The polynomial kernel space of higher spin Dirac operators of order three

Tim Raeymaekers David Eelbode

The higher spin Dirac operators $\mathcal{Q}_\lambda$, acting on functions $f(x)$ on $\mathbb{R}^m$ taking values in arbitrary irreducible half-integer highest weight representations $\mathcal{S}_\lambda$ for Spin(m), should be seen as generalisations of the classical Dirac operator and the Rarita-Schwinger operator. In recent work, we developed an algorithm to decompose the kernel of these higher spin Dirac operators of general order into irreducible spin representations (i.e. the analogue of describing the space of monogenic polynomials for the Dirac operator). In doing so, we discovered an elegant hyperrectangular structure for this kernel. The problem at hand was thereby reduced to a combinatorical problem. In this talk, we will tackle the case of higher spin Dirac operators of order three: the geometrical structure of the kernel then reduces to a rectangular cuboid, which allows a nice visualisation. Nonetheless, the general algorithm can be well understood from this case. We also describe the related combinatorical problem.