

# An Extremely Simple Algorithm for Source Domain Reconstruction

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**Abstract:** The aim of unsupervised domain adaptation (UDA) is to utilize knowledge from a source domain to enhance the performance of a given target domain. Due to the lack of accessibility to the target domain's labels, UDA's efficacy is highly reliant on the source domain's quality. However, it is often impractical and expensive to obtain an appropriate transferable source domain. To address this issue, we propose a novel UDA setting, Source Domain Reconstruction (SDR), which seeks to construct a new transferable source domain utilizing labeled source samples and unlabeled target samples. SDR has a significant advantage over the conventional method as it is much less expensive to construct a suitable pseudo source domain rather than collecting an actual transferable source domain in real-world scenarios. To test the practice of SDR, we investigate SDR theoretically. We propose an easily implementable algorithm, the Domain MixUp (DMU), which is motivated by the MixUp strategy, to solve the SDR problem. The algorithm can be used to design a UDA framework to significantly enhance the performance of several existing UDA algorithms. Results from extensive experiments conducted on seven benchmarks (66 UDA tasks) indicate that the reconstructed source domain has stronger transferability than the original source domain.

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