

# State sum models and induced gravity

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# State sum models

Constructed from  $\mathcal{C} \in \text{tricat}$

Reasonable wish list:

- ▶ Diffeomorphism-invariant QFT on 4-manifolds
- ▶ Sum over geometries
- ▶ Discrete geometry at Planck scale
- ▶ Matter couplings
- ▶ Matter modes cut off at Planck energy  $c$ .
- ▶ Cosmological constant
  
- ▶ No Einstein-Hilbert action

# Induced gravity (Sakharov)

- + + + metric and  $N$  fermion fields. Cutoff =  $c$ .

Proposal:

$$I = \int (\bar{\psi} D_c \psi - 2\Lambda_0) dV$$

Integrating over matter modes gives

$$S_{\text{eff}} = \int \frac{-c^2 N}{32\pi^2} - 2\Lambda_0 + \frac{cN}{192\pi^2} R + \text{etc.} \quad dV$$

- ▶ Correct sign for  $R$  (MTW signs)
- ▶ Cancel cosmological terms

# Spectral action

$D, \Psi$  on  $M \times F$ ,  $F =$  internal space.

Suggest spectral action

$$I = (\Psi, D\Psi)_c - 2\Lambda_0 \text{ vol}$$

- ▶ Bosonic action redundant
- ▶ Renormalisability not an issue
- ▶ Weinberg-Witten theorem irrelevant