## General adversarial channels: When do large codes exist?

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**Abstract:** The question of when communication is possible in an adversarial jamming context is intimately connected to the question of high-dimensional packings – for instance, communication over a binary-input binary-output channel where the adversary can flip up to pn bits is equivalent to designing packings of pn-radius Hamming balls in n-dimensional Hamming space.

We consider a fairly general class of adversarial channels, and:

\* show that each adversarial channel has a bijection with a certain "confusability polytope" embedded in the simplex of all distributions of joint-types of pairs of inputs to the channel

\* precisely characterize when a positive rate is possible (i.e., exponential-size packings are possible). Sufficiency is characterized in terms of codes where each pair of codewords has joint-type given by a "completely positive distribution" outside the confusability polytope. Necessity follows by a Ramsey theoretic argument showing that each large code must have a sufficiently large subcode where each pair of codewords has roughly the same type-class, followed by a Plotkin-type argument.

Joint ongoing work with Andrej Bogdanov, Nicholas Wang, Amitalok Budkuley, Yihan Zhang