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Title: The Solutions of Random High-Dimensional Equations

Abstract: Whether one wants to compute the minimum of a function or analyze the flow of a vector field, understanding the solutions to N equations in N variables often appears as a basic problem. However, as the number of variables increases, this problem becomes exponentially harder. That said, while finding a solution for a specific set of equations may be near impossible, estimating the typical number of solutions for a family of functions can, surprisingly, be much easier. Moreover, frequently these estimates become exact as the number of variables grows to infinity. At the core of this phenomenon is the fact that for many families it is easier to determine the likelihood that a solution occurs at any given point than it is to find any specific solution. In this talk, I will give an overview of this method and the surrounding area of math, and discuss recent progress in this topic spurred by advances in random matrix theory.