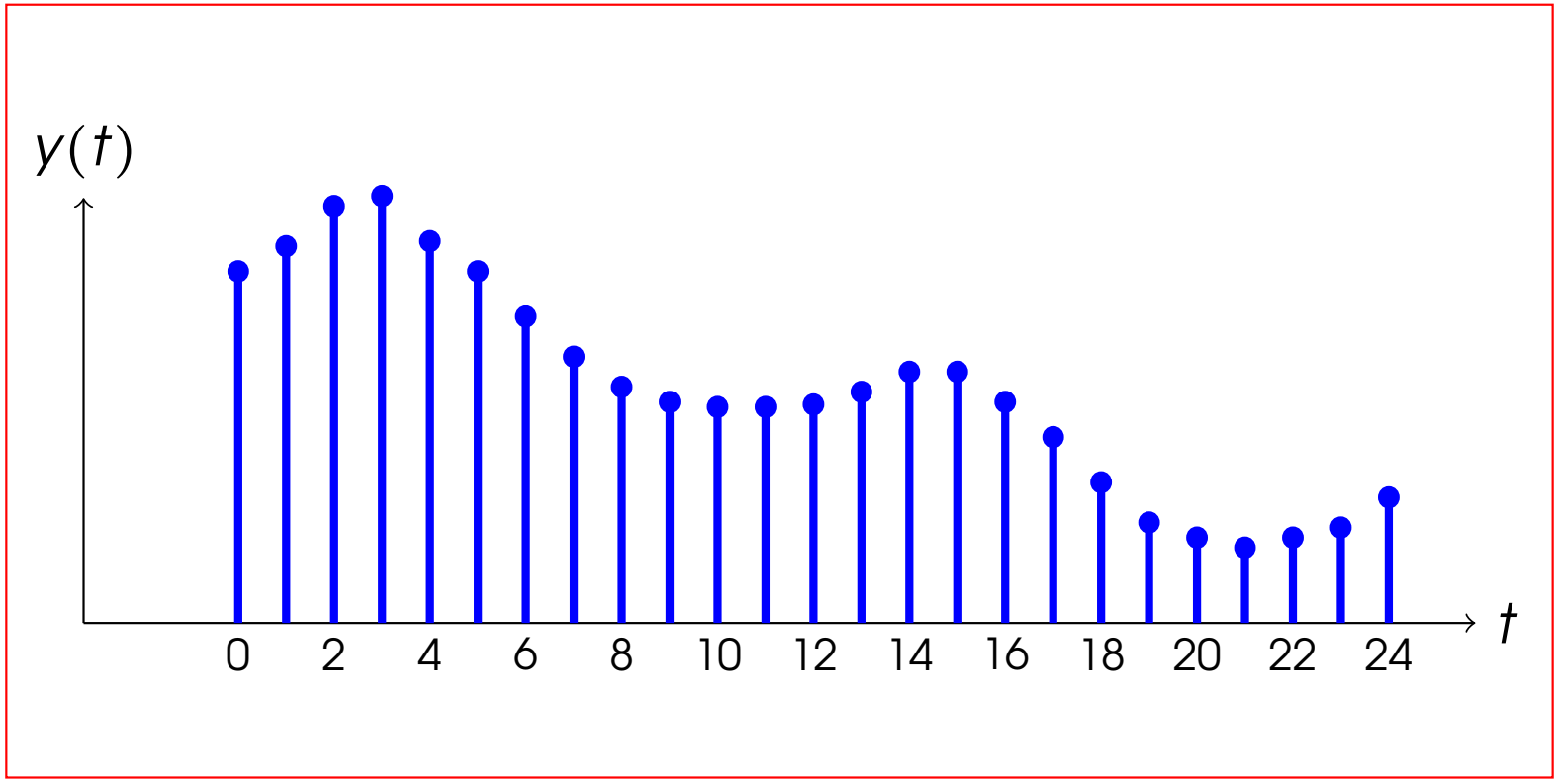

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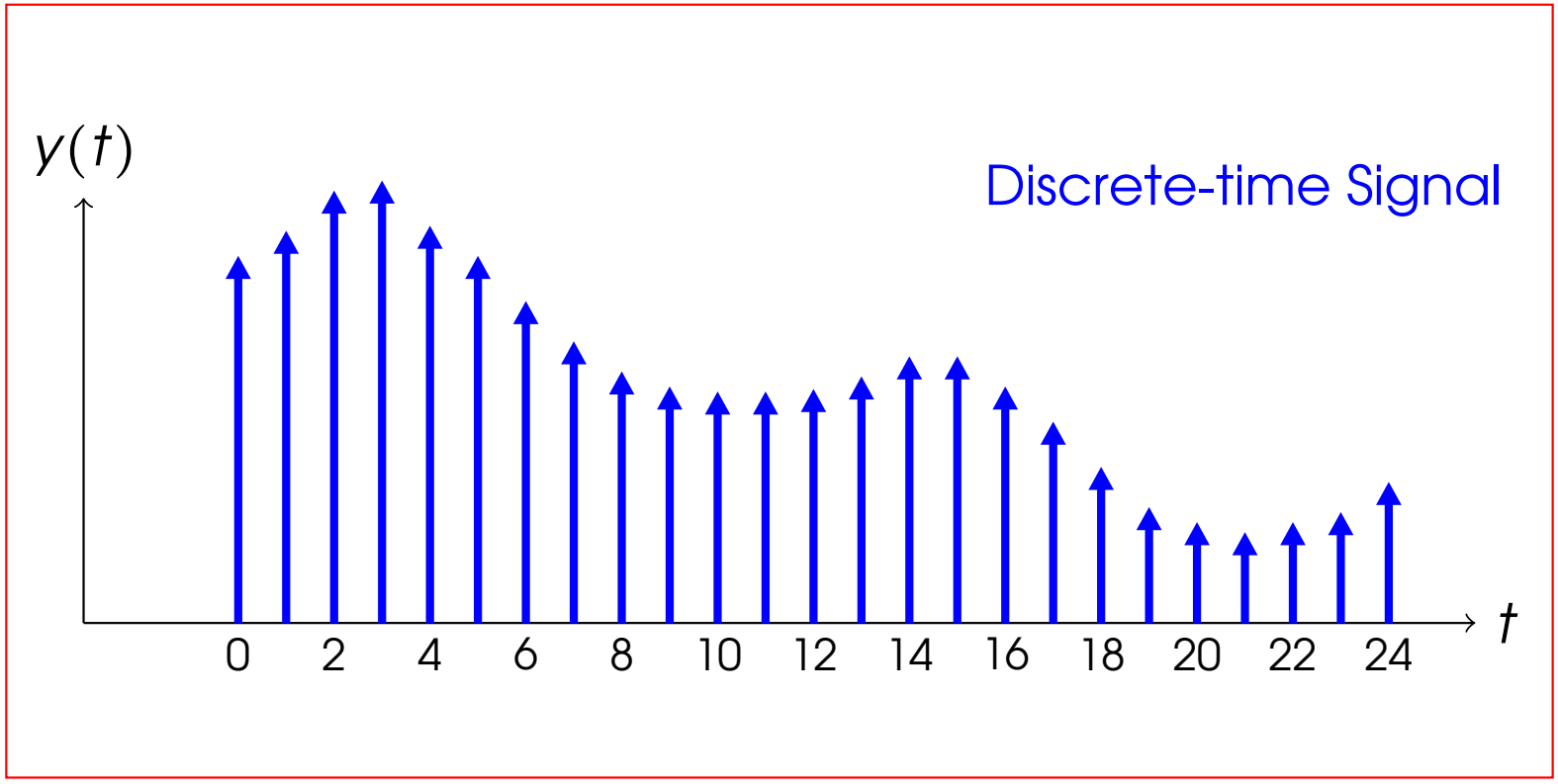

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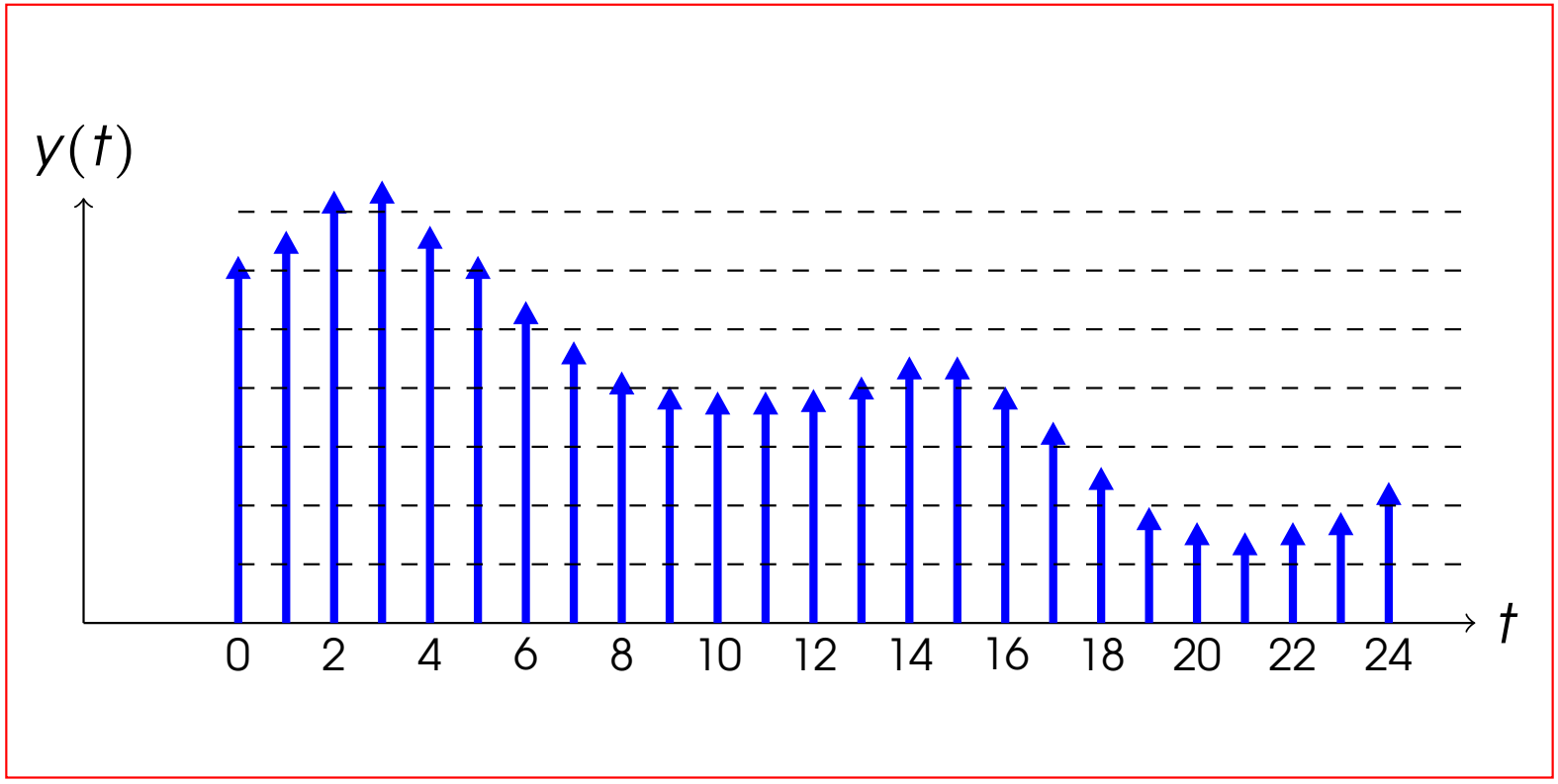

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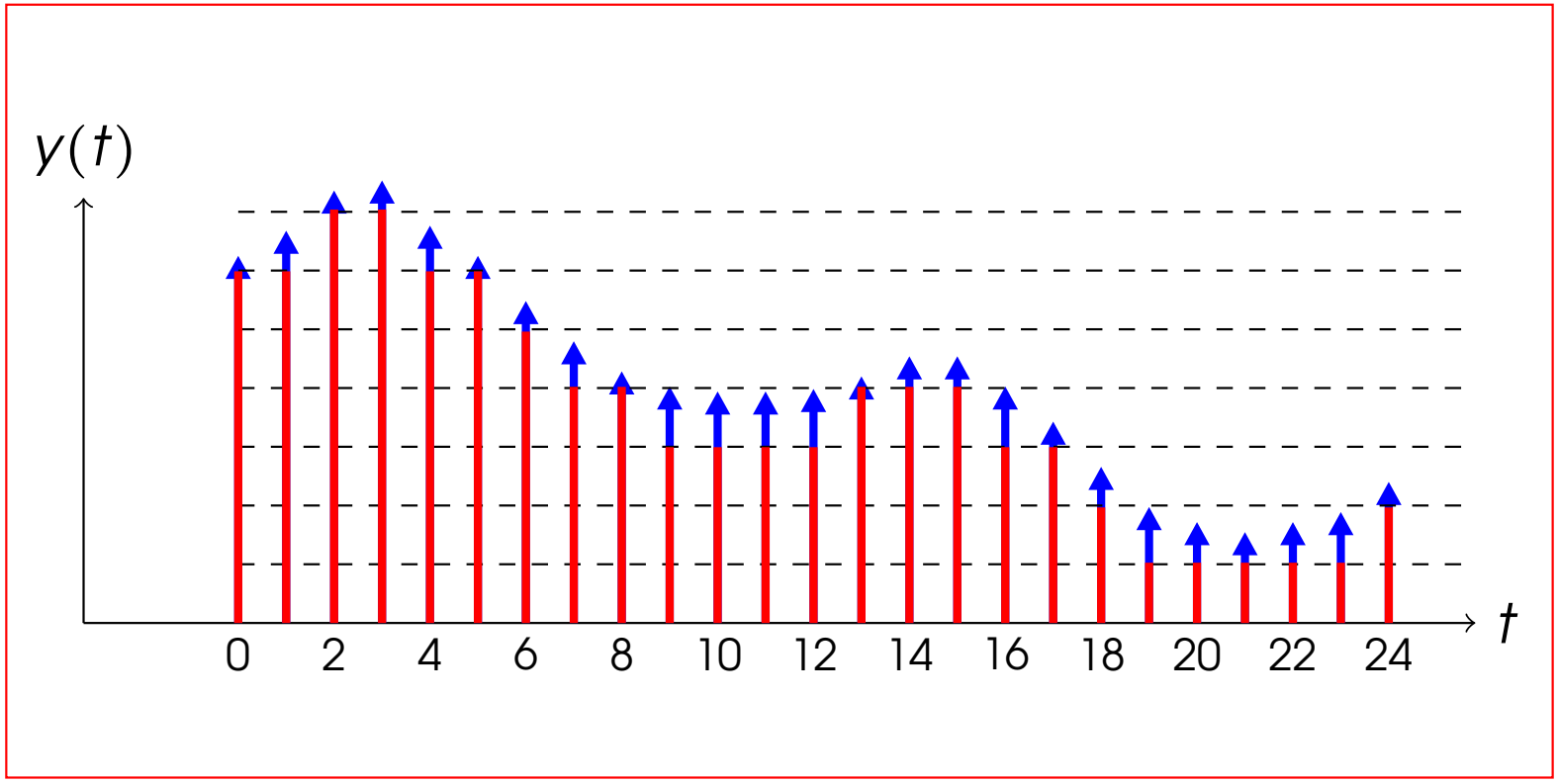

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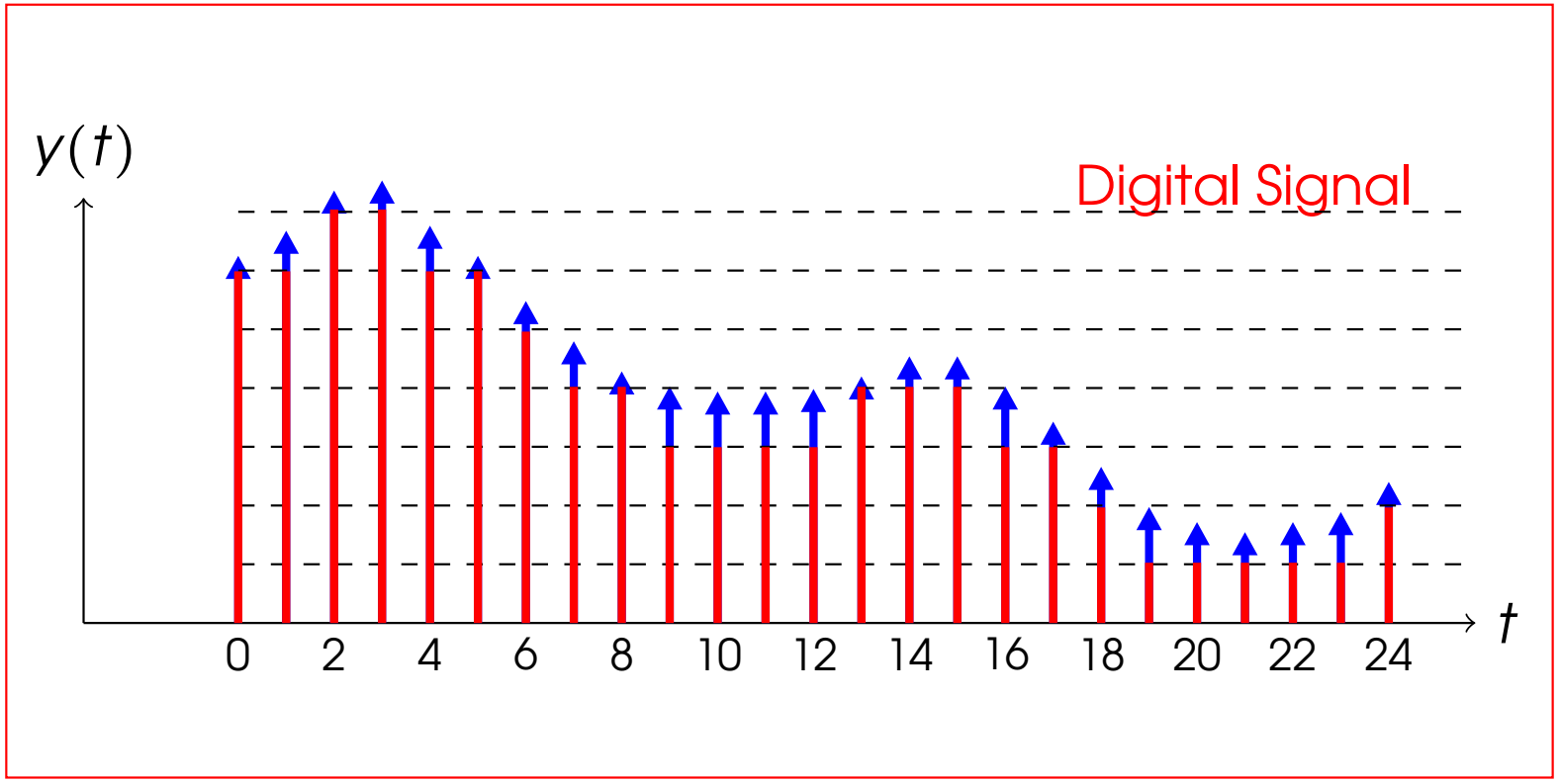

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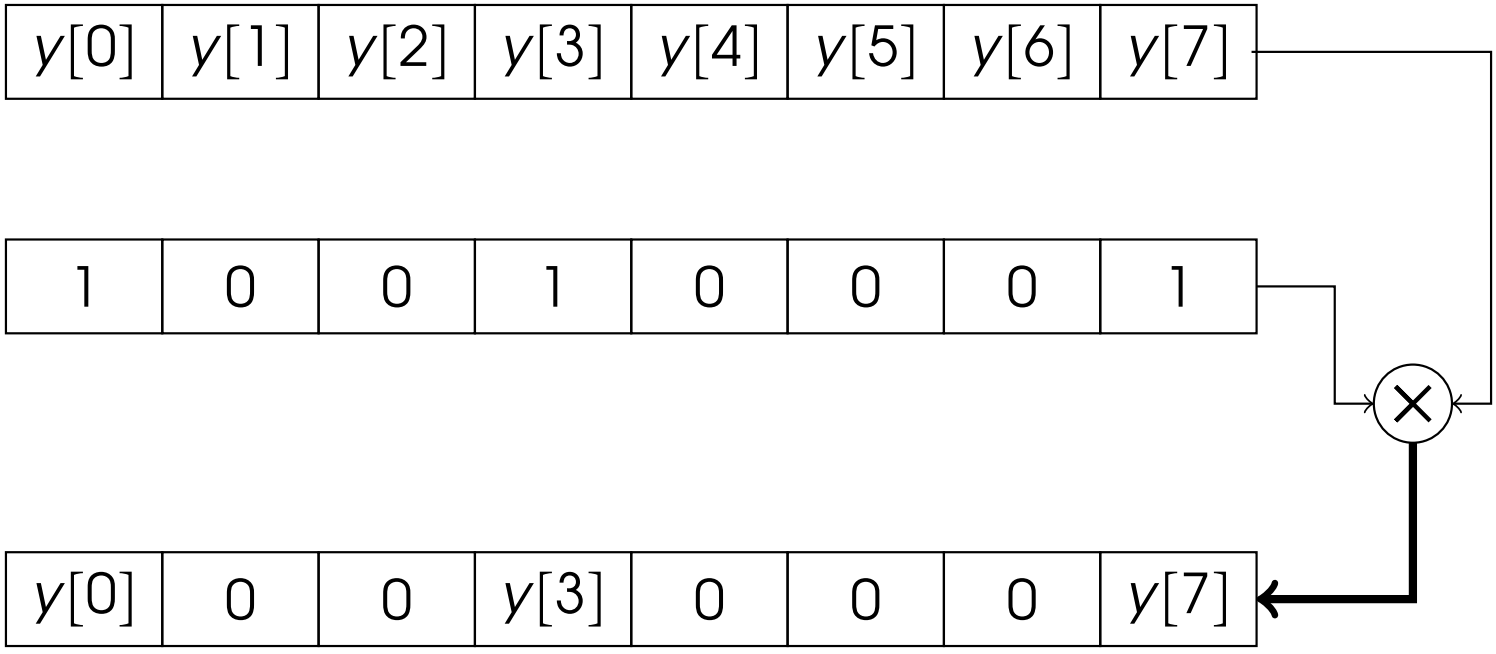
$$\bar{y} = (y[0], y[1], \cdots, y[N-1]).$$

Subsampling



Homework: Write a python program to take a signal vector and a binary vector as inputs, and plot the product of the two vectors as output.

Recap

- Analog Signals: Continuous-time signals.
- Discrete-time Signals: Indexed sequence of $(t, y(t))$.
- Digital signal: a sequence of quantized values.
- Sampling: From analog to discrete-time.
- Subsampling: Repeated sampling.

Elementary Signal Calculus

- **Amplitude scaling** of Signals: $y(t) = \alpha x(t)$, $\alpha \in \mathbb{R}$ or $\alpha \in \mathbb{C}$.
- **DC offset**: $y(t) = \alpha + x(t)$.
- **Addition** of signals: $z(t) = x(t) + y(t)$ (point-wise $\forall t \in \mathbb{R}$).
- **Time-shift**: $y(t) = x(t - \tau)$, $\tau \in \mathbb{R}$.
- **Multiplication** of Signals: $z(t) = x(t).y(t)$ (point-wise)
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