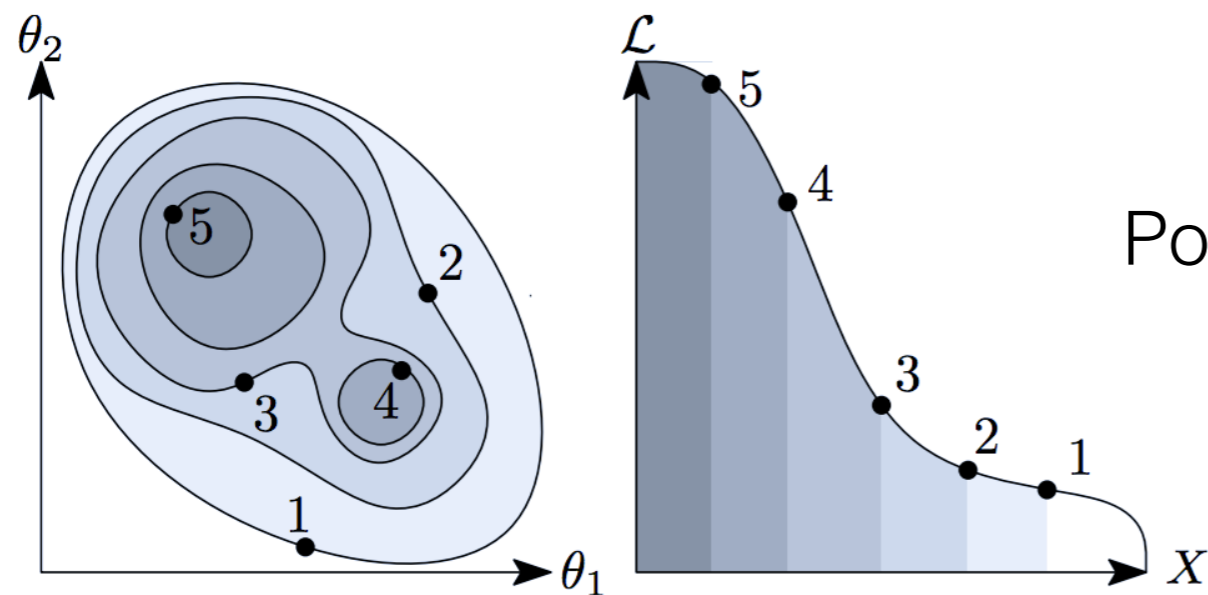


# Statistic Exercises

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## Bayes Theorem

Posterior

Likelihood

Prior

$$P(\theta_{\mathcal{M}}|\mathcal{D}, \mathcal{M}) = \frac{P(\mathcal{D}|\theta_{\mathcal{M}}, \mathcal{M})P(\theta_{\mathcal{M}}|\mathcal{M})}{P(\mathcal{D}|\mathcal{M})}$$

Bayesian Evidence (Z)

$$P(\mathcal{D}|\mathcal{M}) \equiv \mathcal{Z} = \int P(\mathcal{D}|\theta_{\mathcal{M}}, \mathcal{M})P(\theta_{\mathcal{M}}|\mathcal{M}) d\theta_{\mathcal{M}}$$

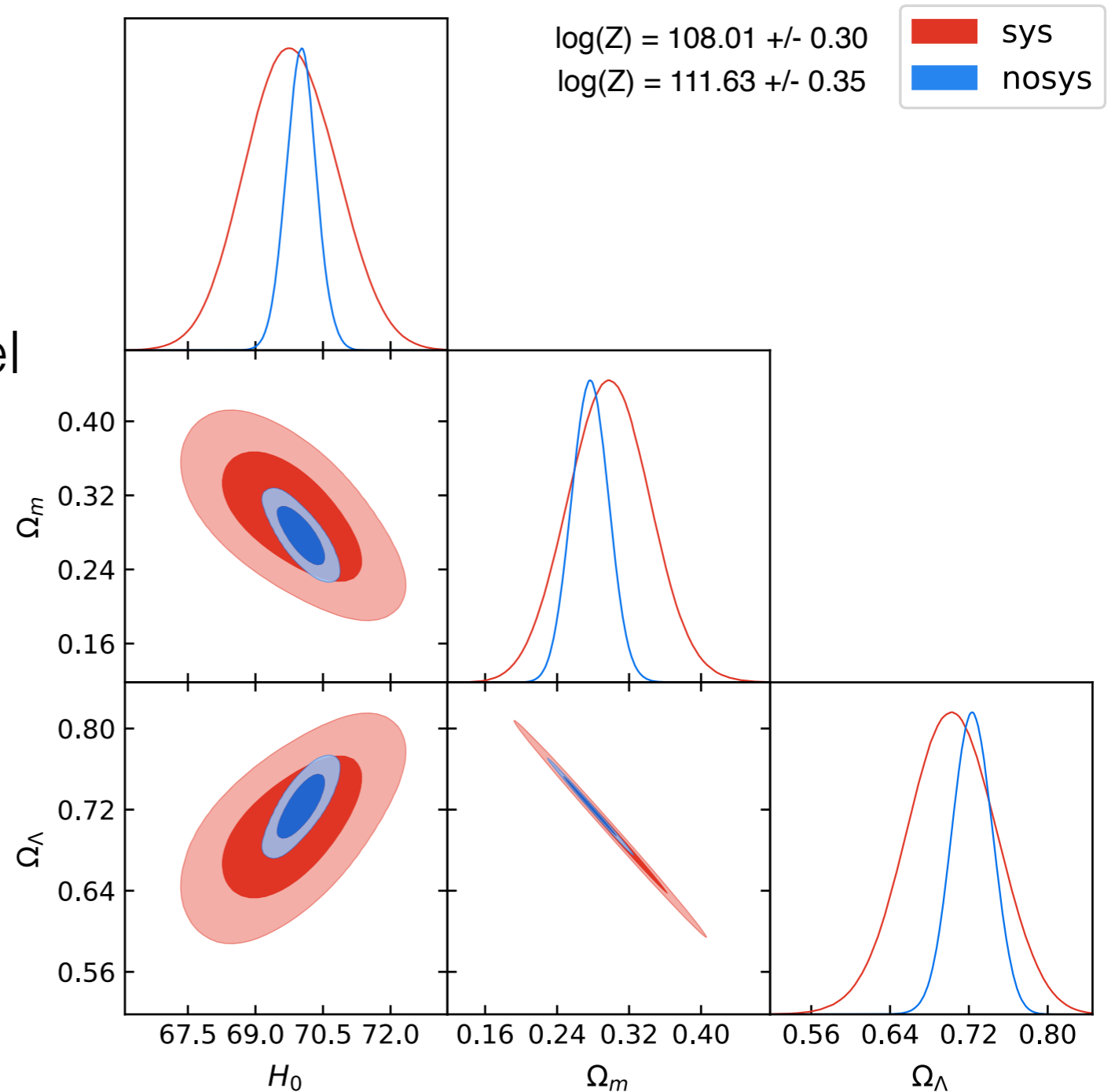
# Model Comparison

Evidence (Z)

Prior on  
the model

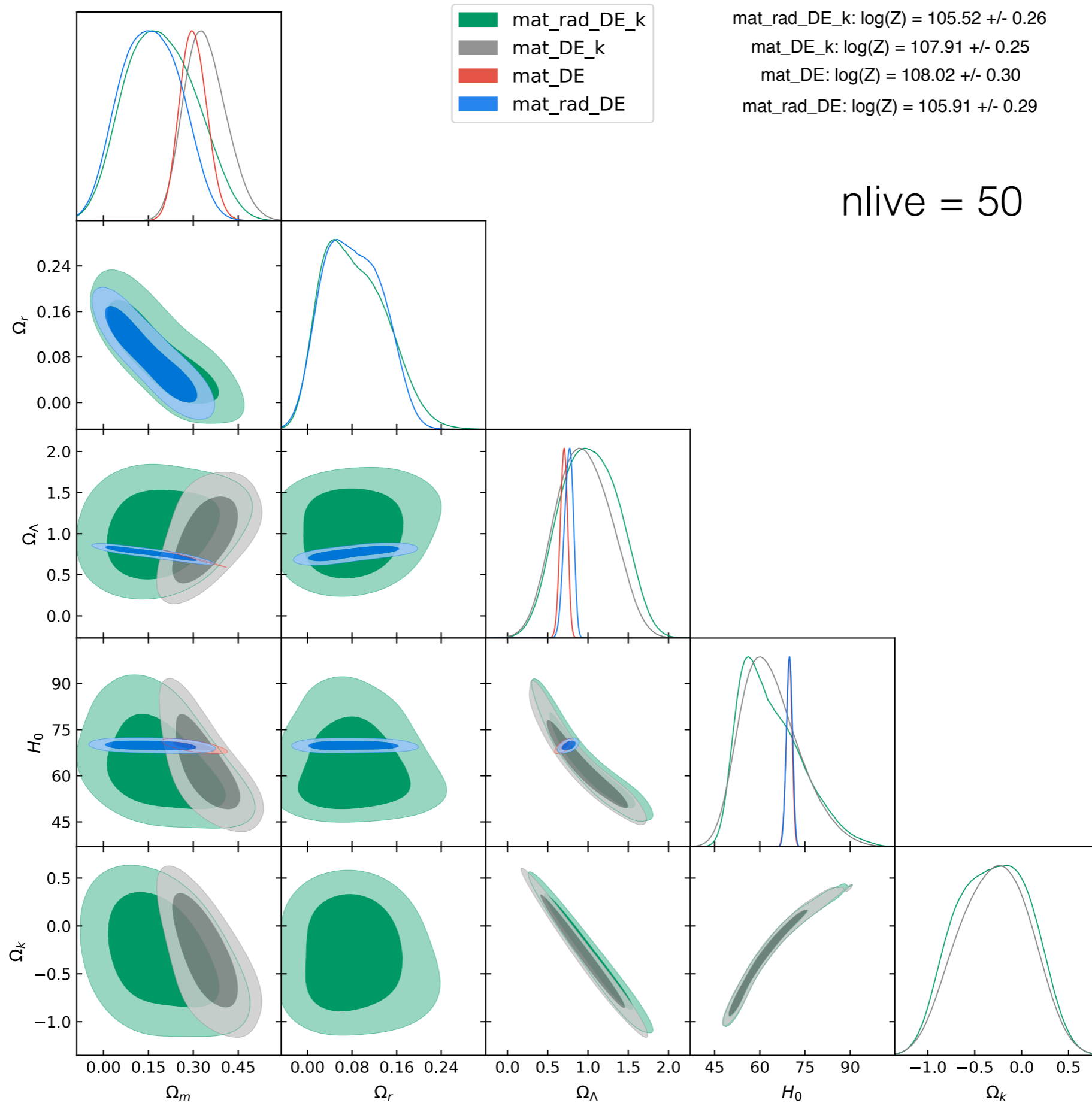
$$P(\mathcal{M}_i | \mathcal{D}) = \frac{P(\mathcal{D} | \mathcal{M}_i) P(\mathcal{M}_i)}{P(\mathcal{D})}$$

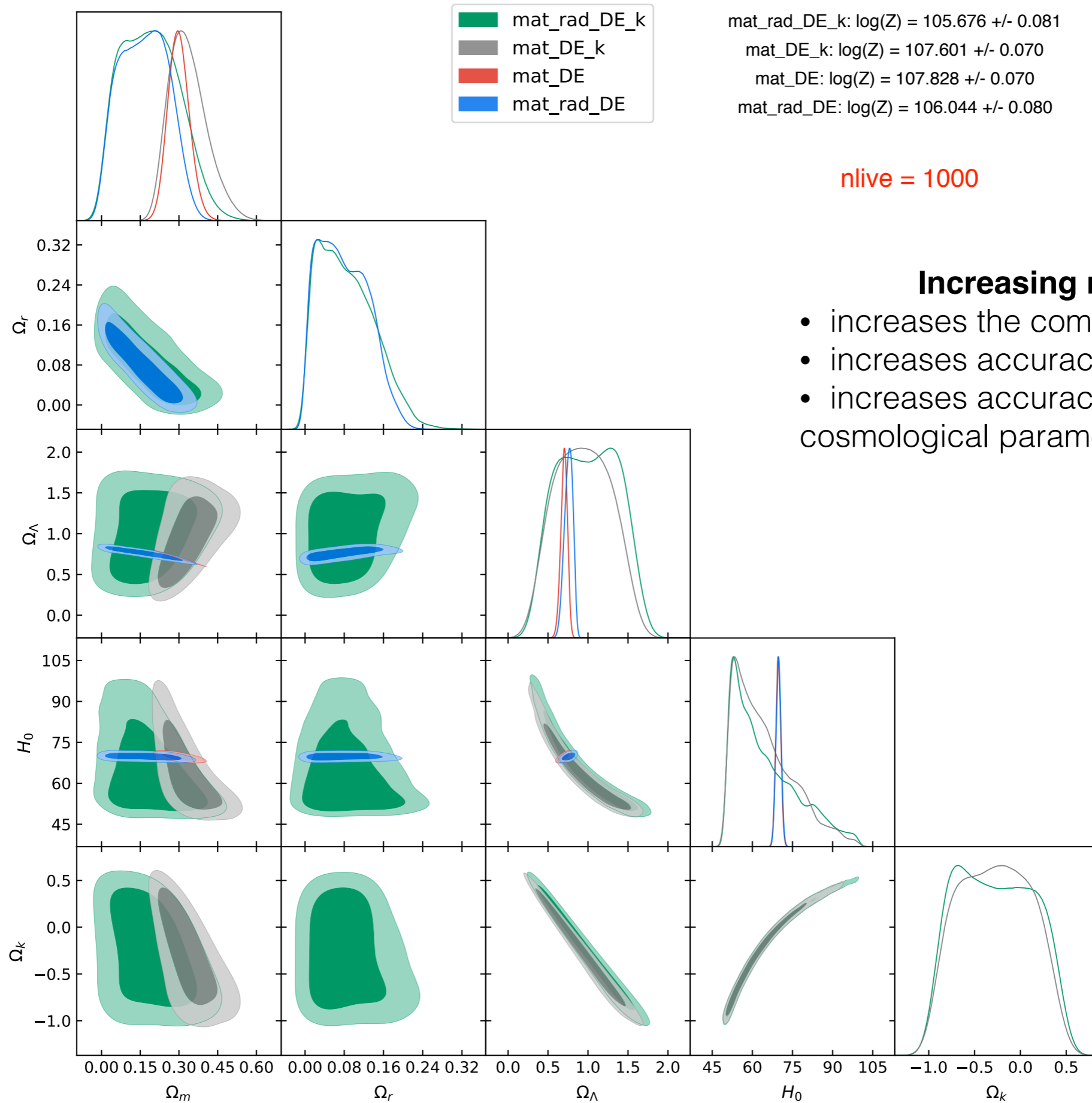
Probability of the model  
given the data



The Bayesian evidence naturally comprises the **Occam's Razor**

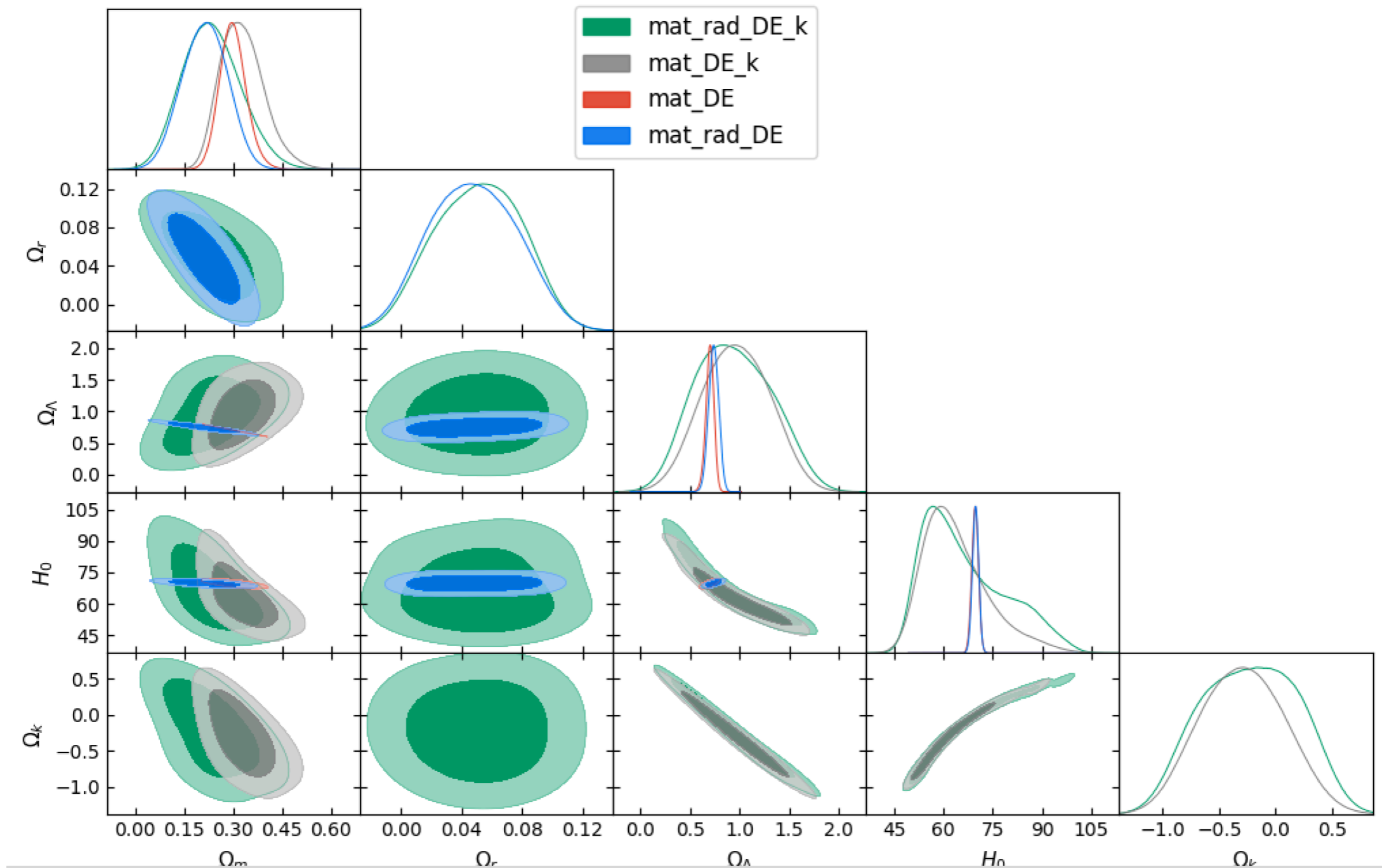
PolyChord agrees with Metropolis-Hastings



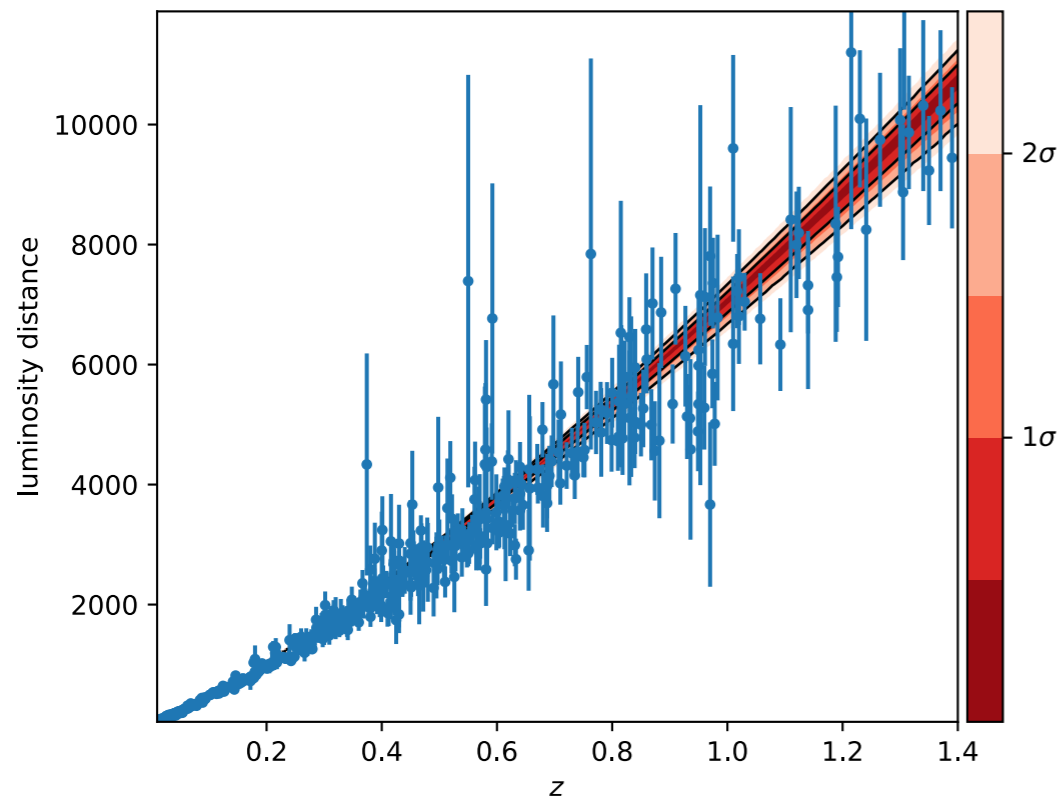


# Changing prior in a « clever way » tends to improve evidence

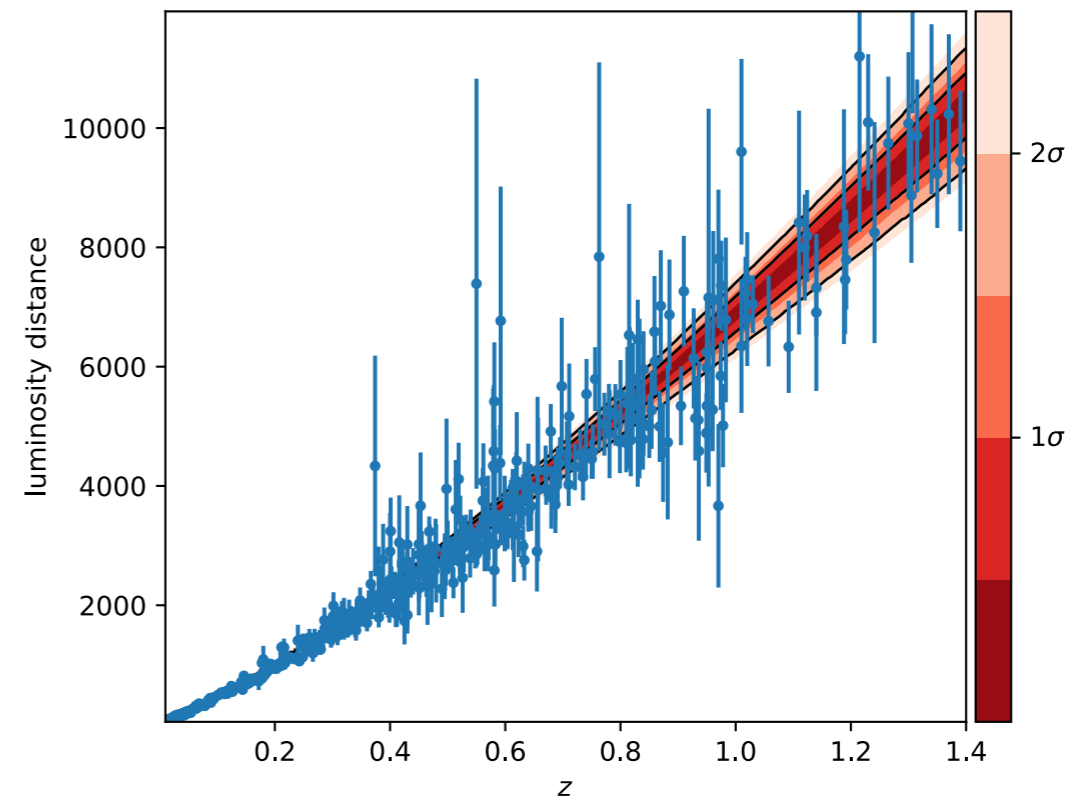
```
('mat_DE', 107.82331, '+/-', 0.30897589)  
( 'mat_DE_k', 107.6195, '+/-', 0.25316232)  
( 'mat_rad_DE', 107.68765, '+/-', 0.25304528)  
( 'mat_rad_DE_k', 107.52153, '+/-', 0.21835703)
```



## Matter + DE



## Matter + DE + Curvature



## PolyChord Pros

- Fast
- Bayesian Evidence
- Doesn't suffer in high dimensions

## PolyChord Cons (v1.9)

- Not user-friendly
- No documentation