

Near-extremal black hole of radius  $R$  and  $T \ll 1/R$  from 4D Einstein-Maxwell

$\implies$  2D Einstein-Maxwell with a scalar field (fluctuations of black hole radius)

$\implies$  Absence of 2D quantum gravity fluctuations: reduction to (0+1)D

$\implies$  (0 + 1)D theory is precisely the Schwarzian theory of the SYK model.