

THE LOGARITHMIC DIMENSION HYPOTHESIS

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On-line social networks (OSNs) such as Facebook and LinkedIn have transformed our paradigms of communication and social interaction. The recent Geometric Protean or GEO-P model exploits a hypothesized underlying social space (sometimes called *Blau space*), where nodes are close via a prescribed metric if they share similar attributes. In this model, nodes are linked with probability based on both their relative proximity and via a ranking scheme. A key prediction of this model is that a small number of network statistics (including network order, power law exponent, average degree, and diameter) give an estimate on the dimension of the network; that is, the least number of attributes needed to identify agents in the networks. The dimension is predicted to be approximately the logarithm of the number of nodes. This so-called *Logarithmic Dimension Hypothesis (LDH)* would therefore predict a relatively small number of attributes needed to identify agents, and may have many potential applications to social networks.

We present evidence for the LDH based model selection techniques exploiting machine learning. Such techniques have been used successfully in the past for protein interaction networks, and more recently in OSNs by Janssen et al. By exploiting a simplified version of the GEO-P model which shares most of its asymptotic properties, we provide evidence for the dimensionality of Blau space for the Facebook 100 graphs and samples from LinkedIn. Additional evidence for the conjecture is provided by considering eigenvalue distributions.