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# The Characteristic Property of Tensor Product Kernels

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## Abstract

Maximum mean discrepancy (MMD) and Hilbert-Schmidt independence criterion (HSIC) are widely-used techniques in data science to measure the difference of two random variables, and to quantify the independence of multiple random variables, respectively. Thanks to their kernel-based foundations, MMD and HSIC are applicable on a large variety of domains including documents, images, trees, graphs, time series, mixture models, dynamical systems, sets, distributions, permutations. Despite the great success of HSIC, surprisingly, quite little is known about when it characterizes independence, and similarly when MMD with tensor product kernel can discriminate two probability distributions. In this talk, I am going to provide a complete answer to these questions, with conditions which are often easy-to-check in practice.

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