

A New Parameter and Our Result

$$\bullet \cdot c_{f,s} \leq c_f[s] \leq s \cdot c_{f,s}$$

• For $f(y) = y^p$, $c_f[s] = s^{p-1} = c_{f,s}$

- **Theorem:** Given a super-additive function f that is 'approximately invertible', there is a **two round** protocol using $O(c_f[s] \cdot \text{polylog}(n)/\varepsilon^2)$ bits of communication to approximate $\sum_i f(x_i)$ up to $1 \pm \varepsilon$

- $\Omega(c_f[s]/\varepsilon^2)$ lower bound for a restricted class of functions

- Suggests $c_f[s]$ captures the complexity better



$$f(y_1 + \dots + y_s) \leq \frac{c_f[s]}{s} \left(\sqrt{f(y_1)} + \dots + \sqrt{f(y_s)} \right)^2$$

$$f(y_1 + \cdots + y_s) \leq c_{f,s}(f(y_1) + \cdots + f(y_s)) \text{ for all } y_i$$

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- For $f(y) = y^p$, $c_f[s] = s^{p-1} = c_{f,s}$
- **Theorem:** Given a super-additive function f that is "approximately invertible", there is a **two round** protocol using $O(c_f[s] \cdot \text{polylog}(n)/\varepsilon^2)$ bits of communication to approximate $\sum_i f(x_i)$ up to $1 \pm \varepsilon$
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Key Observations