Representations of compact Lie groups and their orbit spaces

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Consider the adjoint representation of a compact connected semisimple Lie group G on its Lie algebra g. It is well know that the orbit space $\mathfrak{g}/Ad_G$ can be isometrically recovered as $\mathfrak{t}/W$, where $\mathfrak{t}$ is theLie algebra of a maximal torus of G and W is the corresponding Weyl group. The second presentation of the orbit space is simpler and easier to understand because W is a finite group.

In this talk, we consider an arbitrary real representation of a (nondiscrete, possibly disconnected) compact Lie group and study the problem of existence of similar reductions: When does exist another representation with the same orbit space and strictly lower dimension? What does it imply for the given representation? It turns out that, while most representations do not admit reductions, many geometrically interesting ones do.

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