1 Elements of Probability Theory ... 1
1.1 Introduction ... 1
1.2 Probability Measures and Their Generalisation ... 6
1.3 Conditional Probablity Structures and Bayes' Theorem ... 16
1.4 Random Variables and Probability Distributions ... 22
1.5 Parametric Families of Probability Distributions ... 30
    1.5.1 Characterising Properties ... 33
    1.5.2 Normal Approximations ... 38
    1.5.3 Exponential Families ... 39
1.6 Exponential Transformations ... 42
1.7 Central Limit Theorem ... 47
1.8 Asymptotic Error Propagation ... 48
1.9 Modes of Convergence ... 51
1.10 Conditional Expectation ... 55

2 Elements of Statistical Theory ... 61
2.1 Introduction ... 61
2.2 Statistical Inference ... 62
    2.2.1 Point Estimation ... 62
    2.2.2 Hypothesis Testing ... 75
    2.2.3 Confidence Intervals ... 81
2.3 The $k(1,2,\ldots)$-Sample Problem ... 83
2.4 The General Linear Model ... 89
    2.4.1 Scope ... 89
    2.4.2 Estimation of Regression Coefficients ... 91
    2.4.3 Geometrical Interpretation ... 93
    2.4.4 Linear Parameter Restrictions ... 97
2.5 Introduction to Multivariate Analysis ... 99
    2.5.1 Bivariate Normal Density ... 100
    2.5.2 Multivariate Normal Density ... 102
    2.5.3 Principal Components and their Application ... 104

3 Applied Linear Regression ... 113
3.1 Introduction ... 113
3.2 Estimation and Hypothesis Testing ... 115
    3.2.1 Linear Regression Models ... 115
    3.2.2 Maximum Likelihood and Least-Squares Estimators ... 117
    3.2.3 Method of Least Squares ... 118
    3.2.4 Geometrical Interpretation ... 119
    3.2.5 Distribution Theory of Linear Regression Estimators ... 121
    3.2.6 Confidence Regions and Testing of Hypotheses ... 122
3.3 Model Selection and Validation ... 128
    3.3.1 Motivation ... 128
    3.3.2 Selection of Variables ... 130
    3.3.3 Model Validation