**Abstract**

Preferential Attachment graphs are scale-free growing networks used to model numerous real-world networks. In this thesis, we study degree distributions of directed Preferential Attachment trees with additive fitness. Three regimes of the fitness function are analysed, namely sublinear, linear and superlinear regimes. Further, we obtain analytical expressions for the size of subtree and the height of a vertex in the subtree for a special case of Prefer- ential Attachment with fitness, and use these results to compute expected PageRank for this model. Finally, we study the problem of binary opinion dynamics of a growing population, wherein we obtain the method to determine an optimal influencing strategy to influence the population.