Visualizing Circle and Sphere Packings

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Circle, sphere, and higher dimensional sphere packings may be realized as subsets of the boundary of hyperbolic space, subject to certain symmetry conditions based on a discrete group of motions of the hyperbolic space. This leads to developing and applying counting methods which admit rigorous upper and lower bounds on the Hausdorff (or Besikovitch) dimension of the residual set of several generalized Apollonian circle packings. We find that this dimension (which also coincides with the critical exponent of a zeta-type function) of each packing is strictly greater than that of the Apollonian packing, supporting the unsolved conjecture that, among the many possible disk tilings of the plane, the Apollonian packing has the smallest possible residual set dimension.