DBI FROM DOUBLE COPY IN 1+1 DIMENSIONS

BACKGROUND

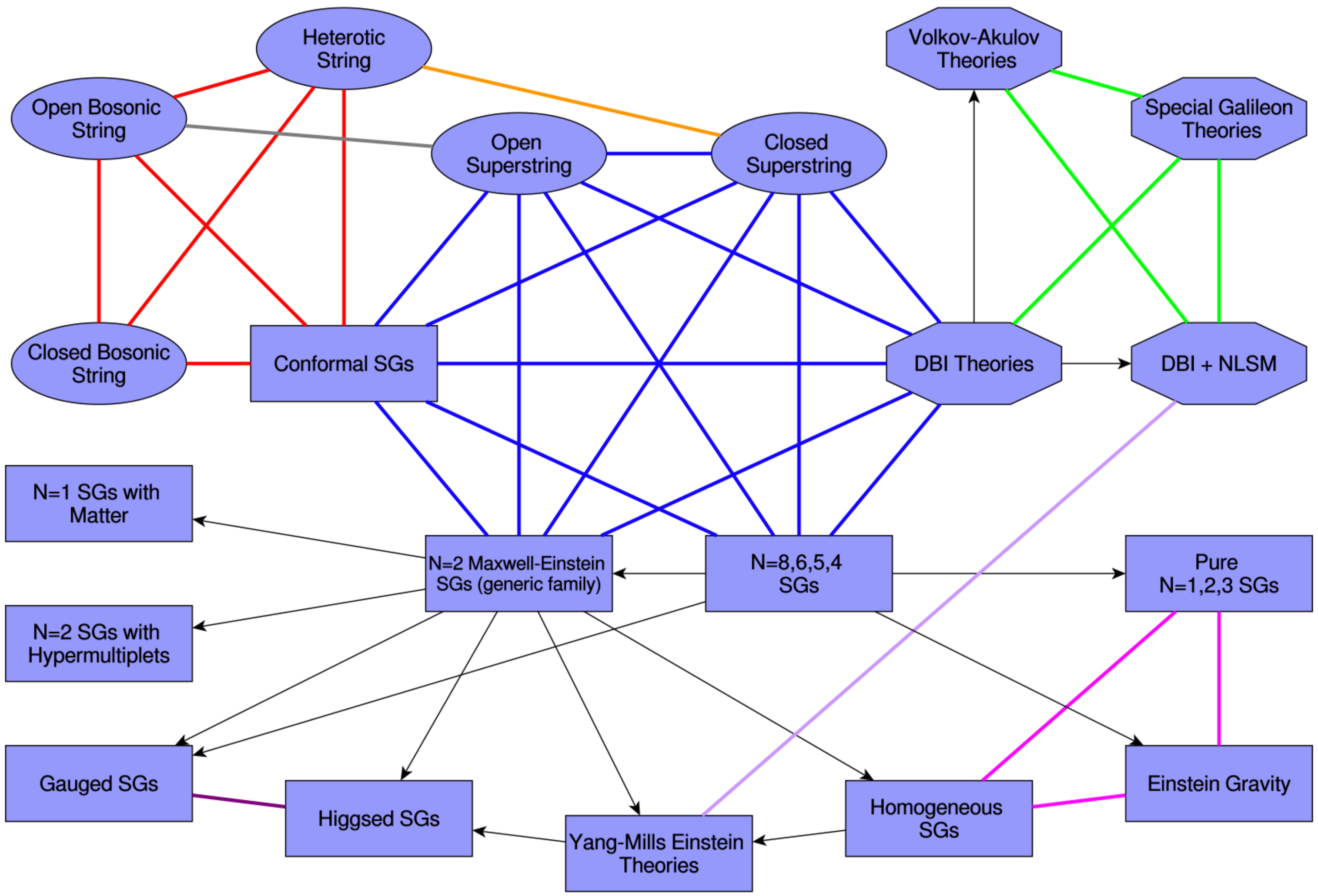

Figure from 1909.01358

- Double copy links different theories at the level of Amplitudes
- Lagrangian (non-perturbative, new perspective)

PREVIOUS RESULTS (1+1 DIMENSIONS)

- Non-perturbative Double Copy in Flatland (2204.07130)
  - Isomorphism between unitary transformations and diffeomorphisms $\lim_{N\to\infty} U(N) \sim \text{Diff}_{S^1\times S^1},$
  - Replacement rules for ZM 1+1 Dimensions
  - BAS -> ZM -> SG manifest at the Lagrangian level

$$\begin{array}{rcl} V^a & \to & V \\ f_{ab}{}^c V^a W^b & \to & \partial_\mu V \tilde{\partial}^\mu W \\ g_{ab} V^a W^b & \to & \int VW. \end{array}$$

DIRAC BORN-INFELD (DBI)

- Yang-Mills Scalar x NLSM = DBI

$$\mathcal{L} = -\mathrm{Tr}\left(\frac{1}{4}F^{\mu\nu}F_{\mu\nu} + \frac{1}{2}D^{\mu}\phi D_{\mu}\phi\right).$$

$$\mathcal{L} = -\frac{1}{4}\Big[\partial_\mu A_\nu \partial^\mu A^\nu - \partial_\mu A_\nu \partial^\nu A^\mu + g\partial_\mu A_\nu \epsilon^{\rho\sigma}\partial_\rho A^\mu \partial_\sigma A^\nu - g\partial_\nu A_\mu \epsilon^{\rho\sigma}\partial_\rho A^\mu \partial_\sigma A^\nu + \frac{1}{2}g^2 \epsilon^{\rho\sigma}\partial_\rho A_\mu \partial_\sigma A_\nu \epsilon^{\bar\rho\bar\sigma}\partial_{\bar\rho}A^\mu \partial_{\bar\sigma}A^\nu + \partial_\mu\phi\partial^\mu\phi - 2g\partial_\mu\phi\epsilon^{\rho\sigma}\partial_\rho\phi\partial_\sigma A^\mu + g^2\epsilon^{\rho\sigma}\partial_\rho\phi\partial_\sigma A_\mu \epsilon^{\bar\rho\bar\sigma}\partial_{\bar\rho}\phi\partial_{\bar\sigma}A^\nu\Big]$$

- Applying the replacement rules for NLSM (ZM) to YMS gives a new Lagrangian formulation for DBI
  - Reproduce known tree-level amplitudes
  - Non-trivial example of a non-perturbative double copy in 1+1 dimensions