The gap phenomenon for parabolic geometries

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Abstract:

Many geometric structures (such as Riemannian, conformal, CR, projective, systems of ODE, and various types of generic distributions) admit an equivalent description as Cartan geometries. For Cartan geometries of a given type, the maximal amount of symmetry is realized by the flat model. However, if the geometry is not (locally) flat, how much symmetry can it have? Understanding this "gap" between maximal and submaximal symmetry in the case of parabolic geometries is the subject of this talk. We show how representation-theoretic considerations involving Kostant's version of the Bott-Borel-Weil theorem and Tanaka prolongation lead to restrictions on the submaximal dimension. In particular, I'll discuss conformal geometry as well as the (G2) geometry of generic rank two distributions in dimension five. (Joint work with Boris Kruglikov.)