The autocorrelation plots illustrate that the dot model preserves correlation in local fitness as the number of maxima increase. In the standard Kauffman NK model, the number of maxima rises with K, however increases in K also cause correlation between steps to decrease rapidly. The dot space model preserves correlation more, this shows that the fitness values of locations around a maxima will not vary as much; whereas a standard NK model may have very low values near a maxima, the dot model preserves a high number of maxima without high variance near the maxima.Chart, scatter chart

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In the plot of average step distance from the 90th percentile finesses location to the maxima, the dot model locations are closer to the global maxima. This suggests that rather than the top locations being scattered around the landscape, they are bunched around the global maxima owing to the higher autocorrelation. This arises in large part due to the construction of the dot model; the global maximum and minimum are guaranteed to be the maximum number of steps apart.

Chart, scatter chart

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However, the high autocorrelation and distance from global max to global minimum does not imply that the local maxima are all bunched around the global maximum. The plot of mean distance from local maxima to global maximum illustrates that the dot model has maxima only slightly closer to the global maxima as compared to the standard Kauffman NK model. The standard deviation plot of step distances between the local maxima and global maxima again shows that the Dot model maxima are only very slightly less dispersed. This illustrates that the dot model local maxima are nearly as evenly dispersed across the landscape as the standard NK model.

Chart, scatter chart

Description automatically generated

In the dot model, exploration from the minimum to maximum guarantees that many local maxima will be encountered along the way. What is crucially different though is that the fitness values of will tend to steadily increase as one approaches the global maxima. In the Standard NK model, the correlation between nearby locations is low, indeed the global minimum may even be just two steps away from the maximum, this creates a spiky landscape where there is high local variation in fitness values. That is, the standard landscape increases ruggedness but also makes the landscape spikier owing to low autocorrelation, increases in the number of local maxima decreases the correlation between nearby locations making search in this landscape more random. The dot model manages to increase ruggedness in terms of local optima without trading off autocorrelation as much, thereby making the landscape spiky: a small change in location will not wildly change fitness. Thus, it is important to distinguish between mere ruggedness of a landscape, as the NK model has been conceived of, from spikiness: the local variation in fitness values.Chart, scatter chart

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