CONTENTS

			Page
Pre	eface		vii
Ac	know	ledgments	xvi
Chapt	er		
1.		ESIAN STATISTICAL INFERENCE FOR MEDICAL DIAGNOSIS	3
~-	1.1	Introduction	3
	1.2	Personal Probability	4
	1.3	Conditional Probabilities and Bayes' Theorem	5
	1.4	Likelihood and Odds	20
2.	Con	E STUDIES OF MEDICAL DIAGNOSIS USING BAYES' THEOREM AND	
۷.	SOM	COMPUTERS	24
	2.1	Introduction	24
	2.2	Computer Aided Diagnosis of Thyroid Disease	26
	2.3	Computer Aided Diagnosis of Congenital Heart Disease	32
	2.4	Computer Aided Diagnosis of Primary Bone Tumors	36
	2. 4	2.4.1 A Method for Determining Minimum Necessary	00
		Additional Tests	43
		2.4.2 A Method for Minimizing the Number of Tests	44
	2.5	Likelihoods and the Likelihood Ratio	46
		2.5.1 An Example of the Likelihood Ratio in Hematology	47
		2.5.2 An Example of the Likelihood Ratio in Automated	
		Multiphasic Screening	51
	2.6	The Development of Diagnostic Criteria	58
		2.6.1 Diagnostic Criteria—Investigators in the Same	
		Department	59
		2.6.2 Diagnostic Criteria—Investigators from Two Separate	
		Institutions	63
		2.6.3 Diagnostic Criteria—Activity of a Professional Society	64
3.	FLO	W CHARTS AND DECISION TREES FOR THE DIAGNOSTIC PROCESS	70
	3.1	Introduction	70
	3.2	Diagnostic Problem Solving	70
	3.3	Flow Charts. Some Examples of Their Uses	76

Chapter	Page
3.4 A Computer Based Medical History System	77
3.5 Computer Aided "Socratic System" for Diagnosis	79
3.6 Is Medical Diagnosis a Pattern Recognition Procedure?	87
3.7 Disease Classification—Clustering Techniques and Numerical	
Taxonomy	94
Tunonomy	
4. Decision Processes and Observer Error in Medical Diagnosis	98
4.1 Introduction	98
4.2 Observer Error in Roentgen Diagnosis	99
4.3 Observer Error in Cancer Cytology	102
4.4 Hypothesis Testing, Signal Detection and Decision Processes	107
4.5 The Signal Detection Problem	112
4.6 Comments on Decision Processes in Perception	113
4.6.1 Action Selection and Expected Value	117
4.6.2 Summary of Decision Theory in Signal Detection	119
4.7 Chest X-Ray Interpretation as a Signal Recognition Study	122
4.8 Scaling Procedure Used to Study Prognostic Judgment in	100
Myocardial Infarction	128
4.9 A Translation of Signal Detectability Theory Into More General	100
Bayesian Language	128 132
4.9.1 Receiver Operating Characteristic Curves	134
4.10 A Swim in the Nile	104
C D C E Correction	141
5. Long Shots and Sure Bets-Some Future Studies	141
5.1 Introduction	
5.2 A Disagreement Among Physicians About Preoperative Diagnosis	
and Subsequent Treatment of the Solitary Nodule of the	142
	143
5.2.1 Material and Analysis of Series	148
The second of the second	149
5.3 Models and Utility Theory	150
5.3.2 Treatment Decision Under Risk	151
5.3.3 Treatment Decision Under Uncertainty	153
5.3.4 Separation of Tangibles and Intangibles	
5.3.5 Values—Tangible, Intangible and Situation Ethics	155
5.4 Research and Development Projects—Present and Future	159
5.4.1 Studies of Medical Terminology and Its Uses	159
5.4.2 Examples of Physician—Computer Symbiosis	161
▲ • • • • • • • • • • • • • • • • • • •	

Conten	ts
--------	----

xxi

Chapter		Page
	5.4.3 Some Medical Decision Making Experiments Using a	
	Probabilistic Information Processing System (PIP) .	163
Referer	nces	169
Appen	dices	
1	Mathematical and Statistical Procedures Used in Computer	
	Aided Diagnosis	176
2	Selected Bibliography of Observer Error Studies	181
	Computer Diagnosis of Thyroid Disease	185
Name	Index	265
Subject	+ Index	268