SVA SEMINARIO VIDAL ABASCAL

USC UNIVERSIDADE DE SANTIAGO DE COMPOSTELA FACULTADE DE MATEMÁTICAS

Inhomogeneous Einstein metrics on complex projective spaces

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Complex projective space $\mathbb{C}Pn$, which parametrizes the complex lines in $\mathbb{C}n+1$, is one of the most extensively studied objects in algebraic and complex geometry. The first Einstein metric discovered on $\mathbb{C}Pn$ was the Fubini–Study metric, and in 1965 Berger asked whether it was the only one. In 1982, Ziller constructed a second homogeneous Einstein metric in odd complex dimensions. Berger's question remained open in even complex dimensions, where Fubini–Study was the only known Einstein metric.

Together with Gonzalo Cao Labora (EPFL, Switzerland), we have constructed new Einstein metrics on $\mathbb{C}Pn$ for $n \in \{3, 4, 5, 6, 7\}$. These are the first known non-homogeneous examples and, together with the Fubini–Study and Ziller metrics, the only ones known to date. Our construction settles Berger's question in the previously open cases $n = 4$ and $n = 6$.

The construction relies on a cohomogeneity-one action by the Lie group $SOn+1$, which allows us to reduce the Einstein equations to a system of ODEs, reparametrized by the mean curvature of the principal orbits. One of the novel aspects of the work is the use of a computer-assisted proof, a methodology that has so far been relatively unexplored in differential geometry. We use interval arithmetic and Krawczyk's fixed-point theorem, a generalization of Newton's method that makes it possible to turn numerical analysis into a rigorous proof.

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