

<<层论>>

图书基本信息

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前言

This book is primarily concerned with the study of cohomology theories of general topological spaces with “general coefficient systems.” Sheaves play several roles in this study. For example, they provide a suitable notion of “general coefficient systems.” Moreover, they furnish us with a common method of defining various cohomology theories and of comparison between different cohomology theories. The parts of the theory of sheaves covered here are those areas important to algebraic topology. Sheaf theory is also important in other fields of mathematics, notably algebraic geometry, but that is outside the scope of the present book. Thus a more descriptive title for this book might have been Algebraic Topology from the Point View of Sheaf Theory.

Several innovations will be found in this book. Notably, the concept of the “gauge” of a subspace and an adaptation of an analogous notion of Spanier to sheaf-theoretic cohomology is introduced and exploited throughout the book. The fact that sheaf-theoretic cohomology satisfies the homotopy property is proved for general topological spaces. Also, relative cohomology is introduced into sheaf theory. Concerning relative cohomology, it should be noted that sheaf-theoretic cohomology is usually considered as a “single space” theory. This is not without reason, since cohomology relative to a closed subspace can be obtained by taking coefficients in a certain type of sheaf, while that relative to an open subspace (or, more generally, to a taut subspace) can be obtained by taking cohomology with respect to a special family of supports. However, even in these cases, it is sometimes of notational advantage to have a relative cohomology theory. For example, in our treatment of characteristic classes in Chapter IV the use of relative cohomology enables us to develop the theory in full generality and with relatively simple notation. Our definition of relative cohomology in sheaf theory is the first fully satisfactory one to be given. It is of interest to note that, unlike absolute cohomology, the relative cohomology groups are not the derived functors of the relative cohomology group in degree zero (but they usually are so in most cases of interest).

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内容概要

本书主要讲述具有一般系数体系拓扑空间的上同调理论。

层论包括对代数拓扑很重要的领域。

书中有好多创新点，引进不少新概念，全书内容贯穿一致。

证实了广义同调空间中层理论上同调满足同调基本特性的事实。

将相对上同调引入层理论中。

读者有一定的基本同调代数和代数拓扑知识就可以理解本书。

每章末都附有练习，这些可以帮助学生更好的理解书中的知识体系。

附录给出了部分习题的解答。

第二版中在内容上做了较大的改动，增加了80多例子和大量更深层次的内容，如，Cech上同调

、Oliver变换、插值理论、广义流形、局部齐性空间、同调纤维和 p 进变换群。

目次：层和准层；层上同调；与其他上同调定理的比较；谱序列的应用；Borel-Moore同调；上层和Cech同调。

读者对象：数学专业的高年级本科生、研究生和相关专业的学者。

书籍目录

Preface	I Sheaves and Presheaves	1	Definitions	2	Homomorphisms, subsheaves, and quotient sheaves	3
	Direct and inverse images	4	Cohomomorphisms	5	Algebraic constructions	6
	Classical cohomology theories		Exercises II Sheaf Cohomology		I Differential sheaves and resolutions	2
	The canonical resolution and sheaf cohomology	3	Injective sheaves	4	Acyclic sheaves	5
	Flabby sheaves	6	Connected sequences of functors	7	Axioms for cohomology and the cup product	8
	Maps of spaces	9	-soft and -fine sheaves	10	Subspaces	11
	The Vietoris mapping theorem and homotopy invariance	12	Relative cohomology	13	Mayer-Vietoris theorems	14
	Continuity	15	The Künneth and universal coefficient theorems	16	Dimension	17
	Local connectivity	18	Change of supports; local cohomology groups	19	The transfer homomorphism and the Smith sequences	20
	Steenrod's cyclic reduced powers	21	The Steenrod operations		Exercises III Comparison with Other Cohomology Theories	
	1 Singular cohomology	2	Alexander-Spanier cohomology	3	de Rham cohomology	4
	Cech cohomology		Exercises IV Applications of Spectral Sequences		I The spectral sequence of a differential sheaf	2
	The fundamental theorems of sheaves	3	Direct image relative to a support family	4	The Leray sheaf	5
	Extension of a support family by a family on the base space	6	The Leray spectral sequence of a map	7	Fiber bundles	8
	Dimension	9	The spectral sequences of Borel and Čech	10	Characteristic classes	11
	The spectral sequence of a filtered differential sheaf	12	The Fary spectral sequence	13	Sphere bundles with singularities	14
	The Oliver transfer and the Conner conjecture		Exercises V Borel-Uoore Homology		I Cosheaves	2
	The dual of a differential cosheaf	3	Homology theory		4 Maps of spaces	5
	Subspaces and relative homology	6	The Vietoris theorem, homotopy, and covering spaces	7	The homology sheaf of a map	8
	The basic spectral sequences	9	Poincaré duality	10	The cap product	11
	Intersection theory	12	Uniqueness theorems	13	Uniqueness theorems for maps and relative homology	14
	The Künneth formula	15	Change of rings	16	Generalized manifolds	17
	Locally homogeneous spaces	18	Homological fibrations and p-adic transformation groups	19	The transfer homomorphism in homology	20
	Smith theory in homology		Exercises VI Cosheaves and Čech Homology		I Theory of cosheaves	2
	Local triviality	3	Local isomorphisms	4	Cech homology	5
	The reflector	6	Spectral sequences	7	Coresolutions	8
	Relative Čech homology	9	Locally paracompact spaces	10	Borel-Moore homology	11
	Modified Borel-Moore homology	12	Singular homology	13	Acyclic coverings	14
	Applications to maps		Exercises A Spectral Sequences		1 The spectral sequence of a filtered complex	2
	Double complexes	3	Products	4	Homomorphisms	B
	Solutions to Selected Exercises		Solutions for Chapter I		Solutions for Chapter II	
	Solutions for Chapter III		Solutions for Chapter IV		Solutions for Chapter V	
	Solutions for Chapter VI		Bibliography		List of Symbols	
	List of Selected Facts		Index			

章节摘录

In this chapter we shall define the sheaf-theoretic cohomology theory and shall develop many of its basic properties. The cohomology groups of a space with coefficients in a sheaf are defined in Section 2 using the canonical resolution of a sheaf due to Godement. In Section 3 it is shown that the category of sheaves contains "enough injectives," and it follows from the results of Sections 4 and 5 that the sheaf cohomology groups are just the right derived functors of the left exact functor F that assigns to a sheaf its group of sections. A sheaf is said to be acyclic if the higher cohomology groups with coefficients in d are zero. Such sheaves provide a means of "computing" cohomology in particular situations. In Sections 5 and 9 some important classes of acyclic sheaves are defined and investigated. In Section 6 we prove a theorem concerning the existence and uniqueness of extensions of a natural transformation of functors (of several variables) to natural transformations of "connected systems" of functors. This result is applied in Section 7 to define, and to give axioms for, the cup product in sheaf cohomology theory. These sections are central to our treatment of many of the fundamental consequences of sheaf theory. The cohomology homomorphism induced by a map is defined in Section 8. The relationship between the cohomology of a subspace and that of its neighborhoods is investigated in Section 10, and the important notion of "tautness" of a subspace is introduced there. In Section 11 we prove the Vietoris mapping theorem and use it to prove that sheaf-theoretic cohomology, with constant coefficients, satisfies the invariance under homotopy property for general topological spaces. Relative cohomology theory is introduced into sheaf theory in Section 12, and its properties, such as invariance under excision, are developed. In Section 13 we derive some exact sequences of the Mayer-Vietoris type.

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