## Contents

ı.	Phil	osophy and Overview of the Book	1
	1.1	Underlying Philosophy	1
	1.2	Peculiarities of Style	1
	1.3	What This Book Is Really About	$^{2}$
	1.4	Gaussian Processes and the Generic Chaining	3
	1.5	Random Fourier Series and Trigonometric Sums, I	5
	1.6	Matching Theorems, I	6
	1.7	Bernoulli Processes	7
	1.8	Trees and the Art of Lower Bounds	7
	1.9	Random Fourier Series and Trigonometric Sums, II	8
	1.10	Processes Related to Gaussian Processes	8
	1.11	Theory and Practice of Empirical Processes	9
	1.12	Partition Scheme for Families of Distances	9
	1.13	Infinitely Divisible Processes	10
	1.14	The Fundamental Conjectures	10
	1.15	Convergence of Orthogonal Series; Majorizing Measures	10
	1.16	Matching Theorems II: Shor's Matching Theorem	11
	1.17	The Ultimate Matching Conjecture in Dimension $\geq 3 \dots$	11
	1.18	Applications to Banach Space Theory	11
	1.19	Appendix B: Continuity	12
	Refe	rence	12
2.		ssian Processes and the Generic Chaining	13
	2.1	Overview	13
	2.2	The Generic Chaining	13
	2.3	Functionals	32
	2.4	Gaussian Processes and the Mysteries of Hilbert Space	40
	2.5	A First Look at Ellipsoids	51
	2.6	Proof of the Fundamental Partitioning Theorem	55
	2.7	A General Partitioning Scheme	61
	2.8	Notes and Comments	70
	Refe	rences	73

vii	Contents
X11	Comento

3.	Ran	dom Fourier Series and Trigonometric Sums, I 75		
	3.1	Translation Invariant Distances		
	3.2	The Marcus-Pisier Theorem		
	3.3	A Theorem of Fernique 86		
	3.4	Notes and Comments 88		
	Refe	erences		
4.	Mat	tching Theorems, I		
	4.1	The Ellipsoid Theorem 91		
	4.2	Matchings		
	4.3	The Ajtai, Komlós, Tusnády Matching Theorem 106		
	4.4	The Leighton-Shor Grid Matching Theorem		
	4.5	Notes and Comments		
	Refe	rences		
5.	Rer	noulli Processes		
<i>.</i>	5.1	Boundedness of Bernoulli Processes		
	5.2	Chaining for Bernoulli Processes		
	5.2	Fundamental Tools for Bernoulli Processes		
	5.4	Control in $\ell^{\infty}$ Norm		
	5.5	Latala's Principle		
	5.6	Chopping Maps and Functionals		
	5.7	The Decomposition Lemma		
	5.8	Notes and Comments		
	-	erences		
_				
6.		es and the Art of Lower Bounds		
	6.1	Introduction		
	6.2	Trees		
	6.3	A Toy Lower Bound		
	6.4	Lower Bound for Theorem 4.3.2		
	6.5	Lower Bound for Theorem 4.4.1		
	Reference			
7.	Rar	ndom Fourier Series and Trigonometric Sums, II 199		
	7.1	Introduction		
	7.2	Families of Distances		
	7.3	Statement of Main Results		
	7.4	Proofs, Lower Bounds 206		
	7.5	Proofs, Upper Bounds		
	7.6	Proofs, Convergence		
	7.7	Explicit Computations		
	7.8	Notes and Comments		
	Refe	erences		

		Contents	xiii
8.	Processes Related to Gaussian Processes		
	8.1 <i>p</i> -Stable Processes		
	8.2 Order 2 Gaussian Chaos		
	8.3 Tails of Multiple Order Gaussian Chaos		255
	8.4 Notes and Comments		269
	References		269
9.	Theory and Practice of Empirical Processes		
	9.1 Discrepancy Bounds		271
	9.2 How to Approach Practical Problems		
	9.3 The Class of Squares of a Given Class		283
	9.4 When Not to Use Chaining		303
	9.5 Notes and Comments		310
	References		310
			010
10.	Partition Scheme for Families of Distances		
	10.1 The Partition Scheme		
	10.2 The Structure of Certain Canonical Processes .		
	References		330
11.	Infinitely Divisible Processes		331
	11.1 A Well-Kept Secret		331
	11.2 Overview of Results		332
	11.3 Rosinski's Representation		344
	11.4 The Harmonic Case		
	11.5 Proof of the Decomposition Theorem		
	11.6 Proof of the Main Lower Bound		
	References		
- i			
12.	The Fundamental Conjectures		
	12.1 Introduction		
	12.2 Selector Processes		
	12.3 The Generalized Bernoulli Conjecture		
	12.4 Positive Selector Processes		
	12.5 Explicitly Small Events		
	12.6 Classes of Sets		
	References		. 398
13.	Convergence of Orthogonal Series; Majorizing	Measures	399
	13.1 Introduction		. 399
	13.2 Chaining, I		408
	13.3 Proof of Bednorz's Theorem		412
	13.4 Permutations		420
	13.5 Chaining, II		429
	13.6 Chaining, III		443

XIV	Contents

	13.7	Notes and Comments	444
		rences	445
<b>14.</b>	Mat	ching Theorems, II: Shor's Matching Theorem	
	14.1	Introduction	
	14.2	The Discrepancy Theorem	
	14.3	Decomposition of Functions of $\mathcal{H}$	
	14.4	Discrete Fourier Transform	
	14.5	Main Estimates	
	14.6	Proof of Proposition 14.2.4	
	14.7	Notes and Comments	
	Refer	rences	474
			475
<b>15</b> .		Ultimate Matching Theorem in Dimension $\geq 3 \ldots$	
	15.1	Introduction	
	15.2	The Crucial Discrepancy Bound	
	15.3	Cleaning up $\varphi$	
	15.4	Geometry	
	15.5	Probability, I	
	15.6	Haar Basis Expansion	
		Probability, II	
	Refei	rences	513
16.	App	lications to Banach Space Theory	515
	16.1	Cotype of Operators from $C(K)$	
	16.2	Computing the Rademacher Cotype-2 Constant	
	16.3	Classifying the Elements of $B_1$	
	16.4	1-Unconditional Bases and Gaussian Measures	
	16.5	Restriction of Operators	
	16.6	The $\Lambda(p)$ -Problem	
٠	16.7	Proportional Subsets of Bounded Orthogonal Systems	
	16.8	Embedding Subspaces of $L^p$ into $\ell^p_N$	
	16.9	Gordon's Embedding Theorem	588
	16.10	Notes and Comments	
		rences	
		11 1771 ( m) ( m	-0-
Α.		endix: What This Book Is Really About	
	A.1 A.2	Introduction	
		The Kolmogorov Conditions	
	A.3	More Chaining in $\mathbb{R}^m$	
	A.4	The Garsia-Rodemich-Rumsey Lemma	
	A.5	Chaining in a Metric Space	
	A.6	Two Classical Inequalities	601

			Contents	xv
в.	App	pendix: Continuity		607
	B.1	Introduction		607
	B.2	Continuity Under Metric Entropy Conditions		607
	B.3	Continuity of Gaussian Processes		613
Re	feren	ces		617
Inc	lex			625