

# On the hard sphere model and sphere packing in high dimensions

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We give an alternative, statistical physics based proof of the  $\Omega(d2^{-d})$  lower bound for the maximum sphere packing density in dimension  $d$  by showing that a random configuration from the hard sphere model has this density in expectation. While the leading constant we achieve is not the best known, we do obtain additional geometric information: we prove a lower bound on the entropy density of sphere packings at this density, a measure of how plentiful such packings are. This is joint work with Felix Joos and Will Perkins.