Interest continues to grow in bosonic versions of topological electronic phases realized using photonic or phononic degrees of freedom. These systems are typically non-interacting, and have the same band structure and edge state structure as their fermionic counterparts. In this talk, I’ll discuss recent theory work in my group on a class of bosonic systems where this correspondence fails, and the bosonic system exhibits unique topological properties. They involve using parametric “two-photon” driving, and have Hamiltonians that superficially resemble those of topological superconductors. Among the surprising effects that emerge are the presence of topologically-protected instabilities that can be harnessed for non-reciprocal quantum amplification, and effective non-Hermitian dynamics in a bosonic analogue of the Kitaev-Majorana chain. I’ll discuss how these ideas could be realized in a variety of different experimental platforms.

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