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Kolloquium über Mathematische Statistik und Stochastische Prozesse

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Weighted Empirical Risk Minimization: Transfer Learning based on Importance Sampling

This presentation concerns statistical learning problems, when the distribution P' of the training observations $Z'_1, \ldots, Z'_n$ differs from the distribution P involved in the risk one seeks to minimize (referred to as the *test distribution*) but is still defined on the same measurable space as P and dominates it. In the unrealistic case where the likelihood ratio $\Phi(z) = dP/dP'(z)$ is known, one may extend the Empirical Risk Minimization (ERM) approach to this specific *transfer learning* setup using the same idea as that behind Importance Sampling, by minimizing a weighted version of the empirical risk functional computed from the 'biased' training data Z'_i with weights $\Phi(Z'_i)$. Although the *importance function* $\Phi(z)$ is generally unknown in practice, in various situations frequently encountered in practice, it takes a simple form and can be directly estimated from the Z'_i's and some auxiliary information on the statistical population P. Besides, we will see that the generalization capacity of the approach aforementioned is preserved when plugging the resulting estimates of the $\Phi(Z'_i)$'s into the weighted empirical risk.

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