Lattice Quantum Field Theory
as a sampling problem

$\phi(x)$

x_2 ($= it$)

x_1
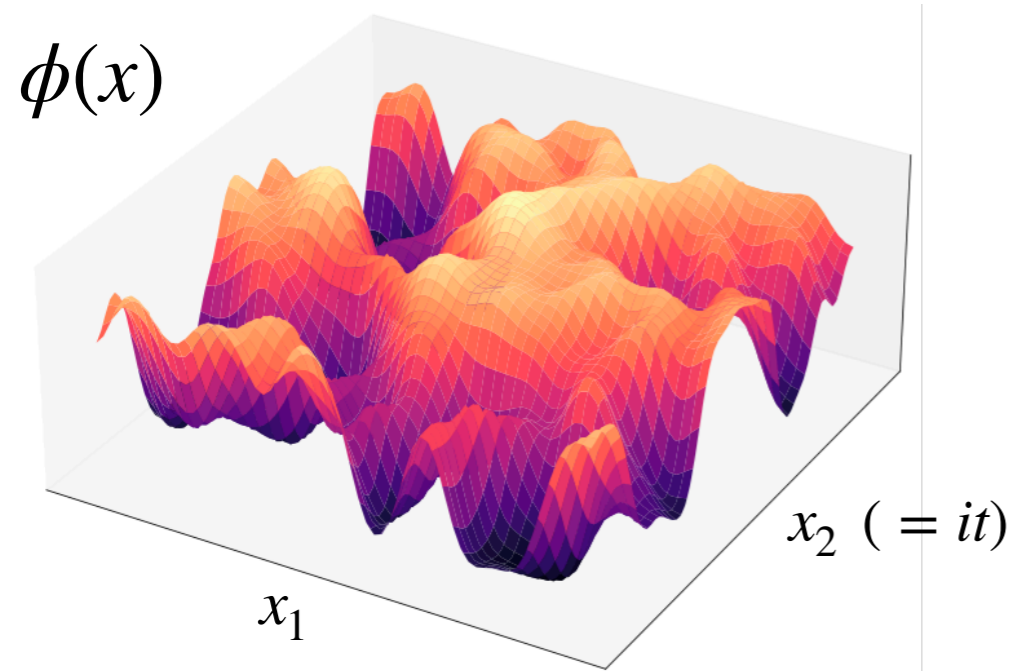
(Euclidean) action

$$S[\phi] = \int d^D x \, \frac{1}{2} \left((\partial_\mu \phi)^2 + m^2 \phi^2 \right) + \lambda \phi^4$$
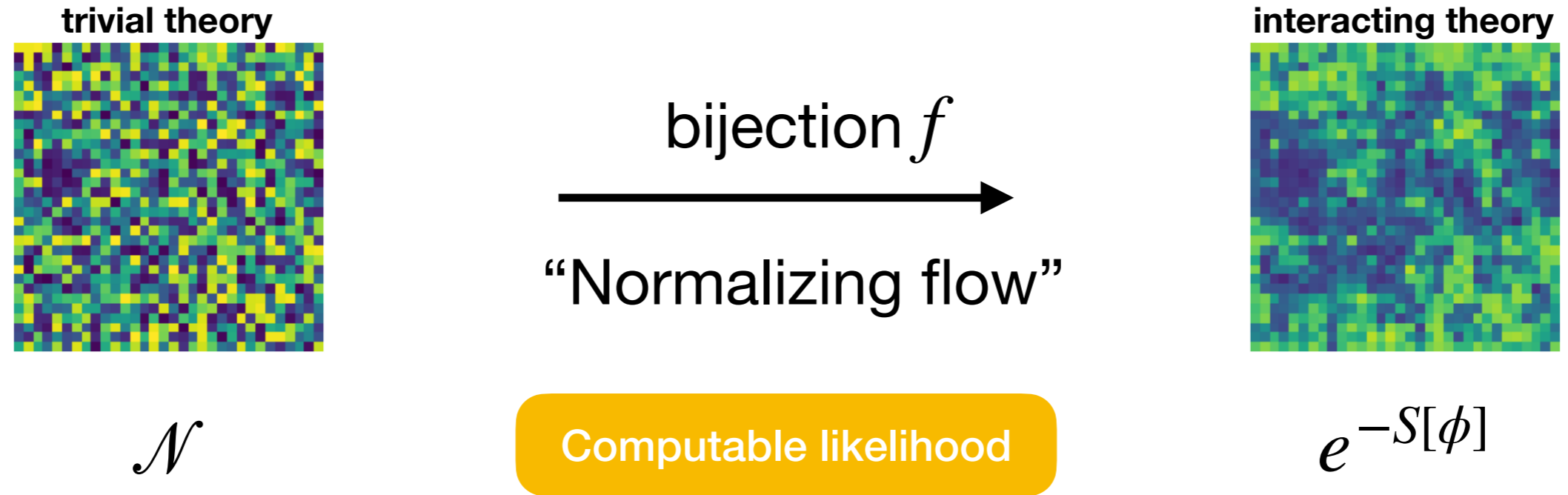
$$p(\phi) \propto e^{-S[\phi]}$$

Samples: $\phi \sim e^{-S[\phi]}$

estimate observables

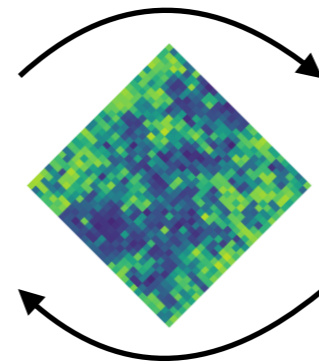$\langle \mathcal{O}[\phi] \rangle$

Generative models

trivial theory

$$\mathcal{N}$$

bijection f

"Normalizing flow"

interacting theory

$$e^{-S[\phi]}$$

Computable likelihood

---

continuous
flow

$$\dot{f} = g_\theta[\phi]$$

$$\phi_0 \longrightarrow \phi_1$$

built-in
symmetry

transfer
learning

$$\lambda = 0.7 \qquad \text{L=6}$$

$$\downarrow \qquad \downarrow$$

$$\lambda = 0.8 \qquad \text{L=12}$$