

# Gluing Solutions of the Einstein Constraint Equations

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A set of initial data for Einstein's gravitational field equations consists of a Riemannian metric  $g$  and a symmetric tensor field  $K$  which satisfy a coupled set of four constraint equations. In the conformal formulation, these constraint equations form a coupled elliptic PDE system. For a number of reasons, it is useful to be able glue pairs of solutions of the constraint equations together. In work begun three years ago, Rafe Mazzeo, Dan Pollack and I have shown that this can be done fairly generally. In this talk, I discuss how the gluing works, what conditions must be satisfied for the gluing to be carried out, and some of the applications (both in math and in physics) of our gluing procedure. I note in particular the various ways we (together with Piotr Chrusciel, Erwann Delay, and David Maxwell) have been able to significantly generalize our results.