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## A semi-linear wave model for critical collapse

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In spherical symmetry compelling numerical evidence suggests that in general relativity solutions near the threshold of black hole formation exhibit critical behavior. One aspect of this is that threshold solutions themselves are self-similar and are, in a certain sense, unique. To an extent yet to be fully understood, the same phenomena persist beyond spherical symmetry. It is therefore desirable to construct simple non-linear models that exhibit such symmetry at the threshold of blow-up. This can help understand both the structural requirements on the non-linearities and the extent to which nearby solutions may display critical behavior. Presently, starting with deformations of the wave equation, we discuss models which have discretely self-similar threshold solutions. We study the behavior of threshold solutions in the past light cone of the blow-up point and show that in spherical symmetry there is a clear sense in which a unique critical solution exists. Near threshold spherical numerical evolutions are also presented for more general models, and exhibit similar behavior. Uniqueness at the threshold of blow-up is, however, completely lost in general.

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