The Thesis consists of an introduction and four papers that contribute to the research of image moments and moment invariants. The first two papers focus on rectangular decomposition algorithms that rapidly speed up the moment calculations. The other two papers present a design of new moment invariants. We present a comparative study of cutting edge methods for the decomposition of 2D binary images, including original implementations of all the methods. For 3D binary images, finding the optimal decomposition is an NP-complete problem, hence a polynomial-time heuristic needs to be developed. We propose a sub-optimal algorithm that outperforms other state of the art approximations. Additionally, we propose a new form of blur invariants that are derived by means of projection operators in a Fourier domain, which improves mainly the discrimination power of the features. Furthermore, we propose new moment-based features that are tolerant to additive Gaussian image noise and we show by extensive image retrieval experiments that the proposed features are robust and outperform other commonly used methods.