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Information Geometry of Covariate Shift Algorithms

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Abstract

Many machine learning methods assume that the training data and the test data follow the same distribution, but in the real world, this assumption is very often violated. In particular, the phenomenon that the marginal distribution of the data changes is called the covariate shift, and it is one of the most important research topics. We show that the well-known family of methods for covariate shift adaptation can be unified in the framework of information geometry. Furthermore, we show that parameter search for geometrically generalized methods of covariate shift adaptation can be achieved efficiently by information criterion for a simple parametric case, or by a Bayesian optimization method in general case. It is experimentally shown that the proposed generalization can almost always achieves better performance than the existing methods it encompasses. This work was done in collaboration with Mr. Masanari Kimura.

Keywords:
Machine Learning; Domain Adaptation; Covariate Shift; Information Geometry.