ID de Contribution: **4** Type: **Non spécifié**

BPS counting and Resurgence of Topological Strings

mercredi 17 décembre 2025 11:00 (1 heure)

The Topological String free energy is an asymptotic perturbative series associated with a specific geometry, typically a Calabi-Yau manifold or a spectral curve. This series encodes important geometric invariants of the corresponding geometry. Physically, the topological string free energy can be interpreted as a sum of amplitudes involving super-symmetric (BPS) particles.
The theory of Resurgence is the right mathematical framework to analyse such asymptotic series. In particular, Resurgence analysis provides analytical and numerical tools to make sense of such divergent series and to re-sum them, providing natural non-perturbative completions to the given theory.
In this talk, I will show what we can uncover by applying the tools of Resurgence to the study of the Topological Strings on compact Calabi-Yau manifolds. In particular, we numerically found that, for any deformations of the underlying geometry, the resurgence analysis of the Topological String naturally encodes invariants associated with BPS particles, even in situations where we do not have a good physical and/or geometrical control.

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