

New spinor fields classes and applications

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A classification of spinor fields according to the associated bilinear covariants is constructed in arbitrary dimensions and metric signatures, generalizing Lounestos 4D spinor field classification. To obtain an analogous classification in higher dimensions we use the Fierz identities, which constrain the covariant bilinears in the spinor fields and force some of them to vanish. A generalized graded Fierz aggregate is moreover obtained in such a context simply from the completeness relation. We analyze the particular and important case of Riemannian 7-manifolds, where the Majorana spinor fields turn out to have a quite special place. In particular, at variance with spinor fields in 4D Minkowski spacetime that are classified in six disjoint classes, spinors in Riemannian 7-manifolds are shown to be classified, according to the bilinear covariants: (a) in just one class, in the real case of Majorana spinors; (b) in four classes, in the most general case. Much like new classes of spinor fields in 4D Minkowski spacetime have been evincing new possibilities in physics, we think these new classes of spinor fields in seven dimensions are, in particular, potential candidates for new solutions in the compactification of supergravity on a seven-dimensional manifold and its exotic versions.