

Abstract

In the thesis we investigate properties of information-theoretic measures for discrete distributions and show how most of them can be related to Möbius expansion of conditional mutual information (CMI). Moreover, we study asymptotic distributions of such measures (Chapter 1). In Chapter 2 we consider four resampling scenarios, which can be used for conditional independence (CI) testing: *CI bootstrap*, *conditional randomisation*, *bootstrap X* and *conditional permutation* schemes. We study asymptotic distributions of introduced measures evaluated for resampled data, as well as properties of the schemes themselves, which are useful in CI testing. Chapter 3 covers numerical experiments conducted in order to investigate performance of \widehat{CMI} and \widehat{CMI} -related measures as test statistics in CI testing. Moreover, the related problem of testing global null hypothesis corresponding to individual hypothesis of conditional independence is investigated.

Keywords: mutual information, conditional mutual information, interaction information, information-theoretic criteria, resampling, bootstrap, asymptotic distribution, conditional independence