Applying Applied Math to Pure Math

Abstract:
Initial data in general relativity must satisfy certain underdetermined differential equations called the constraint equations. A natural problem is to find a parameterization of all possible initial data. A standard method for this is called the conformal method. In the relatively simple “constant mean curvature” (CMC) case, this method provides a good parameterization of initial data. However, the far-from-CMC case has resisted analysis. In part this is because researchers were trying to prove theorems that are false. In this talk, I’ll introduce the problem and known results, and talk about our numerical results that show that the standard conjectures about solvability were all wrong. Numerical investigations can play an important part in informing conjectures about purely analytical questions.