

Self-Organizing Criticality

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Complex Systems with characteristics of Self-Organizing Criticality (SOC) or Highly-Optimized Tolerance (HOT) exhibit events of all sizes, typically with a frequency of occurrence described by a heavy-tailed distribution. Some large physical systems, such as the electric power grid, have failure statistics consistent with event statistics of SOC and HOT systems. This suggests that large-scale failures are not anomalies but should be expected as infrequent, dramatic events. The papers in this minitrack examine network models and properties that characterize complex behavior in large networks.

The first two papers in the session specifically discuss outages in power systems. The effect of increased loading to blackout size is examined in the first paper. In the second paper, the distinction between blackouts arising from loss of load due to generator capacity limits and blackouts caused by loss of lines due line flow limits is explored in detailed.

The third and fourth papers more general models of systems. Self-organizing criticality is examined in the context of a distribution network. In the fourth paper, failure characteristics of the probabilistic influence model are studied when the system is optimized to minimize the sum of failure costs and repair resource allocation costs.