Adaptive learning is useful when visual recognition tasks are performed in a new “target” domain that has different characteristics than the “source” domain used for training. Classifier performance often suffers due to variations between source and target domains, a problem known as the dataset bias, and domain adaptation methods aim to overcome this limitation. In this seminar, we overview domain adaptation approaches ranging from manifold learning to deep learning and present recent contributions from our group. We outline a robust adaptation approach that combines L1-PCA and manifold learning for improved classification performance. In recent years, deep domain adaptation has received significant attention due to the popularity of deep networks. We present a novel domain adaptation approach for deep learning that performs unsupervised label transfer from the source domain to the target samples for updating the network. Label transfer is accomplished with feature conditioning, subspace alignment and clustering on the feature manifold. The proposed manifold-guided label transfer method produces state-of-the-art results for deep domain adaptation on standard datasets.