# Wormhole and the Thermodynamic Arrow of Time

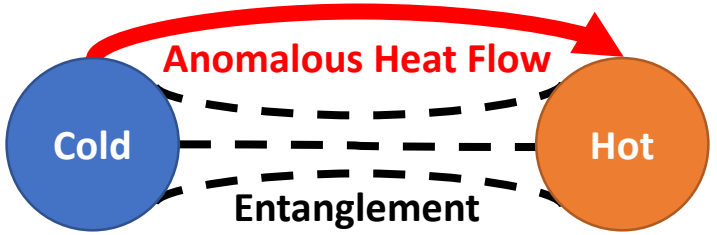
- **Thermodynamic Arrow of Time:** *– Zhuo-Yu Xian (ITP-CAS)*

Heat spontaneously pass from a hotter system to a colder system.

*However, it does not always hold in the present of initial correlation.*

- **Anomalous Heat Flow:**

It is possible that energy can pass from colder system to hotter system by consuming correlation.




- **AdS2/CFT1:** Hilbert space $\mathcal{H} = \mathcal{H}_L \otimes \mathcal{H}_R$.

Hamiltonian $H_{tot}(t) = H \otimes 1 + 1 \otimes \lambda H + H_I(t)$, with $\lambda > 1$,

where $H_I(t) = \begin{cases} g(V_L W_R - W_L V_R), & t_i < t < t_f \\ 0, & others \end{cases}$, scalar operators $V \neq W$.

State at $t = 0$, $|TFD\rangle = \frac{1}{\sqrt{Z}} \sum_n e^{-\beta E_n/2} |n\rangle_L |n\rangle_R$.