Confidence Augmented Bootstrap Percolation

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Existing Work

1. **Erdős–Rényi graph:** Independent edge probability p between any two nodes.
2. **Power law configuration graph:** A few nodes (aka hubs) hold most edges; most nodes have very few.
3. **GIRG (Geometric Inhomogeneous Random Graph):** Power-law plus geometry; closer nodes are likelier to connect.

My contribution

A node now activates if **either** condition is met:

1. Percolation: At least r of its neighbors have failed ($|\{j \sim i : j \in A_t\}| \geq r$).
2. **Fear:** A Bernoulli variable with probability $f_i g_t$ that a node activates ($U_i < f_i\, g_t$).

How is fear defined?

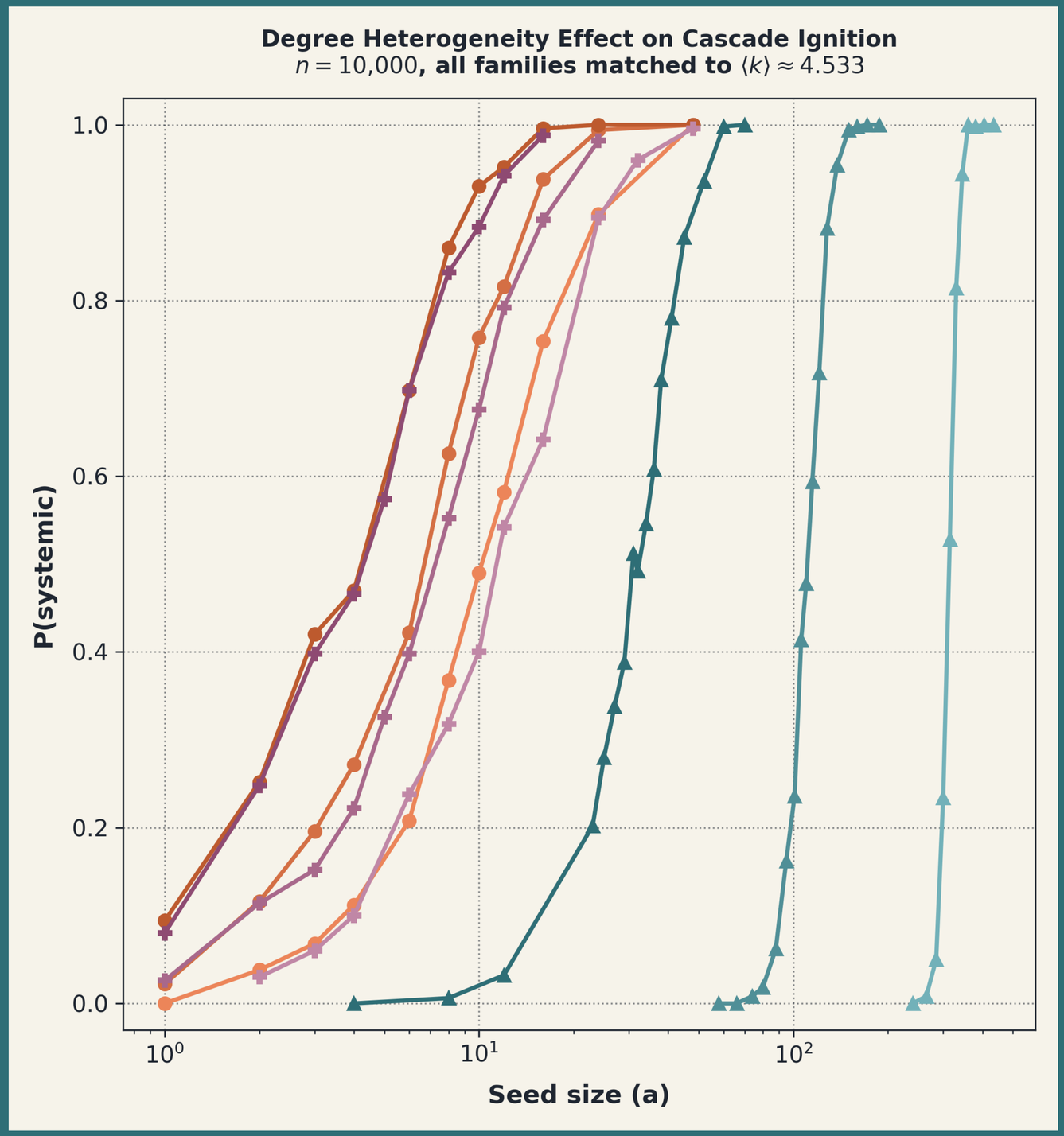
1. $f_i \in [0, 1]$: Node i's fear susceptibility (1 = highest).
2. g_t: the share of nodes that failed recently, averaged over the last 5 generations.

What We Look For

Holding n and $\langle k \rangle$ fixed, we isolate three effects:

- **Heterogeneity:** homogeneous degrees vs. heavy-tailed hubs.
- **Geometry:** pure random links vs. local spatial clustering.
- **Fear:** baseline percolation vs. confidence augmentation.

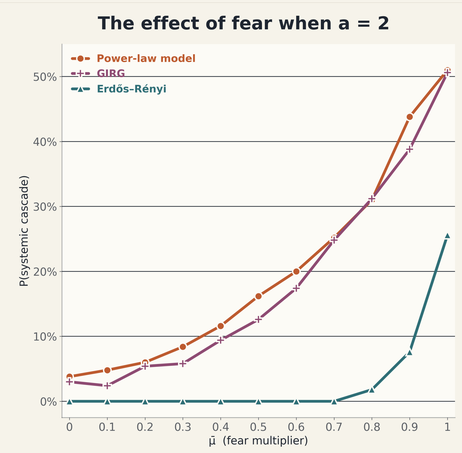
Fear is a new way for nodes to fail. **This** is how fear interacts with heterogeneity and geometry.



Measured at matched mean degree $\langle k \rangle = 4.533$, $n = 10000$.
500 trials per point.

Fear is an amplifier with a dial.

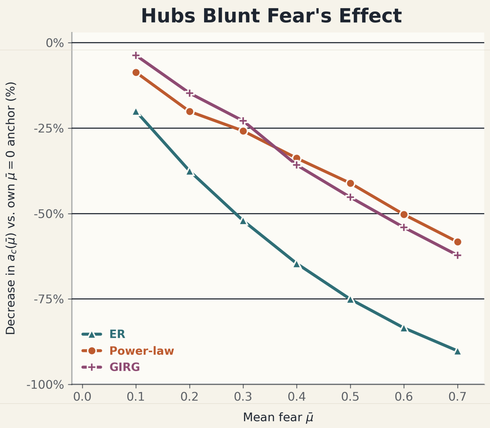
When we set $a = 2$, the Erdős–Rényi graph doesn't activate at all until $\bar{\mu} = 0.8$, and even then in only ~2% of trials. The effects of fear on the GIRG and power-law model appear relatively equal.



P(systemic | μ̄), n=10,000. Every curve uses the same bounded seed a=2.

Fear and Structure

The same fear that cuts ER's tipping point by 65% cuts the heavy-tailed networks' by only ~35% at $\bar{\mu} = 0.4$. Hubs blunt fear's effect, and geometry doesn't change that.



Scan to interact with live graphs