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<tr><td>authors</td><td>Erik van Erp</td></tr>
<tr><td>title</td><td>The Atiyah-Singer index formula for subelliptic operators on contact manifolds. Part I</td></tr>
<tr><td>publication_date</td><td>2010-04-25 00:00:00</td></tr>
<tr><td>source</td><td>SupportedSources.INTERNET_ARCHIVE</td></tr>
<tr><td>journal</td><td>Annals of Mathematics, Princeton U</td></tr>
<tr><td>volume</td><td></td></tr>
<tr><td>doi</td><td>10.4007/annals.2010.171.1647</td></tr>
<tr><td>urls</td><td>https://web.archive.org/web/20190430113110/http://annals.math.princeton.edu/wp-content/uploads/annals-v171-n3-p05-p.pdf</td></tr>
<tr><td>id</td><td>id-890066293499521257</td></tr>
<tr><td>abstract</td><td>The Atiyah-Singer index theorem gives a topological formula for the index of an elliptic differential operator. The topological index depends on a cohomology class that is constructed from the principal symbol of the operator. On contact manifolds, the important Fredholm operators are not elliptic, but hypoelliptic. Their symbolic calculus is noncommutative, and is closely related to analysis on the Heisenberg group. For a hypoelliptic differential operator in the Heisenberg calculus on a contact manifold we construct a symbol class in the K-theory of a noncommutative C -algebra that is associated to the algebra of symbols. There is a canonical map from this analytic K-theory group to the ordinary cohomology of the manifold, which gives a de Rham class to which the Atiyah-Singer formula can be applied. We prove that the index formula holds for these hypoelliptic operators. Our methods derive from Connes' tangent groupoid proof of the index theorem. 1648 ERIK VAN ERP 3.6. The analytic index map for subelliptic operators 3.7. The topological index for subelliptic operators 3.8. A technical result References THE ATIYAH-SINGER INDEX FORMULA 1649 (the so-called osculating groups introduced by Stein and Folland [FS74]). For a Heisenberg 'elliptic' operator P we construct a K-theory element, We then modify Connes' construction of the tangent groupoid, replacing the tangent bundle TM by the groupoid T H M . This leads to a map in K-theory, We prove that this map computes the index of P . Since the fibers of T H M are nilpotent groups, a well-known result in noncommutative geometry gives a natural isomorphism, This means that we can identify our noncommutative symbol OE H .P / with an element in the topological K-theory group K 0 .T M /. We end the present paper with a novel groupoid argument to prove that, in fact, the index of P is computed by means of the classical formula of Atiyah-Singer, Ch. OE H .P //^Td.M /:</td></tr>
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<tr><td>authors</td><td>Erik van Erp</td></tr>
<tr><td>title</td><td>The Index of Hypoelliptic Operators on Foliated Manifolds</td></tr>
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<tr><td>abstract</td><td>We present an index theorem for certain hypoelliptic differential operators on foliated manifolds. Our proof is a development of Alain Connes tangent groupoid proof of the Atiyah-Singer index theorem. The paper is largely self-contained.</td></tr>
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