Geometry of orbit spaces

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Let $\rho : G \to \mathbf{O}(V)$ be a faithful orthogonal representation of a compact Lie group G on an Euclidean space V. The space of orbits $X = V/G$ (resp. $S(V)/G$, where $S(V)$ is the unit sphere of V) has a natural structure of metric space, simply by declaring the distance between two points in X to be the distance between the corresponding G-orbits in V (resp. $S(V)$), which makes it into an Alexandrov space of curvature bounded below.

In this talk, we would like to address the following question:

> *How much of ρ can be recovered from X?*

The motivating example of such situation is the adjoint representation of a compact connected Lie group on its Lie algebra, in which case X is identified with a Coxeter Riemannian orbifold.

We consider several different conditions on X regarding its isometry type, orbifold points or curvature and obtain corresponding results. After giving some examples, we will survey on these results and discuss open problems.

This talk is based on joint work with A. Lytchak (Köln) and F. J. Gozzi (São Paulo).