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Orville Damaschke: An L2-index theorem for the Dirac operator on globally hyperbolic spacetimes.

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Index theory deals with solutions of certain differential equations, where the index roughly measures the difference between the number of kernel solutions and constraints coming from inhomogeneities. The famous Atiyah-Singer index theorem states, that for an elliptic operator this number can be expressed with topological data of the underlying (compact) Riemannian manifold - generalizations to singular and non-compact Riemannian spaces are known and well studied. Next to an analytical interest the index also appears formally in the study of anomalies in relativistic quantum field theories, where the underlying manifold is Lorentzian and the operator of interest usually hyperbolic. A rigorous treatment of these anomalies were not clear until the groundbreaking result of Bär and Strohmaier in 2015. Since then several extensions and applications have been discussed and are supposed to play a crucial role in the future analysis of quantum anomalies on globally hyperbolic spacetimes as well as differential geometry of pseudo-Riemannian manifolds.