A missing distribution and a metric of holonomy G_2*

Dr. Travis Willse (Australian National University)

Abstract: In his 1910 "Five Variables" paper, Cartan solved the equivalence problem for the geometry of (2, 3, 5) distributions, demonstrating an intimate link between this geometry and the exceptional simple Lie groups of type G_2. He claimed to produce a local classification of all such (complex) distributions which have infinitesimal symmetry algebra of dimension at least 6 (and which satisfy a natural uniformity condition), but in 2013 Doubrov and Govorov showed that Cartan's list misses a single distribution E. We produce a closed form for the Fefferman-Graham ambient metric g_E of the conformal class induced by (a real form of) , expanding the small catalogue of known explicit, closed-form ambient metrics. We show that the holonomy group of g_E is the exceptional group G_2*; this can be used, for example, to give an explicit example of a 6-dimensional projective structure with normal projective holonomy equal to that group.