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Topological and Metric Aspects of Noncommutative Geometry

(4 Lectures)

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In this series of five lectures, I shall first give a quick introduction to some of the underlying topological themes in noncommutative geometry as first appeared in Connes' 1985 paper, and summarized in his 1994 book. Our next topic is to understand the way spectral geometry of Riemannian manifolds, as in for example Weyl's law on the asymptotic distribution of eigenvalues informs noncommutative geometry and its metric aspects. Topics to be discussed include:

1. 1. Noncommutative spaces: where they come from, how they are defined,
2. 2. Cyclic cohomology and Connes-Chern characters: an abstract index formula,
3. 3. The Dixmier trace, spectral triples and metric noncommutative geometry,
4. 4. The CKM invariant and Connes' reconstruction theorem.