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Disconnecting structure and dynamics in glassy thin films
DANIEL SUSSMAN, Syracuse University, SAMUEL SCHOENHOLZ, Google Brain, EKIN CUBUK, Stanford University, ANDREA LIU, University of Pennsylvania — The dynamics near the surface of a glassy film are markedly different from those in the bulk. We investigate whether the differences between surface and bulk dynamics can be explained by differences in local microscopic structure. We show that machine learning methods that successfully identify strong correlations between local structure and particle rearrangement dynamics in the bulk completely fail to detect key aspects of thin-film glassy dynamics. Furthermore, we show that no combination of local structural features drawn from a very general set of two- and multi-point functions is able to distinguish between particles at the center of film and those in near the surface where the dynamics are strongly perturbed. We note that the behavior of glassy films has often been interpreted via a model with a glassy, immobile layer near the center of the film and liquid-like mobile layers near free interfaces. Our results suggest that the two populations are indistinguishable in structure, necessitating a purely dynamical theory for additional relaxation processes in the film.

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