Inference in probabilistic context neighborhood

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Abstract

We introduce the Probabilistic Context Neighborhood model for two dimensional lattices as an extension of the Probabilistic Context Tree model in one dimensional space preserving some of its interesting properties. This model has a variable neighborhood structure with a fixed geometry but varying radius. In this way we are able to compute the cardinality of the set of neighborhoods and use the Pseudo-Likelihood Bayesian Criterion to select an appropriate model given the data. We represent the dependence neighborhood structure as a tree making easier to understand the model complexity. We provide an algorithm to estimate the model that explores the sparse tree structure to improve computational efficiency. We also propose a statistical hypothesis test in order to decide whether a given sample was generated or not by a specific PCN. To this end we propose a dissimilarity measure between two trees and show that two PCN's are equal if and only if this dissimilarity is zero. This result allows us to implement a test to verify if a given sample comes from a specific PCN. The proposed hypothesis test can be also applied to PCT's in the one dimensional case.