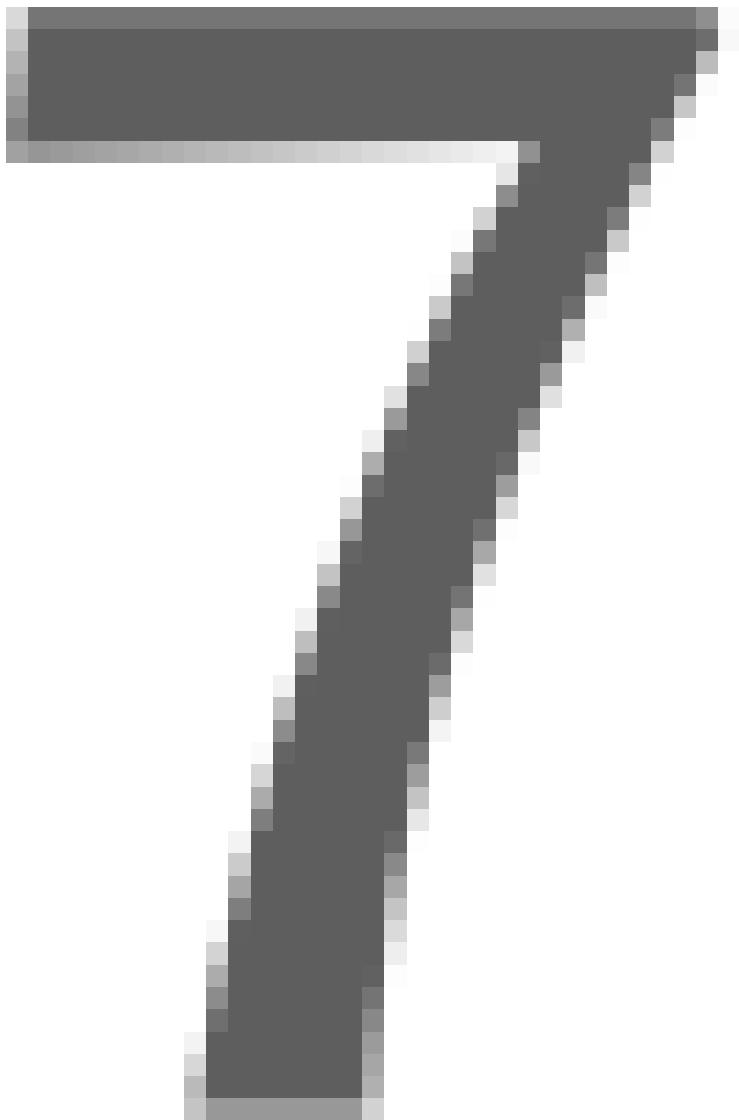


Siddhartha Mishra (MIT/Alfi) Summer School



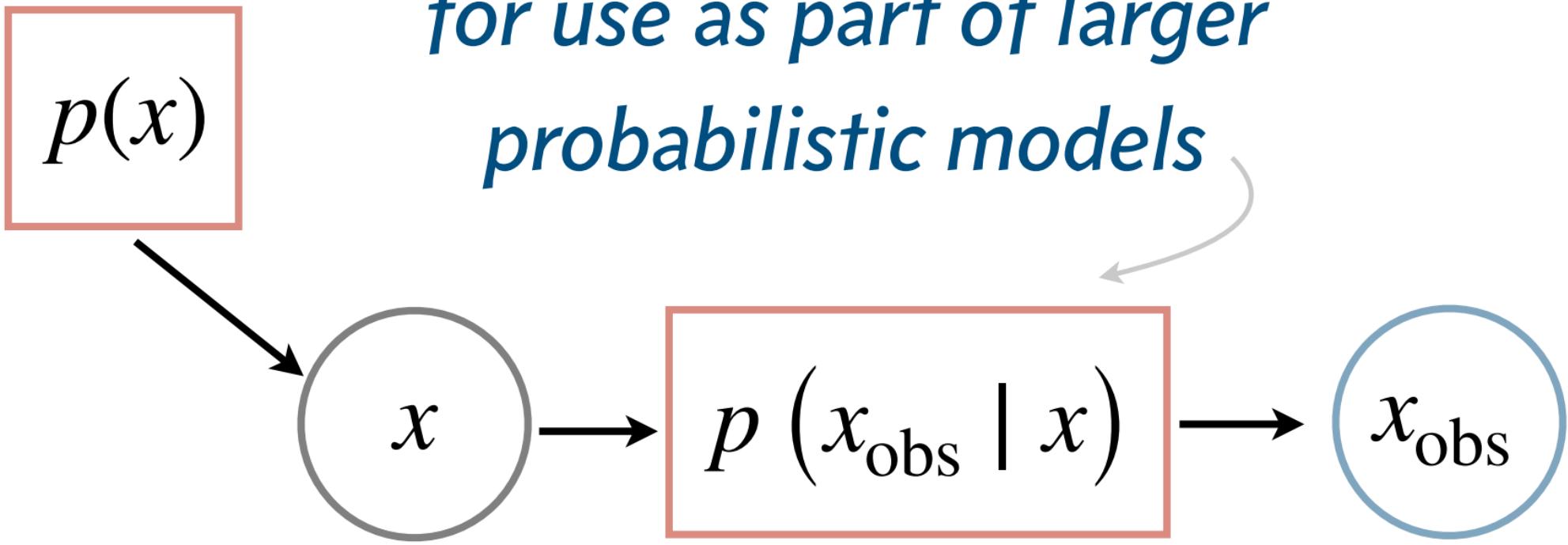


What could we do with $p(x)$?

can efficiently generate a wide variety of scientific models for different applications

Encode complex priors

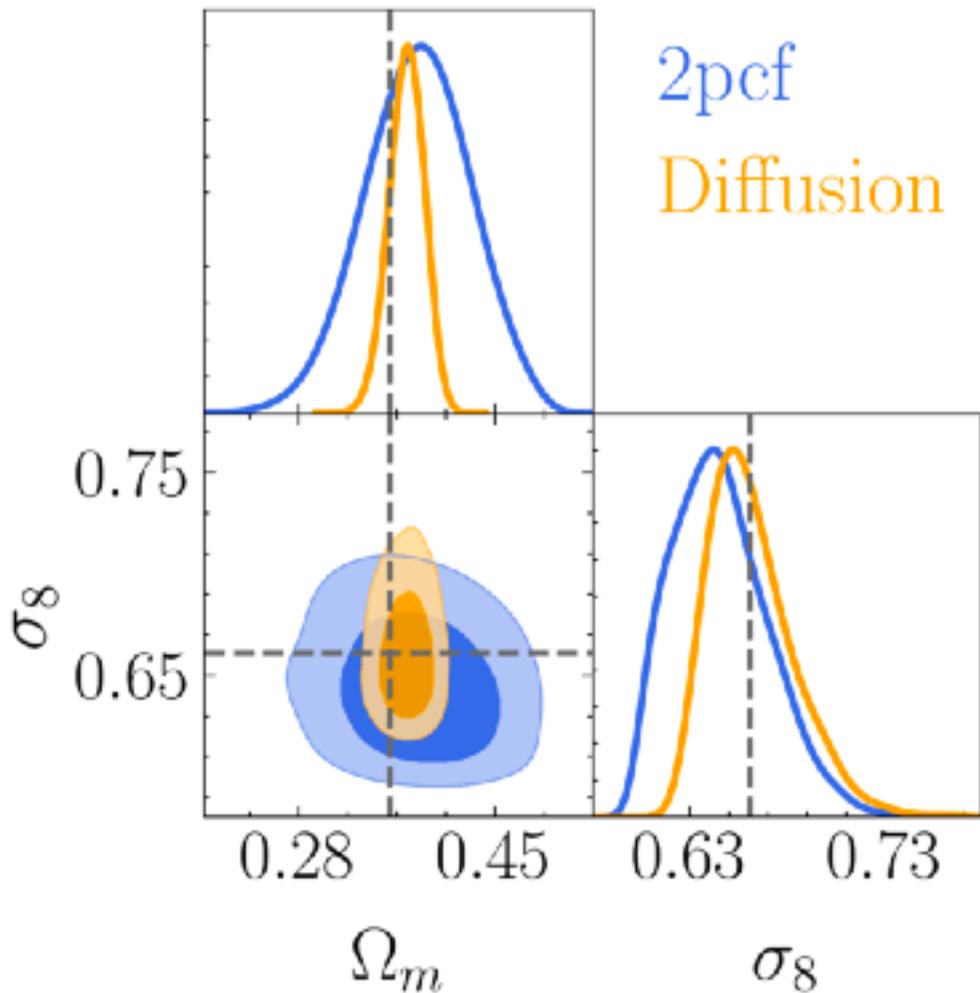
*for use as part of larger
probabilistic models*



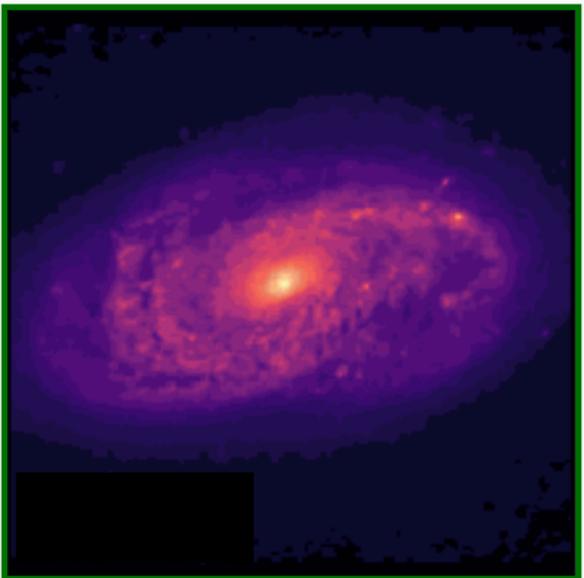
Evaluate likelihood

for model selection, parameter inference, outlier detection, ...

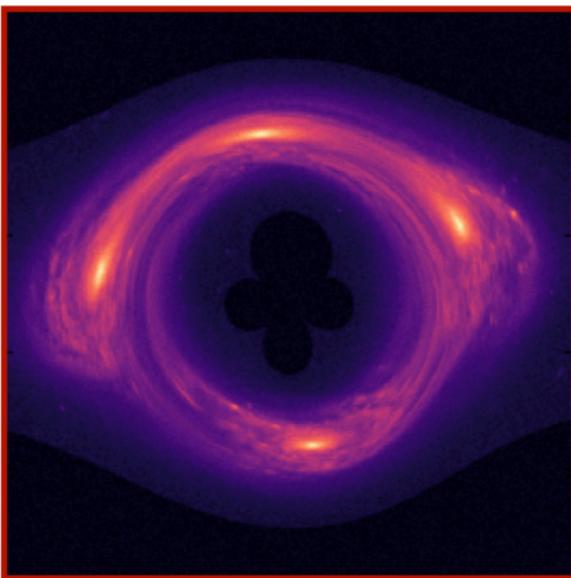
$$p(\theta \mid x) = \frac{p(x \mid \theta) \cdot p(\theta)}{p(x)}$$



$p(\text{galaxies})$

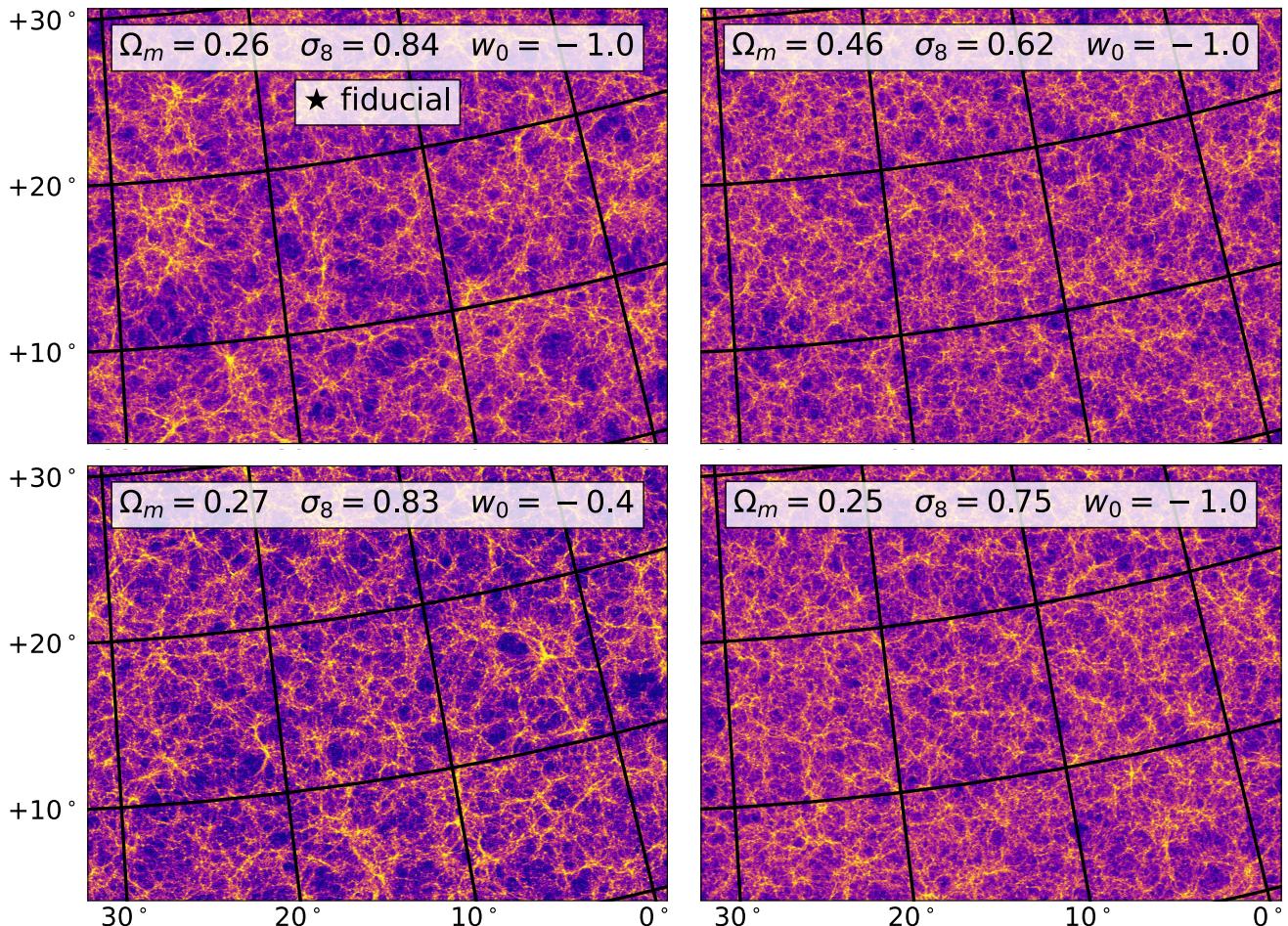


Lens



Produce samples for downstream applications: a fast simulator/emulator

$$x \sim p(x)$$

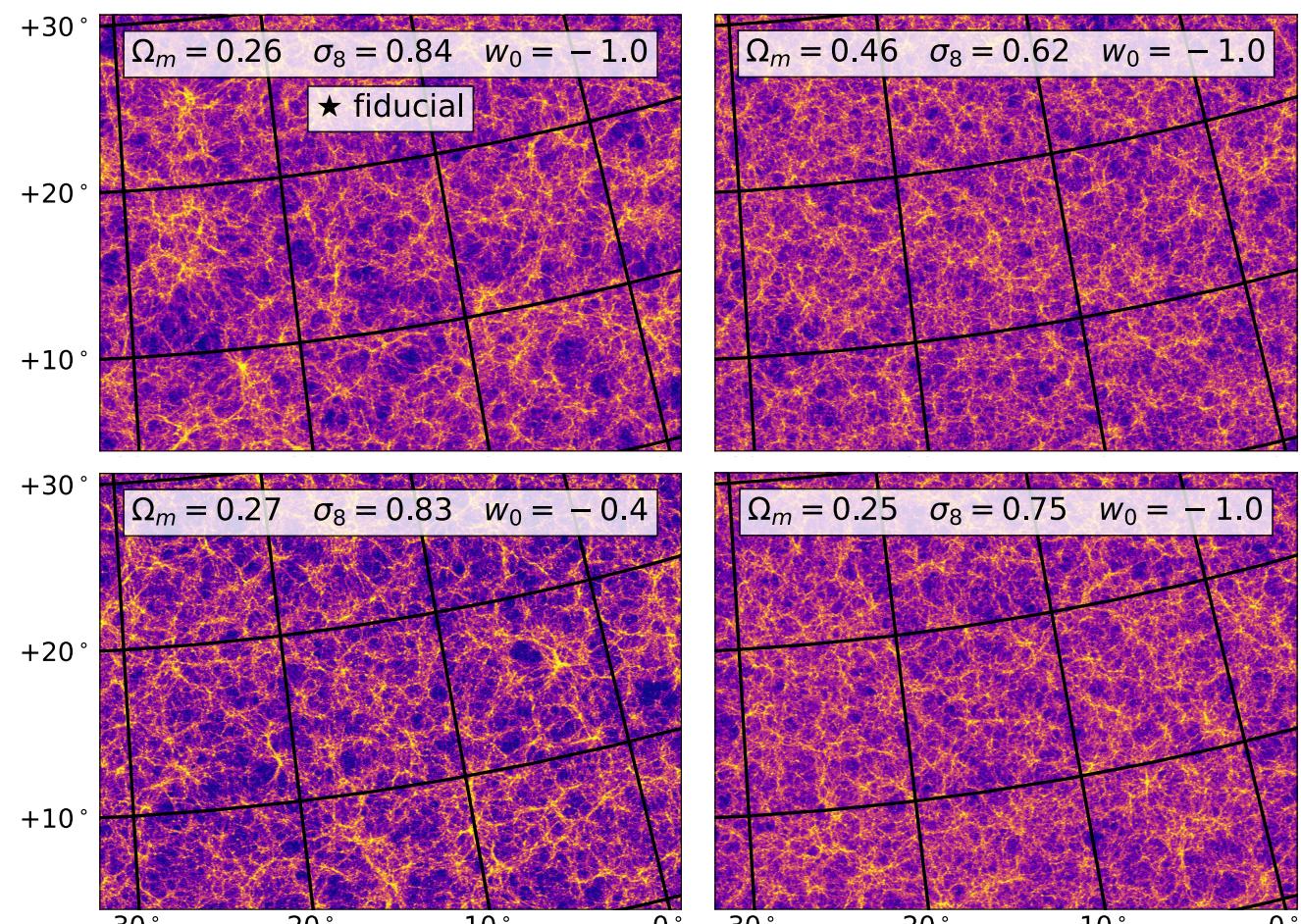


What could we do with $p(x)$?

Produce samples

for downstream applications: a fast simulator/emulator

$$x \sim p(x)$$

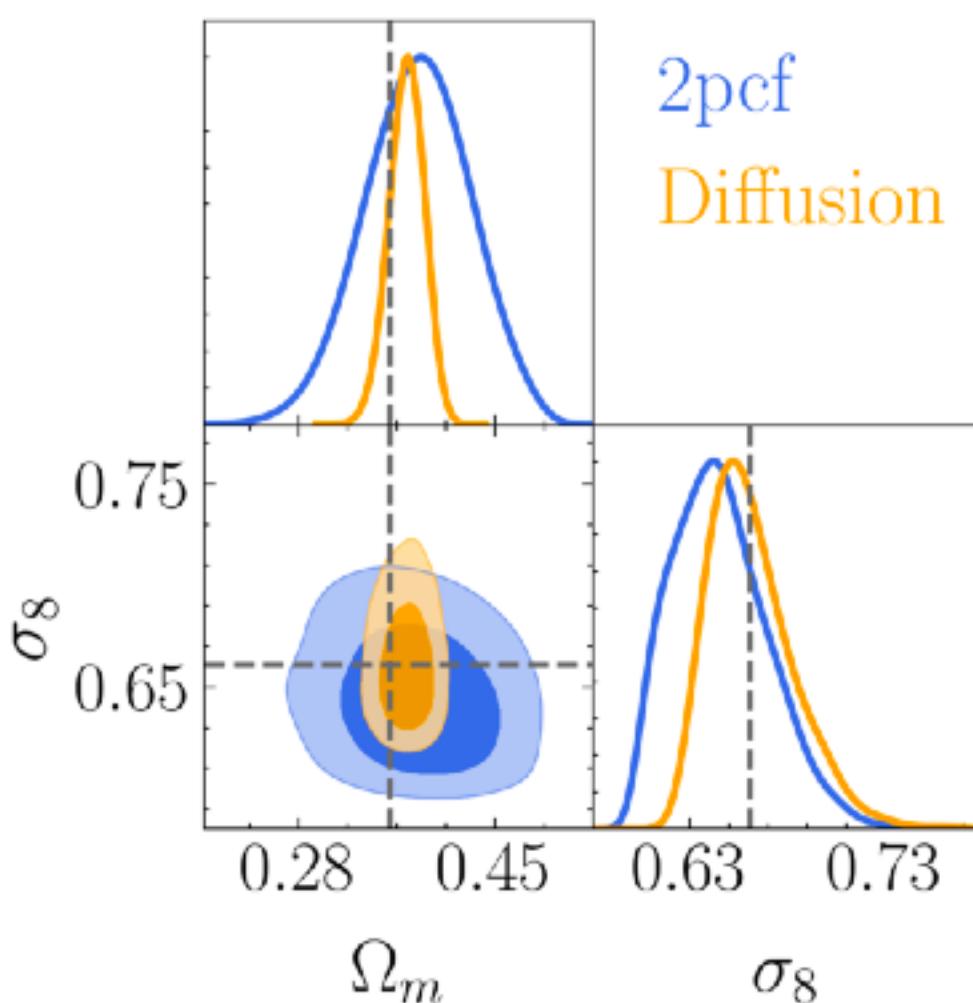


[Kacprzak et al 2022]

Evaluate likelihood

for model selection, parameter inference, outlier detection, ...

$$p(\theta | x) = \frac{p(x | \theta) \cdot p(\theta)}{p(x)}$$



Encode complex priors

for use as part of larger probabilistic models

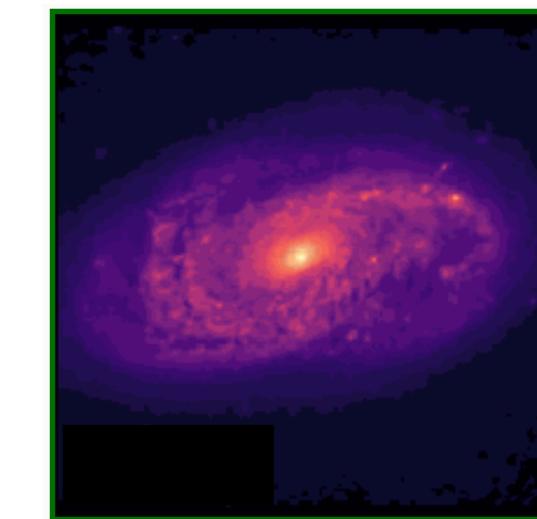
$$p(x)$$

$$x$$

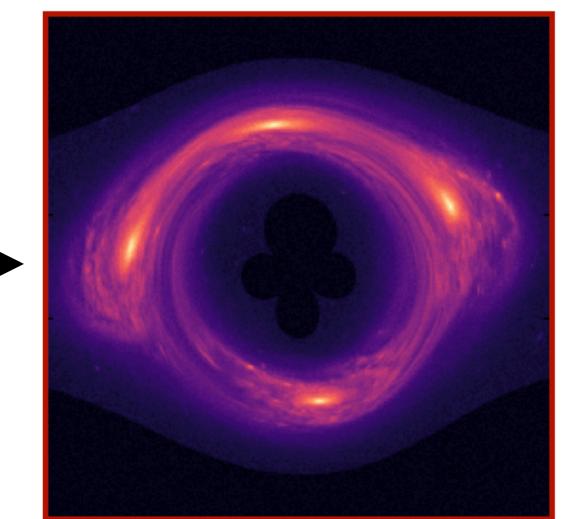
$$p(x_{\text{obs}} | x)$$

$$x_{\text{obs}}$$

$$p(\text{galaxies})$$



Lens



Generative modeling can efficiently enable these for a wide variety of scientific data/models!

Learning the data distribution

I'm sold! *How do I learn a generative model for my data?*