Debruijn identities: from Shannon, Kullback-Leibler and Fisher to generalized $\phi$-entropies, $\phi$-divergences and $\phi$-Fisher informations. (English) [Zbl 1483.62008]


Summary: In this paper we propose a generalization of the usual deBruijn identity that links the Shannon differential entropy (or the Kullback-Leibler divergence) and the Fisher information (or the Fisher divergence) of the output of a Gaussian channel. The generalization makes use of $\phi$-entropies on the one hand, and of $\phi$-divergences (of the Csiza’r class) on the other hand, as generalizations of the Shannon entropy and of the Kullback-Leibler divergence respectively. The generalized deBruijn identities induce the definition of generalized Fisher informations and generalized Fisher divergences; some of such generalizations exist in the literature. Moreover, we provide results that go beyond the Gaussian channel: we are then able to characterize a noisy channel using general measures of mutual information, both for Gaussian and non-Gaussian channels.

For the entire collection see [Zbl 1470.00021].

MSC:
- 62B10 Statistical aspects of information-theoretic topics
- 94A17 Measures of information, entropy
- 94A24 Coding theorems (Shannon theory)

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