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Computational optimization: from glasses to black holes

Abstract: In everyday life we are confronted to optimization problems, which are rather efficiently solved with the help of computers and, recently, artificial intelligence. One such practical problem consists in finding the shortest path that a traveling salesman should take to visit once and only once a (large) number of cities. A physical one is the crystallisation of a material suddenly cooled from a liquid state. These problems can be set in terms of finding the deepest valley of a mountainous landscape. Curiously enough, their theoretical physics description presents points in common with the one of black holes. In this talk I will describe these problems in simple terms and I will give an idea of the kind of mathematics that we, theoretical physicists, use to try to decipher them.