

Nondeterministic Protocols

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"Nondeterministic communication complexity"

Defined similarly to NP

Consider a two party problem (we can generalize to multi-party from here).

Each player is given their input along with some nondeterministic guess z of length m that may depend on the given inputs.

Otherwise the protocol is deterministic.

$f(x,y) = 1$ iff $\exists z$ that makes the players output 1

$C(f) = m + \text{communication}$

NP^{CC} is simply nondeterministic communication protocols the have a $C(f) = n^k$
 $coNP^{CC}$ is defined similarly

$g(x,y) = 1 - f(x,y)$

However it can be shown that: $NP^{CC} \cap coNP^{CC} = P^{CC}$

This is shown by relating the communication complexities of $f \in NP^{CC}$ and $\bar{f} \in coNP^{CC}$
 $C(f) = k$
 $C(\bar{f}) = 10kl$ for some complexity l