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Force distributions in disordered fiber networks KNUT HEIDEMANN, Institute for Numerical and Applied Mathematics, Georg-August-Universitaet, Goettingen, ABHINAV SHARMA, FLORIAN REHFELDT, CHRISTOPH F SCHMIDT, Third Institute of Physics – Biophysics, Georg-August-Universitaet, Goettingen, MAX WARDETZKY, Institute for Numerical and Applied Mathematics, Georg-August-Universitaet, Goettingen — Disordered filamentous networks determine the mechanical response of many materials in nature. Due to the filamentous character of these networks, the strain field, and hence the force distributions, can be highly inhomogeneous. Large local stresses can result in an increased susceptibility for local rearrangements due to rupture or unbinding events. In our study, we introduce a quantitative measure to characterize the emergence of highly stressed one-dimensional paths, so-called force chains, in three-dimensional nonlinear fiber networks. Furthermore, we provide an analytical approach, based on graph theory, that quantitatively describes the force distributions in one-dimensional periodic spring networks. Our analytical results are in excellent agreement with our extensive numerical simulations.

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