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Topological Version of Pach's Overlap Theorem

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Consider the collection of all the simplices spanned by some n -point set in \mathbf{R}^d . There are several results showing that simplices defined in this way must overlap very much. In this talk I focus on the generalization of these results to 'curvy' simplices.

Specifically, Pach showed that every $d+1$ sets of points, Q_1, \dots, Q_{d+1} , in \mathbf{R}^d contain linearly-sized subsets P_i in Q_i such that all the transversal simplices that they span intersect. In joint work with Alfredo Hubard, we show, by means of an example, that a topological extension of Pach's theorem does not hold with subsets of size $C(\log n)^{1/(d-1)}$. We show that this is tight in dimension 2, for all surfaces other than S^2 . Surprisingly, the optimal bound for S^2 is $(\log n)^{1/2}$. This improves upon results of Barany, Meshulam, Nevo, Tancer.

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