On the conditional independence inference and information-theoretical inequalities

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Abstract

A short historical excursion devoted to (abstract properties of) probabilistic *conditional independence* (CI) will start the talk. Then the problem of characterizing CI structures induced by 4 discrete random variables will be recalled, including its solution by Matúš in the end on 1990's. After that basic concepts will formally defined, including information-theoretical tools, like the entropic function and polymatroids. The so-called conditional Ingleton inequalities appear to play crucial role in verifying CI implications because they seem to offer an universal tool for their derivation. In recent publications, the analysis of these inequalities was completed and it was shown that all probabilistic CI implications among 4 discrete random variables follow from 5 conditional Ingleton inequalites.

References

[1] M. Studený: Conditional independence structures over four discrete random variables revisited: conditional Ingleton inequalities. *IEEE Transactions on Information Theory 67* (2021), 7030-7049.

[2] T. Boege: No eleventh conditional Ingleton inequality. Experimental Mathematics, published online in December 2023. doi://10.1080/10586458.2023.2294827.