

## Playing 2-to-2 games with Grassman graphs

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### Abstract

It is by now well known that optimization problems are often hard not just to solve, but even to approximate. However the field of "hardness-of-approximation" does not only solve questions about the approximability of optimization problems -- over the years it also introduced many new and fascinating questions in more classical branches of study, such as geometry, combinatorics, and analysis.

Indeed, in this talk we present a new hypothesis concerning Grassman graphs (namely, graphs in which nodes are  $l$ -dimensional subspaces, and an edge connects two subspaces if their intersection is of dimension  $(l-1)$ ). The hypothesis seems interesting and natural to us, and if true, we show that it implies hardness-of-approximation for "2-to-2" games. Hardness with similar parameters for "1-to-1" games would yield the famous Unique Games conjecture of Khot, while no hardness result is known with these parameters even for  $r$ -to- $r$  games for any constant  $r$ .

This is a joint work with Irit Dinur, Subhash Khot, Dor Minzer, and Muli Safra. It extends and builds substantially on a recent result of Minzer, Khot and Safra.