Erasure-Resilient Graph Property Testing

Workshop on Local Algorithms 2018

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Graphs are represented as adjacency lists.

Graph $G = (V, E)$ with $n$ vertices and $m$ edges.

If $G$ satisfies property $P$.

If $G$ has to be modified in at least $\epsilon \cdot m$ edges to satisfy $P$. 
Erasure-resilient graph property testing

Graph $G = (V, E)$ with $n$ vertices and $m$ edges (erased and nonerased).

$\leq \alpha \cdot m$ edges are erased.

Exists completion of $G$ satisfying property $P$.

Every completion of $G$ has to be modified in at least $\epsilon \cdot m$ edges to satisfy $P$.

Erasure-resilient (function) property testing

[Dixit Raskhodnikova Thakurta Varma 18]
Erasure-resilient testing connectedness

• $\alpha$-erasure-resilient $\epsilon$-tester for connectedness with query complexity

$$O\left(\left(\frac{1}{(\epsilon - \alpha) d}\right)^2\right)$$ whenever $\alpha < \epsilon$, where $d = \frac{m}{n}$.

• Every $\alpha$-erasure-resilient $\epsilon$-tester for connectedness needs $\Omega(m)$ queries when $\alpha \geq \frac{2\epsilon}{1+\epsilon}$.

Threshold phenomenon!

Constant query complexity!

Linear query complexity!