

COMPUTATIONAL MODEL

p1

function:

$$f: D \rightarrow K$$

domain

codomain sets

"set of inputs"

"set of conceivable outputs"

COMPUTATIONAL TASK

Cost : A "algorithm" $x \in D$

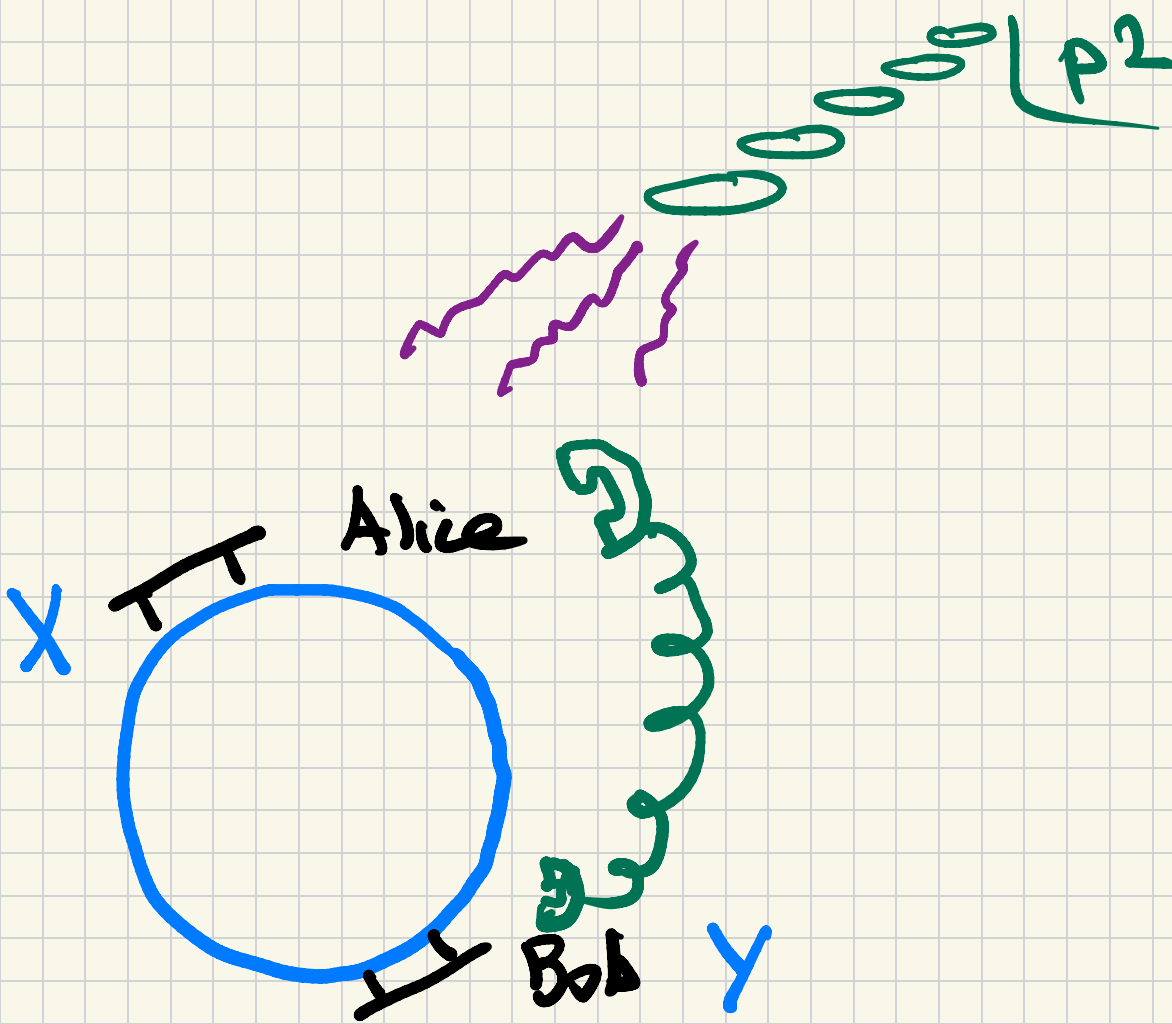
$$C(A, x) \leftarrow$$

cost worst-casecomplexity

$$n = |x|$$

size of input

$$C'_A(n) = \max_{\substack{x \in D \\ |x| = n}} C(A, x)$$



$$X, Y \in \{0, 1\}^N$$

← (0,1)-strings
of length N

$$X \stackrel{?}{=} Y$$

$$N = \text{exa bit} = 10^{18}$$

speed 1 Mbit/sec

→ > 30 years

COMMUNICATION COMPLEXITY

$$f: A \times B \rightarrow K = \{0,1\}$$

Boolean

$$A = B = \{a_i\}_{i=1}^N$$

$$C_f = \max_A C(A)$$

MEHLHORN - SCHMIDT

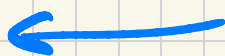
Communication matrix

$$M_f = (f(x,y))_{x,y}$$

$2^N \times 2^N$

$$C_f \geq \log_2 \text{rank}(M_f)$$

$$C_{x \stackrel{?}{=} y} \geq N$$



$$\text{for } f: x \stackrel{?}{=} y$$

$$M_{x \stackrel{?}{=} y} = \begin{pmatrix} 1 & \cdots & 1 \\ 0 & \cdots & 0 \\ \vdots & \ddots & \vdots \\ 0 & \cdots & 0 \end{pmatrix}$$

$2^N \times 2^N$