## **EXECUTIVE SUMMARY**

Blind modulation classification remains a challenging problem despite the numerous studies that have investigated it. This thesis applies higher-order moments and cumulants as features to several modulation classification algorithms.

An overview of digital communications is provided along with the statistical models for noisy and fading channels. The extraction of moments and cumulants is discussed at length, and the criteria for selecting them as features for discrimination are explained. Attempts are made to make the classifers robust to fading effects, first by investigating the effects of phase shifts on the statistics, and second by applying realistic power normalizations. Principal Component Analysis (PCA), Linear Discriminant Analysis (LDA) and their nonlinear, kernel-based counterparts are presented.

Principal Component Analysis works slightly better than Linear Discriminant Analysis in most channel conditions and equals the performance of kernel-based PCA with less computational overhead. Results show that this classifier works very well with signals that are corrupted only by additive white Gaussian noise (AWGN). It achieves a classification rate of 95.1% at an SNR of 20 dB and 89.0% at 5 dB. In moderate fading conditions, such as might be experienced by a mobile device being carried by a person walking, it performs nearly as well, with classification rates in a Rayleigh channel of 87.0% (20 dB) and 86.8% (5 dB), and 91.5% (20 dB) and 91.7% (5 dB) in a Ricean channel. Even PCA's performance degrades sharply, however, in more severe fading conditions.