Higher rank stable pairs and virtual localization over local Calabi Yau threefolds and K3 surfaces

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We introduce a higher rank analog of the Pandharipande-Thomas theory of stable pairs on a Calabi-Yau threefold $X$. More precisely, we develop a moduli theory for frozen triples given by the data $\mathcal{O}_X(-n) \to \mathcal{F}$ where $\mathcal{F}$ is a sheaf of pure dimension 1. The moduli space of such objects does not naturally determine an enumerative theory: that is, it does not naturally possess a perfect symmetric obstruction theory. Instead, we build a zero-dimensional virtual fundamental class by hand, by truncating a deformation-obstruction theory coming from the moduli of objects in the derived category of $X$. This yields the first deformation-theoretic construction of a higher-rank enumerative theory for Calabi-Yau threefolds. We calculate this enumerative theory for local $\mathbb{P}^1$ using the Graber-Pandharipande virtual localization technique. Moreover, if time permits we will talk about similar computations over K3 surfaces which provide us with a higher rank analog of the Kawai-Yoshioka formula.

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