Dynamic Network Analysis of Bitcoin's Lightning Network

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Abstract

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1 Introduction

1.1 Related work

Our contribution:

2 Background

2.1 Network properties

Let $E(t)$ and $N(t)$ denote the number of edges and nodes at time t respectively.

2.2 Bitcoin and Lightning Network

3 Data

4 Experiments

4.1 Simulating transactions on LN

4.2 LN's evolution

4.2.1 Macroscopic evolution

Ever since LN had been launched its popularity steadily grew, causing its average degree increasing over time. In [1] it was shown that densification of real networks follow power-law distribution, i.e.:

$$E(t) \propto N(t)^a, \tag{1}$$

where we call a the power law densification exponent, where $1 \leq a \leq 2$. If $a = 1$, then average degree of the network is constant over time, on the other hand if $a = 2$, the network is an extremely dense graph, where each node has, on average, edges to a constant fraction of all nodes [1]. We found that LN is no exception to the DPL rule (4.2.1).

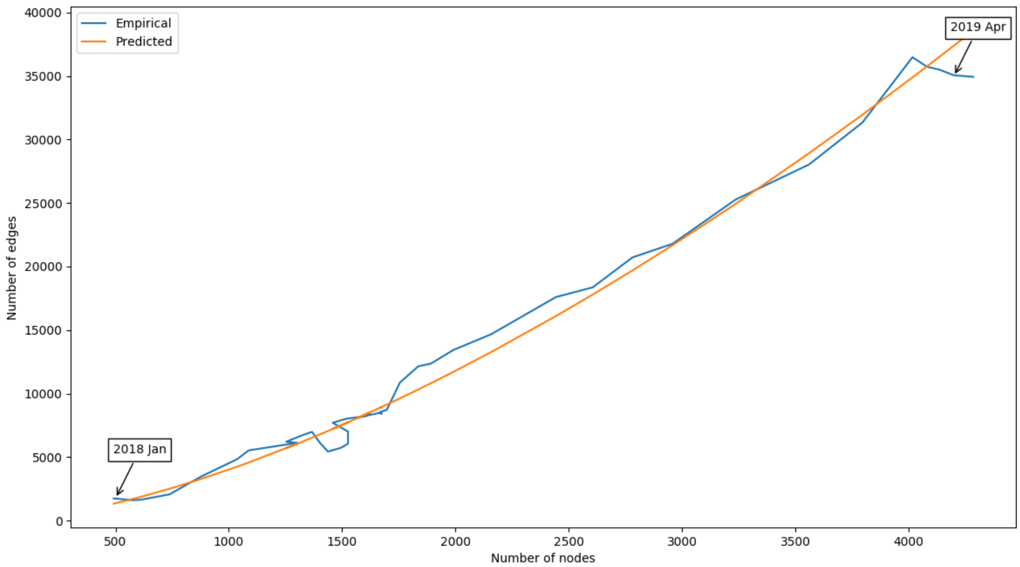

Figure 1: LN follows the Densification Power Law relation with exponent $a = 1.55634117$. Goodness-of-fit: $R^2 = 0.98$.

4.2.2 Densification of LN

4.2.3 Link prediction

5 Results

6 Acknowledgements

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References

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