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Higher rank equivariant Donaldson-Witten theory

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Partition function and correlation functions of the topologically twisted $\mathcal{N} = 2$ super Yang-Mills theory on a smooth four-manifold with gauge group $SU(2)$, also known as Donaldson-Witten theory, provide us a way to compute topological invariants of many manifolds classifying their smooth structure (Donaldson invariants). Equivariantisation of this theory, on the one hand, can be considered as a tool to find the original invariants by means of the equivariant localisation, and on the other hand, is interesting by itself, since it also has a topological counterpart (equivariant Donaldson invariants). While for the equivariant Donaldson-Witten theory with $SU(2)$, gauge group quite a lot of results were found, there is still not much known in the case of the higher rank gauge symmetry.
After giving an introduction on the subject I will present our recent results for the higher rank theory, which include generalisation of the recurrence relation for the partition function on $\mathbb{C}^2$ (Zamolodchikov relation) and a proposal for the equivariant Donaldson invariants of the compact toric manifolds.

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