Recovering the low-rank structure of a linear subspace using a small set of corrupted examples has been recently made feasible through substantial advances in the area of matrix completion and nuclear-norm minimization. Such low-rank structures appear heavily in computer vision, for instance, the frames of a video, the camera motion, and a picture of a building façade, all may contain low-rank structures in certain conditions. In this dissertation, we propose several formulations and extensions of low-rank optimization, and demonstrate how recovering the underlying basis and detecting the corresponding outliers allow us to solve fundamental computer vision problems, including video denoising, background subtraction, motion decomposition, and complex event recognition.