On Csiszár's f-Divergences and Informativities with Applications

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Abstract

Throughout their development, information theory, and more generally, probability theory, have benefited from non-negative divergence measures of dissimilarity between pairs of probability measures defined on the same measurable space. Many divergence measures of interest fall under the common paradigm of an f-divergence, as proposed by Csiszár in the early sixties, while generalizing the Kullback-Leibler divergence and providing a large family of measures which satisfy the data processing inequality among other pleasing properties. For every f-divergence, Csiszár defined a quantity called f-informativity, which plays the same role as of the Shannon mutual information for the Kullback-Leibler divergence. Csiszr's f-divergences and informativities appear to be useful in many instances such as proving convergence of probability measures according to various metrics, hypothesis testing, concentration of measure inequalities, minimax and Bayes risk in estimation and modeling, strong data processing inequalities and maximal correlation, etc.

This talk surveys some of the pleasing properties of f-divergences and f-informativities, including recent results of our research work, and it also addresses some of the applications of Csiszár's measures.