Group-invariant solutions for the Ricci curvature equation and the Einstein equation

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In this talk, it will be considered the following problems:

(P1) Given a symmetric (0,2)-tensor $R$, defined on a manifold $M^n$, $n \geq 3$, does there exist a Riemannian metric $g$, such that $\text{Ric}_g = R$?

(P2) Given a symmetric (0,2)-tensor $T$, defined on a manifold $M^n$, $n \geq 3$, does there exist a Riemannian metric $g$, such that $\text{Ric}_g - \frac{1}{2}Kg = T$?

Where, in both problems, $\text{Ric}_g$ is the Ricci tensor and $K$ is the scalar curvature of $g$, respectively.

Finding solutions to the problems (P1) and (P2) corresponds to solving systems of nonlinear second-order differential equations. We use the technique of Lie point symmetries to provide conformally flat metrics that solves (P1) and (P2).

References