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Local origin of global contact numbers in frictional ellipsoid packings FABIAN SCHALLER, University Erlangen-Nürnberg, Erlangen, Germany, MAX NEUDECKER, Max Planck Institute for Dynamics and Self-Organization, Goettingen, Germany, MOHAMMAD SAADATFAR, Applied Maths, RSPhysSE, ANU, Australia, GARY DELANEY, CSIRO, Clayton South, Victoria, Australia, GERD SCHRÖDER-TURK, University Erlangen-Nürnberg, Erlangen, Germany, MATTHIAS SCHRÖTER, Max Planck Institute for Dynamics and Self-Organization, Goettingen, Germany — In particulate soft matter systems the average number of contacts Z of a particle is an important predictor of the mechanical properties of the system. Using X-ray tomography, we analyze packings of frictional, oblate ellipsoids of various aspect ratios α, prepared at different global volume fractions ϕ_g. We find that Z is a monotonously increasing function of ϕ_g for all α. We demonstrate that this functional dependence can be explained by a local analysis where each particle is described by its local volume fraction ϕ_l computed from a Voronoi tessellation. Z can be expressed as an integral over all values of ϕ_l: $Z(\phi_g, \alpha, X) = \int Z_l(\phi_l, \alpha, X)\ P(\phi_l|\phi_g)\ d\phi_l$. The local contact number function $Z_l(\phi_l, \alpha, X)$ describes the relevant physics in term of locally defined variables only, including possible higher order terms X. The conditional probability $P(\phi_l|\phi_g)$ to find a specific value of ϕ_l given a global packing fraction ϕ_g is found to be independent of α and X. Our results demonstrate that for frictional particles a local approach is not only a theoretical requirement but also feasible.

Fabian Schaller
University Erlangen-Nürnberg, Erlangen, Germany

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