

Want to understand Ryu-Takayanagi from standard holography.

Lewkowycz-Maldacena:

- Renyi entropies computed from bulk geometries with replica symmetry
- Quotient by cyclic symmetry: fixed points become conical deficit
- Reproduces area of minimal surface as deficit angle goes to zero

But what surfaces are produced like this?

Aim: classify replica-symmetric saddles in AdS3.

Finding bulk dual to genus g surface X :

Choose g independent disjoint simple loops to fill in, $\{\gamma_1, \gamma_2, \dots, \gamma_g\}$

Invariant object is $N = \langle \{\gamma_1, \dots, \gamma_g\}^{\pi_1(X)} \rangle \triangleleft \pi_1(X)$

- Allows change of basis, including conjugation (free homotopy)
- Subgroup of bulk contractible curves (kernel of inclusion map)
- Covering group of Schottky uniformization

Replica symmetry: N invariant under some outer automorphisms

Make some progress with weaker homology language.

Homology is free abelian group ($\mathbb{Z}$ -module) with symplectic form.

We need Lagrangian subspaces respecting the symmetries.

Reduces to system of quadratic Diophantine equations.

Remains to lift to homotopy group....







