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The hyperbolic Hadwiger-Nelson problem

Consider the graph $H(d)$ whose vertex set is the hyperbolic plane, and where two points are joined with an edge when their distance is equal to d. Asking for the chromatic number of this graph is the hyperbolic analogue to the famous Hadwiger-Nelson problem. One has the lower bound of 4 for all $d > 0$, as in the Euclidean case. Using spectral methods, we prove that with the additional requirement that the colour classes be measurable, one needs at least 6 colours to properly colour $H(d)$ when d is sufficiently large. This is joint work with Konstantin Golubev.