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# Continuous-time normalizing flows

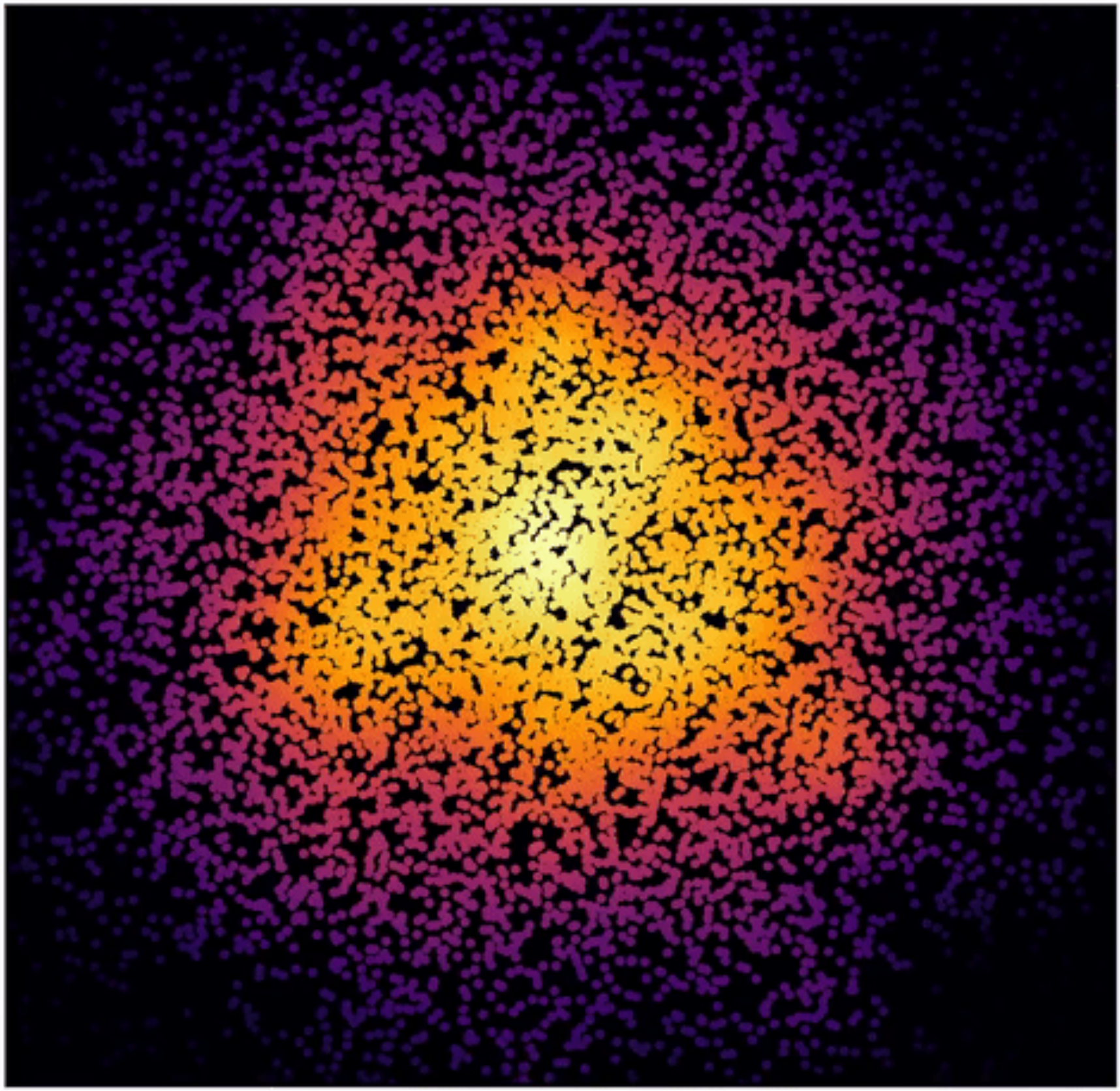
# Parameterize the transformation by a neural ODE

## Instantaneous change-of-variable formula

$$\frac{\mathrm{d} \log p(x(t))}{\mathrm{d}t} = -\operatorname{Tr}\left(\frac{\mathrm{d}f}{\mathrm{d}x(t)}\right)$$

ODE with reversible dynamics

$$\frac{\mathrm{d}x}{\mathrm{d}t} = f\left(x(t)\right)$$

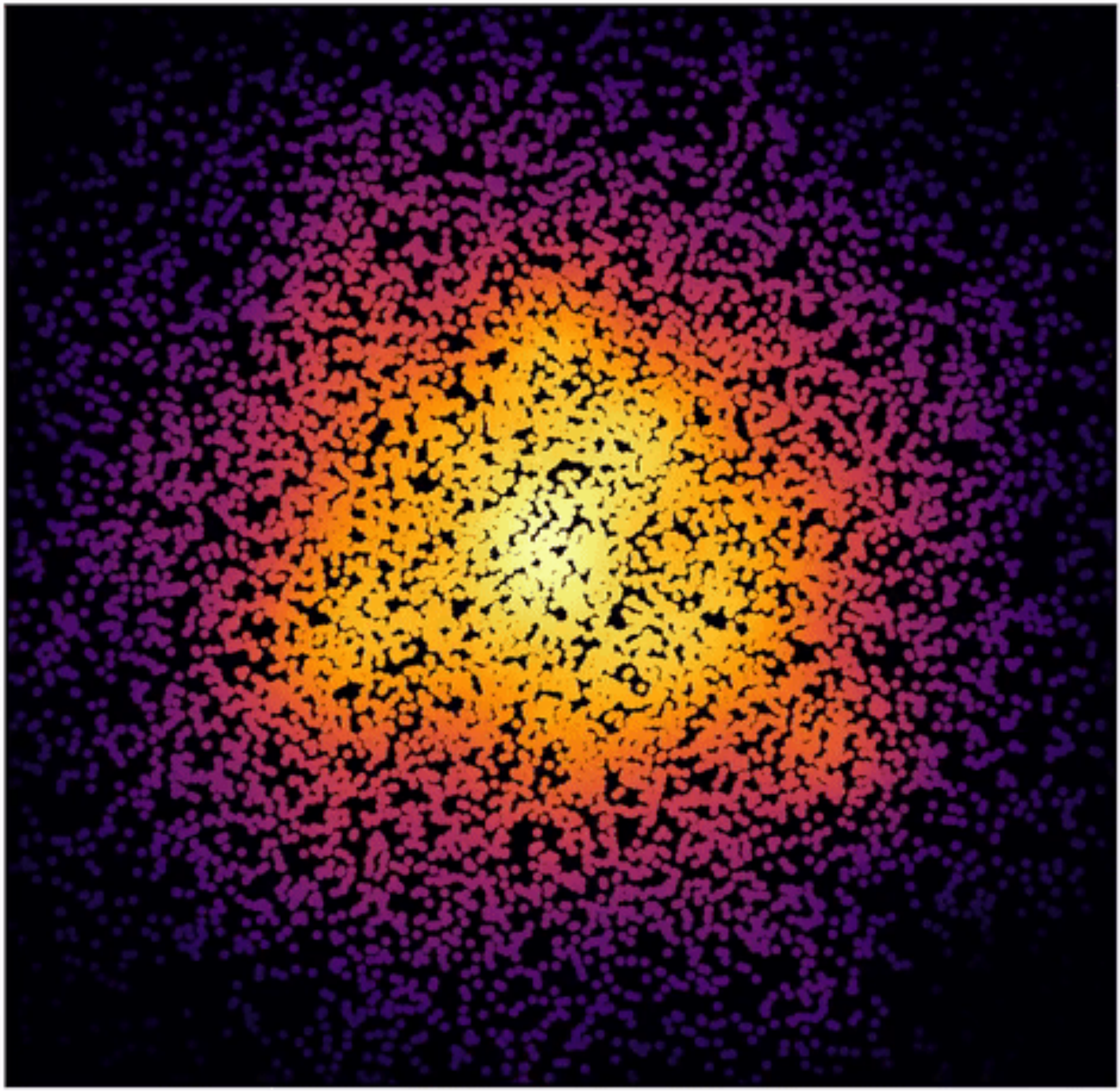


# Cons 😵

- Need for efficient trace calculation
- Solving an ODE and backpropping through the solution can make for cumbersome training

# Pro ✅

Unrestricted form of transformation $f(x)$!



# Continuous-time normalizing flows

## Parameterize the transformation by a neural ODE

ODE with reversible dynamics

$$\frac{\mathrm{d}x}{\mathrm{d}t} = f\left(x(t)\right)$$

Instantaneous change-of-variable formula

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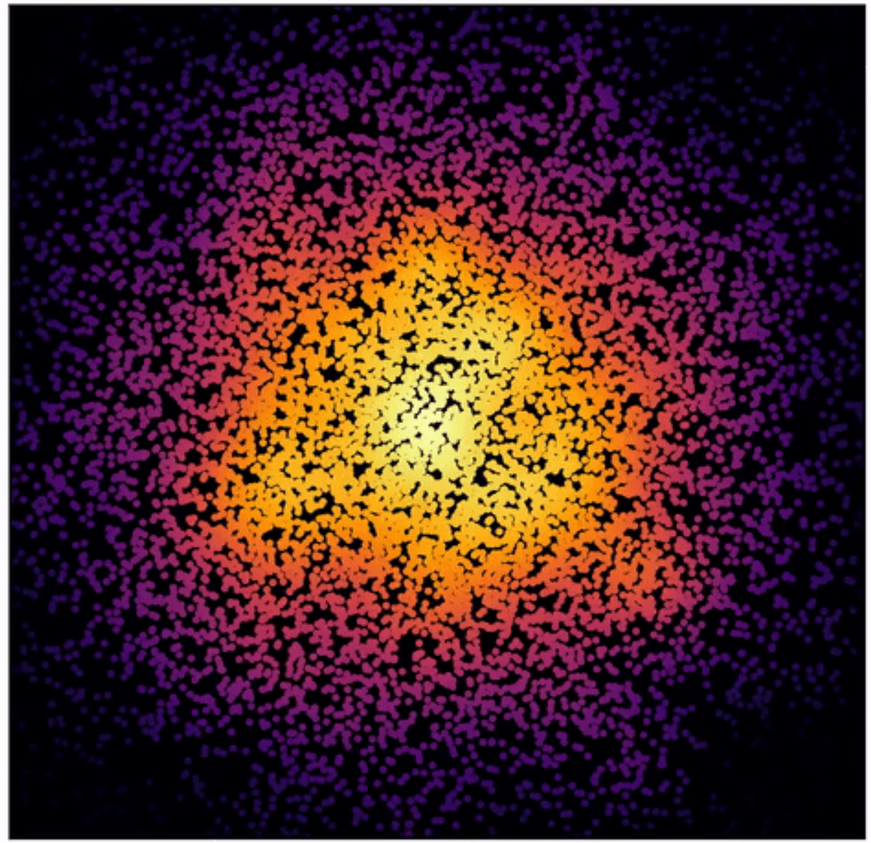

Pro ✅

Unrestricted form of transformation $f(x)$!

Cons 😵‍💫

- Need for efficient trace calculation
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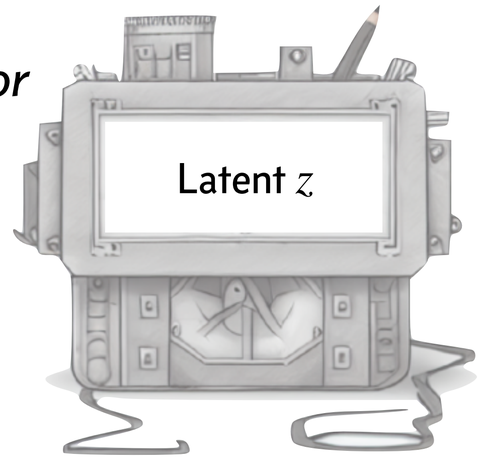
# Simulation-based inference (SBI)

Parameters
$\theta$




Observations
$x$