

## Infrared supersymmetry enhancement in 4d QFT

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Abstract: We study certain deformations of four-dimensional  $\mathcal{N} = 2$  superconformal field theories (SCFTs) with non-abelian flavor symmetry which preserve an  $\mathcal{N} = 1$  supersymmetry. The deformation is described by adding an  $\mathcal{N} = 1$  chiral multiplet transforming in the adjoint representation of the flavor symmetry with a superpotential coupling, and giving a nilpotent vacuum expectation value to the chiral multiplet which breaks the flavor symmetry. This triggers a renormalization group flow to an infrared SCFT. Remarkably, we find classes of theories flow to enhanced  $\mathcal{N} = 2$  supersymmetric fixed points in the infrared under the deformation. For instance, the deformations of  $\mathcal{N} = 2$  supersymmetric  $SU(N)$  QCD with  $2N$  flavors and  $Sp(N)$  QCD with  $2N + 2$  flavors flows to the  $(A_1, A_{2N-1})$  and  $(A_1, A_{2N})$  Argyres-Douglas theories respectively. From these “Lagrangian descriptions,” we compute the full superconformal indices of the  $(A_1, A_n)$  theories and find perfect agreements with the previous results in some limits. Other examples of the infrared supersymmetry enhancement include generalized Argyres-Douglas theories and rank-one SCFTs with non-abelian flavor symmetries.

This talk is based on the collaborations with Jaewon Song and on the papers arXiv:1606.05632 and 1607.04281.