Crypto refresher

What's a cryptosystem

- A **cryptosystem** is a tuple Π with key, plaintext and ciphertext spaces $\mathscr{K}, \mathscr{P}, \mathscr{C}$

$$\Pi = \begin{cases} Gen : 1^n \to \mathscr{K} \\ Enc : \mathscr{K} \times \mathscr{P} \to \mathscr{C} \\ Dec : \mathscr{K} \times \mathscr{C} \to \mathscr{P} \end{cases}$$

- It is said to be **exact** (resp. **approximate**) if $\forall s \in \mathscr{K}, m \in \mathscr{P}$

$$Dec_s(Enc_s(m)) = m \text{ or } Dec_s(Enc_s(m)) \approx m$$

- It is said to be **homomorphic** if $\forall s \in \mathscr{K}, m_0, m_1 \in \mathscr{P}$

$$Enc_s(m_0 \circ m_1) = Enc_s(m_0) \circ Enc_s(m_1)$$

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For some notion of distance

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