

Part I: Comparison and Metric Riemannian Geometry

(1) Sectional curvature comparison

Metric and Hessian comparison

Jacobi fields comparison and injective radius estimate

Topology of manifolds with negative/nonpositive sectional curvature

Synge's trick on positive sectional curvature

Toponogov theorem

Gromov's short basis and bounding number for generators of fundamental group

Soul theorem

(2) Ricci curvature comparison

Laplacian comparison

Relative volume comparison

Splitting theorem

(3) Gromov-Hausdorff topology

Gromov-Hausdorff distance and approximations

Precompactness theorem

Equivariant Gromov-Hausdorff distance

Pointed Gromov-Hausdorff distance

(4) Convergence theory for manifolds with bounded sectional curvature

Fibration theorem

Harmonic radius estimate and $C^{1,\alpha}$ -convergence theorem

Singular fibration theorem

Part II: Partial Differential Equation

(1) Laplace equation

Fundamental solution

Mean-value formulas and maximum principle

Harnack inequality

Green's function

(2) Heat equation

Fundamental solution

Mean-value formulas

Properties of solutions

(3) Wave equation

Solutions by spherical means

Nonhomogeneous problem

(4) Sobolev spaces

Approximation, extension and traces

Sobolev inequalities, Poincare's inequality

Compactness theorem

(5) Second-order elliptic equations

Existence of weak solutions

Regularity

Maximum principles

Eigenvalues and eigenfunctions