Detecting Hierarchical Structure in Networks

Many real-world networks exhibit hierarchical organization. Previous models of hierarchies within relational data have focused on binary trees; however, for many networks it is unknown whether there is hierarchical structure, and if there is, a binary tree might not account well for it. We propose a generative Bayesian model that is able to infer whether hierarchies are present or not from a hypothesis space encompassing all types of hierarchical tree structures. For efficient inference we propose a collapsed Gibbs sampling procedure that jointly infers a partition and its hierarchical structure. On synthetic and real data we demonstrate that our model can detect hierarchical structure leading to better link-prediction than competing models. Our model can be used to detect if a network exhibits hierarchical structure, thereby leading to a better comprehension and statistical account the network.

General information
State: Published
Organisations: Department of Informatics and Mathematical Modeling, Cognitive Systems
Contributors: Herlau, T., Mørup, M., Schmidt, M. N., Hansen, L. K.
Number of pages: 6
Publication date: 2012

Host publication information
Title of host publication: 2012 3rd International Workshop on Cognitive Information Processing (CIP)
Publisher: IEEE
ISBN (Print): 978-1-4673-1877-8
DOI: 10.1109/CIP.2012.6232913
Source: dtu
Source-ID: oai:DTIC-ART:iel/366673952::18167
Research output: Research - peer-review › Article in proceedings – Annual report year: 2012