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A Universal Law of Robustness via Isoperimetry (Sebastien Bubeck, Mark Sellke) This talk tackles the robust memorization problem in modern neural networks. A large model turns out to be required by robust memorization, which is called the law of robustness in the context.

The Lipschitz constant of the memorization function is the notion of robustness. The fact is that perfect memorization is possible with $\mathcal{O}(1)$-Lipschitz. But we have no idea about the complexity of the hypothesis space at this point. The main theorem shows that for a p-dimensional hypothesis space, the partial memorization of noisy data implies the Lipschitz constant larger than $\sigma\sqrt{nd/p}$, where d is the dimension of the memorization function. A key point for the theorem is that the input distribution can be a mixture of the isoperimetric components. The isoperimetry requires the distribution has a good concentration property, which is satisfied by a large range of functions. Last, the presenter discusses the application of the law of robustness in MINST and ImageNet.

References