Contents

Preface ix 1 Introduction page 1 1. The nature of statistical prediction analysis 2. Some examples 3. Examples of choice of future experiment 4. Examples of detection of future experiment 2 Predictive distributions 17 1. Notation and terminology 2. Two sources of information and their combination 18 3. The predictive density function 4. Predictive distributions for the standard situations 26 5. Prediction for regression models 6. An application to medical prognosis 35 3 Decisive prediction 45 1. Point prediction 2. An application to machine tool replacement 50 3. Set prediction 54 4. Further analysis of the machine tool problem 5. Computational aids for more general utility functions 60 6. An alternative formulation 4 Informative prediction 68 1. Introduction 68 2. Bayesian informative prediction 69 3. Region of previous experience 72 4. An application to metabolite excretion rates 73 5. Bayesian coverage 6. Statistical tolerance regions: role of coverage distributions 79 5 Mean coverage tolerance prediction 88 1. Introduction 88 2. Interpretation of similar mean coverage tolerance predictors 91 3. Additional criteria 92

93

4. Relationship to Bayesian coverage

100	TA F	nn	4
Co	ri.i.	en.	ı.

νi

	5. Mean coverage tolerance predictors for the binomial case 6. Mean coverage tolerance predictors for the Poisson case 7. Mean coverage tolerance predictors for the gamma case 8. Mean coverage tolerance predictors for the normal case 10. Mean coverage tolerance predictors for the multinormal case 10. Mean coverage tolerance predictors for the two-parameter exponential case 105	104
6	Guaranteed coverage tolerance prediction	110
	 Introduction 110 Interpretation of similar guaranteed coverage tolerance predictors 113 Guaranteed coverage tolerance predictors for the binomial and Poisson cases 114 Guaranteed coverage tolerance predictors for the gamma case Guaranteed coverage tolerance predictors for the normal case Guaranteed coverage tolerance predictors for the multinormal case 123 Guaranteed coverage tolerance predictors for the two-paramete exponential case 124 	117 118
7	Other approaches to prediction	131
	 Introduction 131 Linear utility structure 131 Frequentist decision theory 132 Frequentist linear utility theory 133 Prior probabilities on the sample space 135 Empirical Bayes prediction 137 Distribution-free prediction 138 	
8	Sampling inspection	146
	 Introduction 146 Fixed-size single-sample destructive testing 146 Role of mean coverage and guaranteed coverage tolerance predictors in sampling plans 152 Optimum choice of fixed sample size 154 Sequential predictive sampling inspection 156 	
9	Regulation and optimisation	162
	 Introduction 162 Point regulation 163 Set regulation 170 Regulation problems with a finite index set 172 Optimisation 173 	
10	Calibration	181
	 The nature of a calibration problem 181 The calibrative distribution 185 	

	Contents	vii
	 Calibrative distributions for the normal case Two applications of calibrative distributions The search for tractable prior distributions Calibration under a utility structure Some comparisons of methods An application to antibiotic assay 	
11	Diagnosis	212
	 The nature of a diagnostic problem 212 The diagnostic distribution 215 An illustrative example 221 Monitoring for atypicality 224 Estimative and predictive diagnosis 227 An application to differential diagnosis of Conn's syndrome 231 Diagnosis under a utility structure 234 	
12	Treatment allocation	238
	 The nature of a treatment allocation problem 238 The prognostic distributions and utility structure 240 Two applications 241 Treatment allocation to meet a required specification 246 	
	Appendix I	249
	Appendix II	258
	Bibliography	259
	Author index	267
	Subject index	269

273

Subject index

Example and problem index