Geometrical properties for solutions of subelliptic nonlinear PDEs.

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Geometrical properties for solutions to elliptic and parabolic PDEs is a classic mathematical problem. In particular we will focus on starshapedness, a geometrical notion deeply connected to convexity but weaker than that. For elliptic PDEs it is know that the capacitary potential defined on a starshaped ring has starshaped level sets. We generalise this results in the setting of subelliptic PDEs, in particular to PDEs associated to Carnot groups. Carnot groups are non-commutative nilpotent Lie groups which are not isomorphic to the Euclidean space at any scale. Going into these more degenerate geometries some unexpected phenomena appear: e.g. there are different possible notions of starshapedness and they may not be all equivalent. We use a notion associated to the the natural scaling in Carnot groups (dilations) and show that this geometrical property is inherited by the level sets of a large class of nonlinear PDEs.

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1