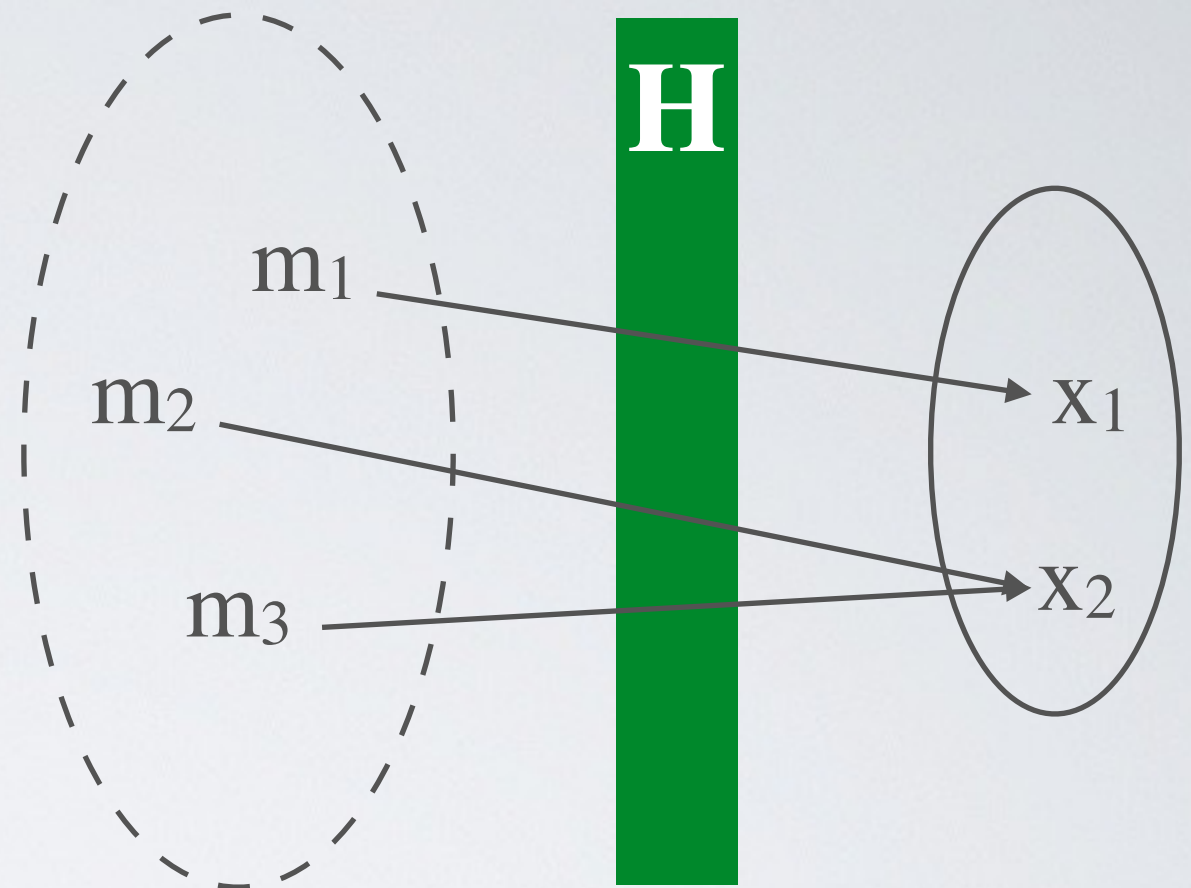# Cryptographic Hashing

$H(m) = x$ is a hash function if

- H is one-way function
- m is a message of any length
- x is a message digest of a fixed length
- ➡ H is a lossy compression function
  necessarily there exists x, m_1 and m_2 | $H(m_1) = H(m_2) = x$

Computational Complexity

$$m \longrightarrow \boxed{H} \longrightarrow x$$

- Given H and m, <u>computing x</u> is **easy** (polynomial or linear)

- Given H and x, <u>computing m</u> is **hard** (exponential)

➡ H is **not invertible**