

Summer Term 2026

Seminar: Positive Curvature, Homogeneous and Symmetric Spaces

Content:

The study of Riemannian manifolds (M, g) with positive sectional curvature is a classical theme in differential geometry. The list of known manifolds satisfying this condition is relatively short, and the known examples are either rank-one symmetric spaces, homogeneous manifolds, biquotients or cohomogeneity-one manifolds.

The goal of this seminar is to familiarize the participants with explicit examples of positively curved spaces. We will study homogeneous spaces and invariant metrics, and we will review the basic structure theory of symmetric spaces. The seminar is guided by the references listed below and works towards the classification of homogeneous manifolds with positive sectional curvature as presented in [WZ].

Homogeneous and symmetric spaces provide a particularly useful framework: they are rich enough to exhibit a wide range of phenomena, while remaining explicit enough to permit concrete calculations. In many cases curvature calculations can be performed, making these spaces a natural testing ground for conjectures in Riemannian geometry.

Timeslot: Thursdays 14:00 – 15:30 in SR -1.009 (UG).

Prerequisites: Sound knowledge of foundational results and concepts from differential geometry as provided in the KIT course 'Differential Geometry'.

References

- [Be] A. L. Besse, *Einstein Manifolds*. Springer, 1987.
- [He] S. Helgason, *Differential Geometry, Lie Groups, and Symmetric Spaces*. Academic Press, 1978.
- [Wa] F. W. Warner, *Foundations of Differentiable Manifolds and Lie Groups*. Springer, 1983.
- [Zi] W. Ziller, *Lie Groups, Representation Theory and Symmetric Spaces* (lecture notes / script). Available online at <https://www2.math.upenn.edu/~wziller/math650/LieGroupsReps.pdf>.
- [WZ] B. Wilking and W. Ziller, *Revisiting Homogeneous Spaces with Positive Curvature*. arXiv:1503.06256, 2015.



The preliminary meeting takes place on Thursday, 19 February 2026 at 13:00 in seminar room SR 2.066 of the Mathematics Building (20.30).