Modes For a Non Strict Functional Logical Language

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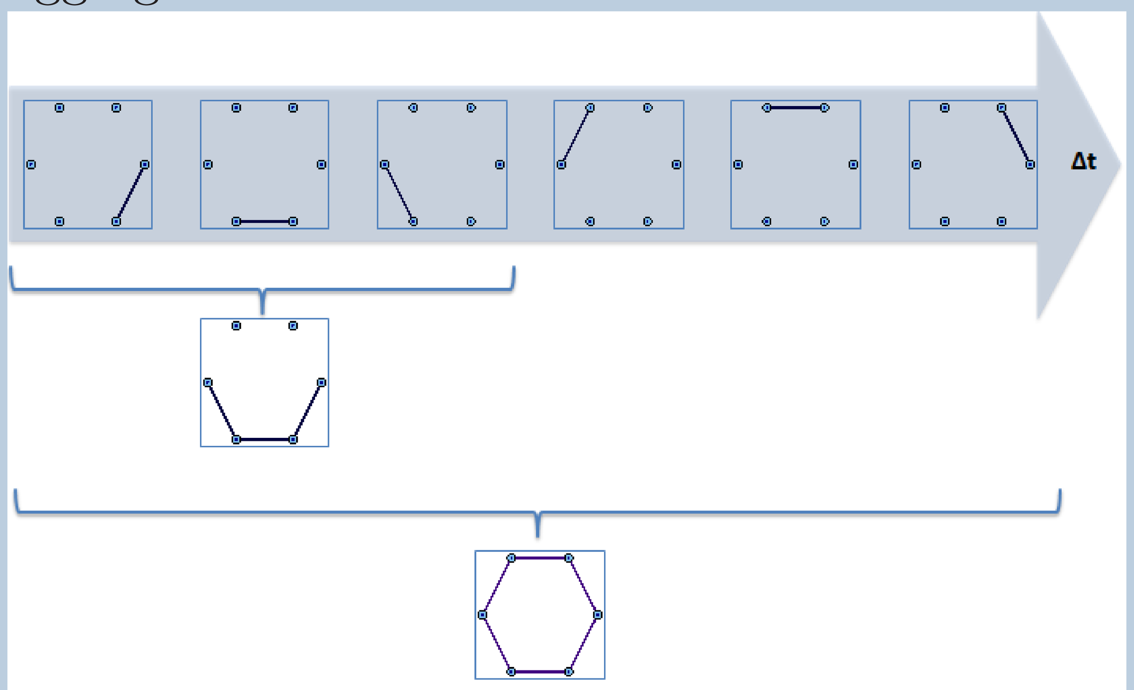
Problem

Sampling networks always involves the act of aggregation (e.g., when collecting longitudinal samples of networks). We sutdy how the cumulation window length effects the properties of the aggregated network.



Basic Concepts

In our work the dynamic network is a series of graphs, that is, $DN = G_t(V_t, E_t)$, where $E_t \subseteq V_t \times V_t$ $(\forall t \geq 0)$. The initial network, G_0, is considered as a parameter of the process. The **node set fixed** and we worked with an about **constant number of edges**. We assume that the evolution of the network can be described as the result of an edge creation and an edge deletion process. We define G_t as the **snapshot network** and

$$G_T = (\bigcup_{t=0}^{T} V_t, \bigcup_{t=0}^{T} E_t) \text{ for } T \geq 0.$$

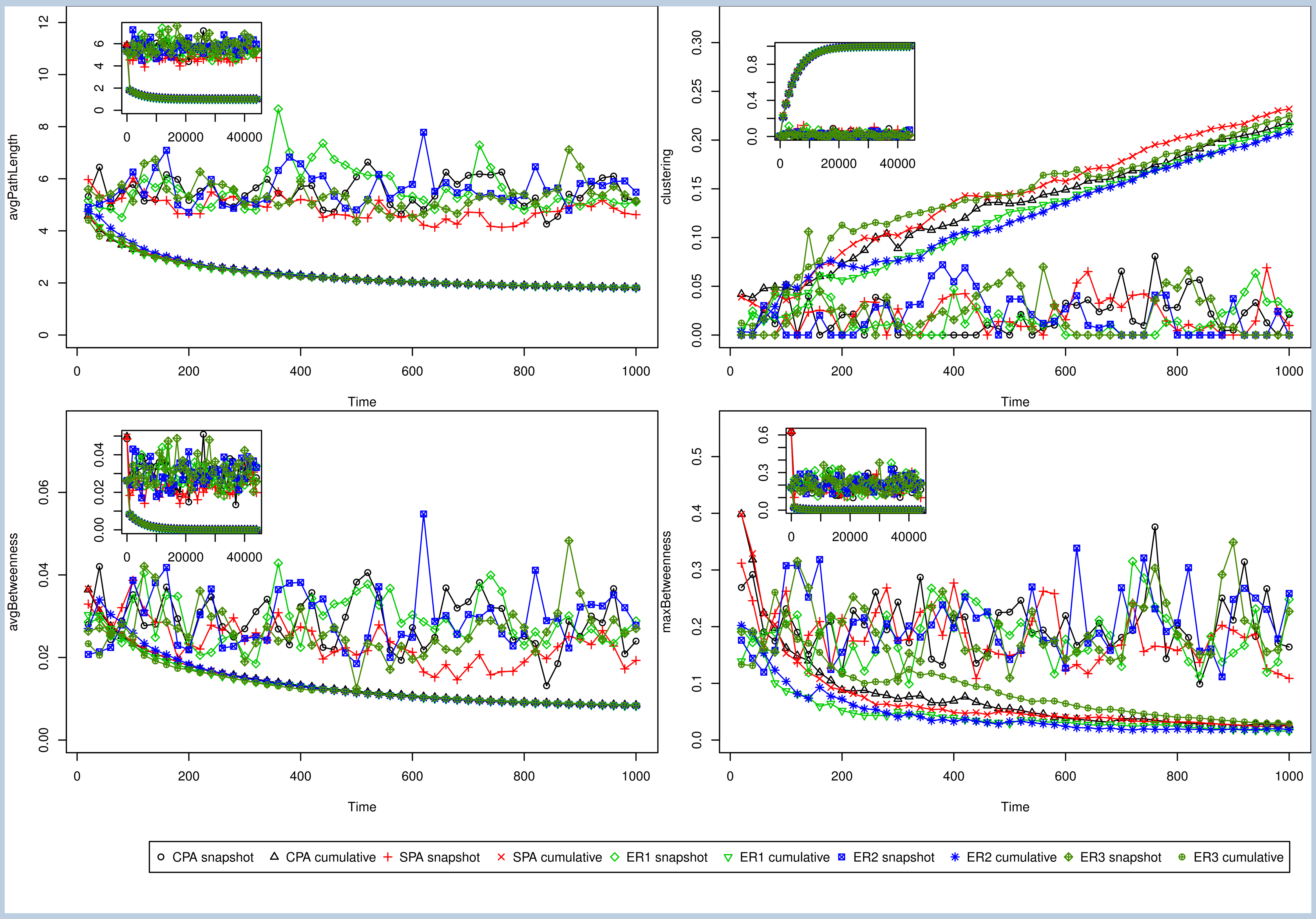
as the **cumulative network**.

Models

ER1 G_0 is a random graph. Add each non-existing edge with p_A, delete each existing edge with p_D probability.
ER2 G_0 is a random graph. Add k_A uniformly selected random new edges and delete k_D existing edges.
ER3 G_0 is a random graph. Rewire k_{RW} edges.
SPA (*Snapshot preferential*) G_0 is a scale free network. Add k_A edges from a random node with preferential attachment based on the snapshot network. Delete k_D existing edges.
CPA (*Cumulative preferential*) G_0 is a scale free network. Add k_A edges from a random node with preferential attachment based on the cumulative network. Delete k_D existing edges.

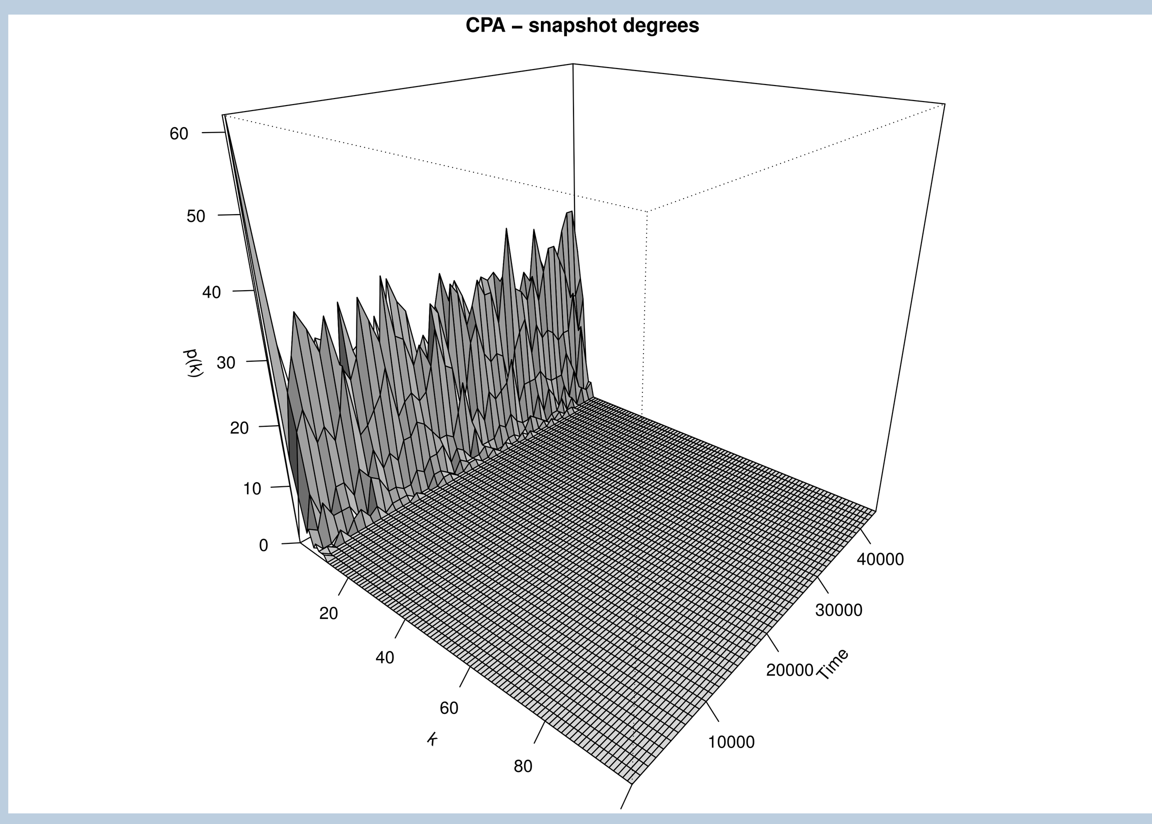
Dynamic Networks are Sensitive to Aggregation

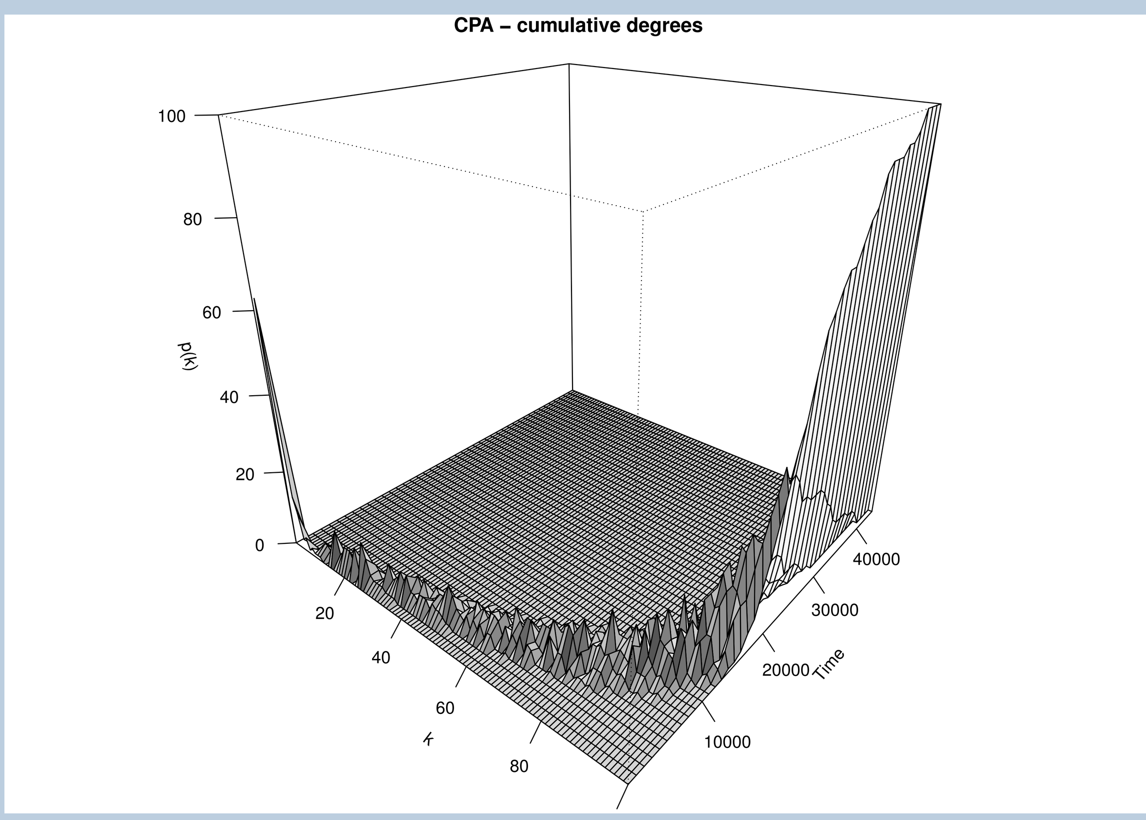
Network characteristics are extremely sensitive to minor changes in aggregation length. In our previous work , we studied the cumulative properties of Elementary Dynamic Network models over the complete time period (i.e., until they reach the stable point of a full network). Here we focus on the more realistc domain of sparse (cumulative) networks. We find that even when snapshot networks are stationary, **important network characteristics** (average path lenght, clustering, betwenness centrality) **are extremely sensitive to aggregation** (window length).



Degree Distribution Radically Changes

Degree distributions are exceptionally sensitive to the length of the aggregation window. **The same dynamic network may produce a normal, lognormal or even power law distribution for different aggregation lenghts.** The digree distribution of the snapshot and cumulative network is inherently different. The following surfaces show the CPA model until it approaches the complete network.





Conclusions

In this thesis, we discussed a lazy functional logic language similar to Curry[?] and proved its runtime safety. We supplied a mode system and a way to separate nondeterminism from input and output. However, the mode system is not always entirely expressive enough. It is also still necessary to show the safety of extensions of polymorphism and recursion to the current mode algorithm. Finally, a full implementation of the language has yet to be completed.

References