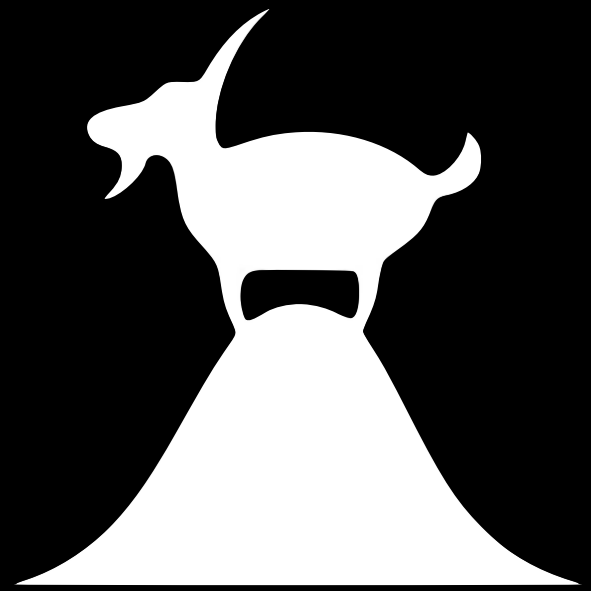


gaussbock

Non-parametric Bayesian methods for cosmological parameter estimation

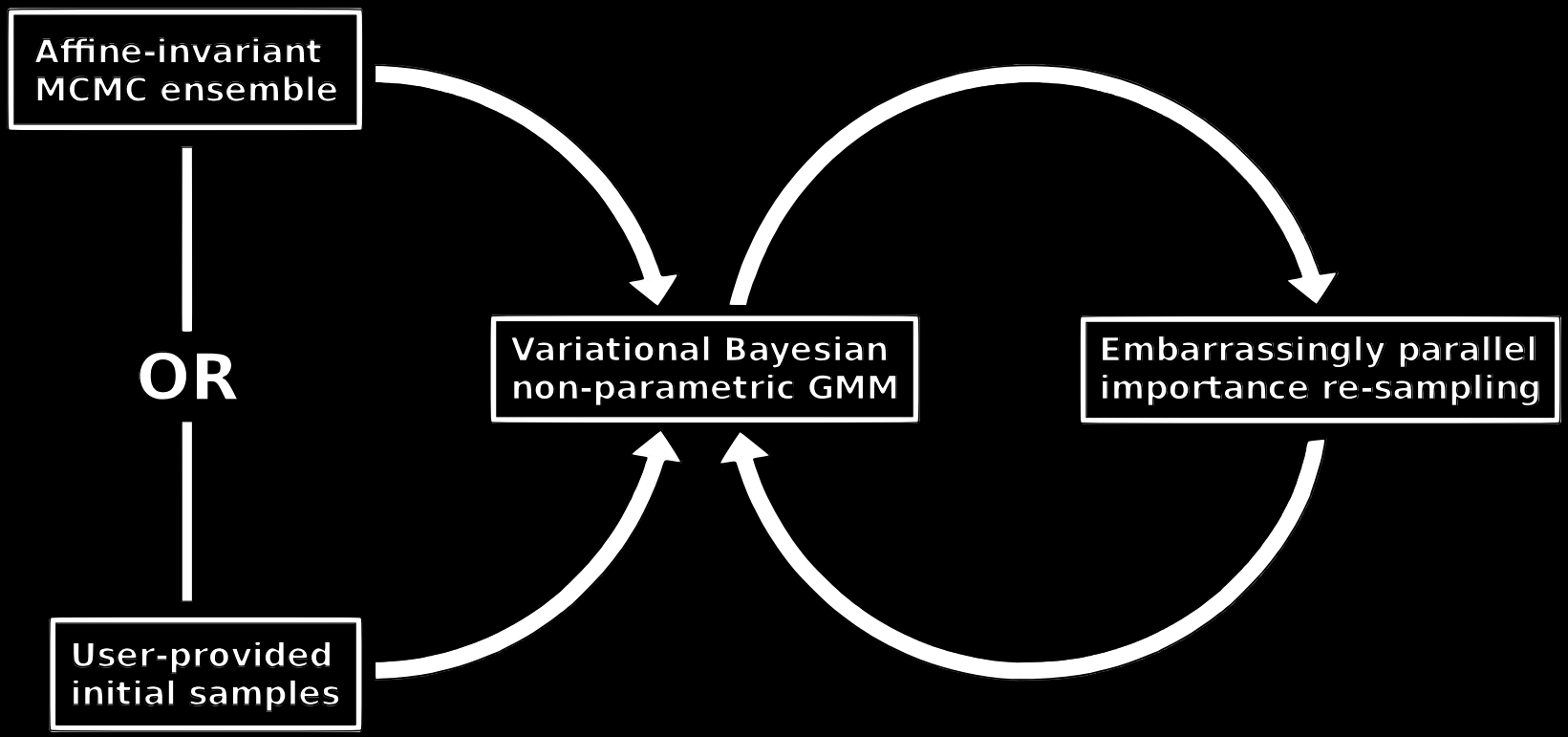
Ben Moews & Joe Zuntz
Institute for Astronomy (IfA)
School of Physics & Astronomy
The University of Edinburgh

Status quo of cosmological parameter estimation

- Modern problems deal with high-dimensional estimation
- Computing posterior values is computationally expensive
- MCMC algorithms, even using multiple walkers, are slow
- Distributions often can't be ballparked in a reasonable way
- Making this an embarrassingly parallel problem would help

Non-parametric Bayesian solutions to this problem

- Cut down the initial parallelization-limited sampling step
- Parallelize a repeated Bayesian fitting and re-sampling step



Simple, fast and robust high-dimensional CPE

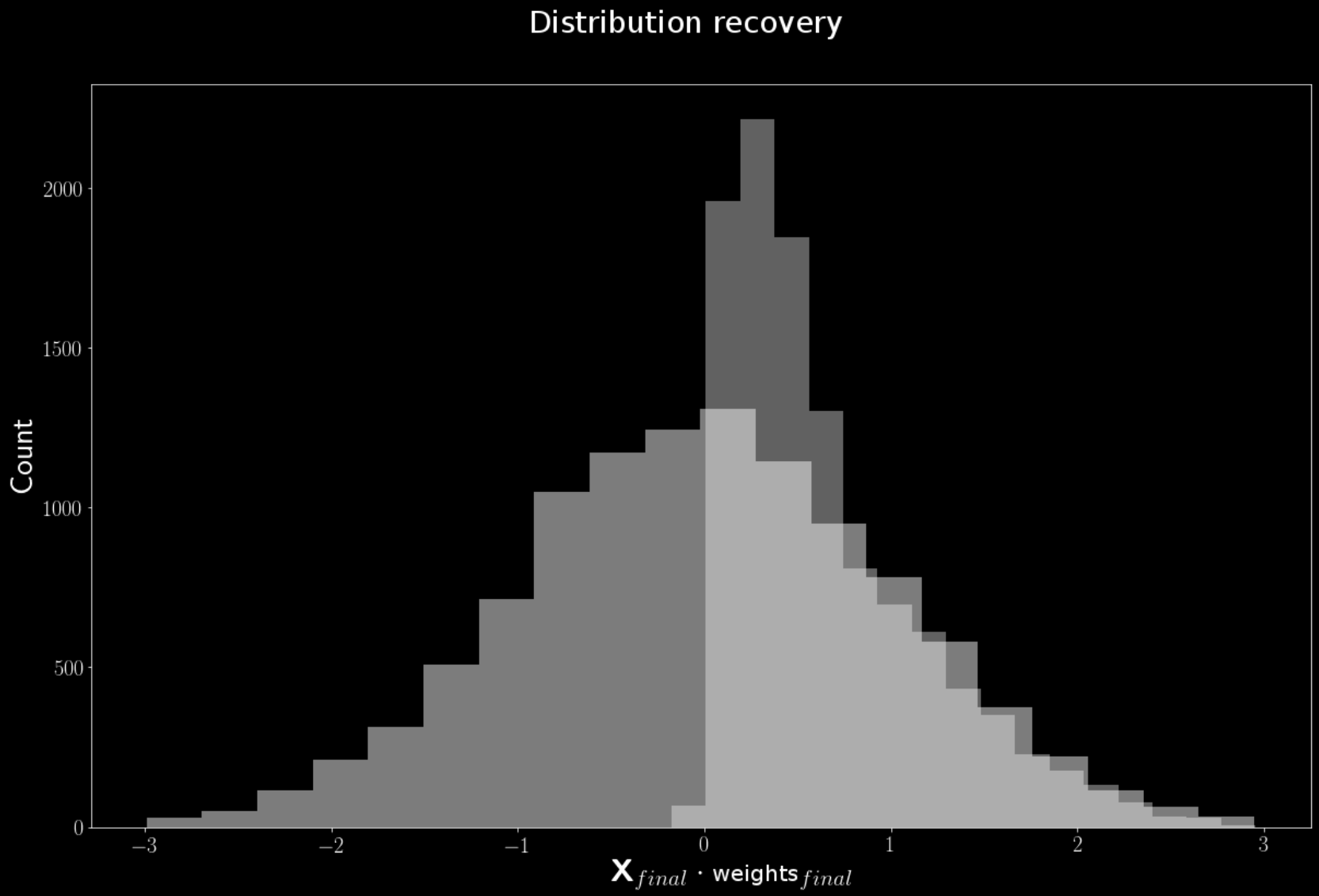
Callable with one function, only 3 *required* inputs:

- The set of ranges for the parameters
- The function that returns a posterior
- The number of samples in the output

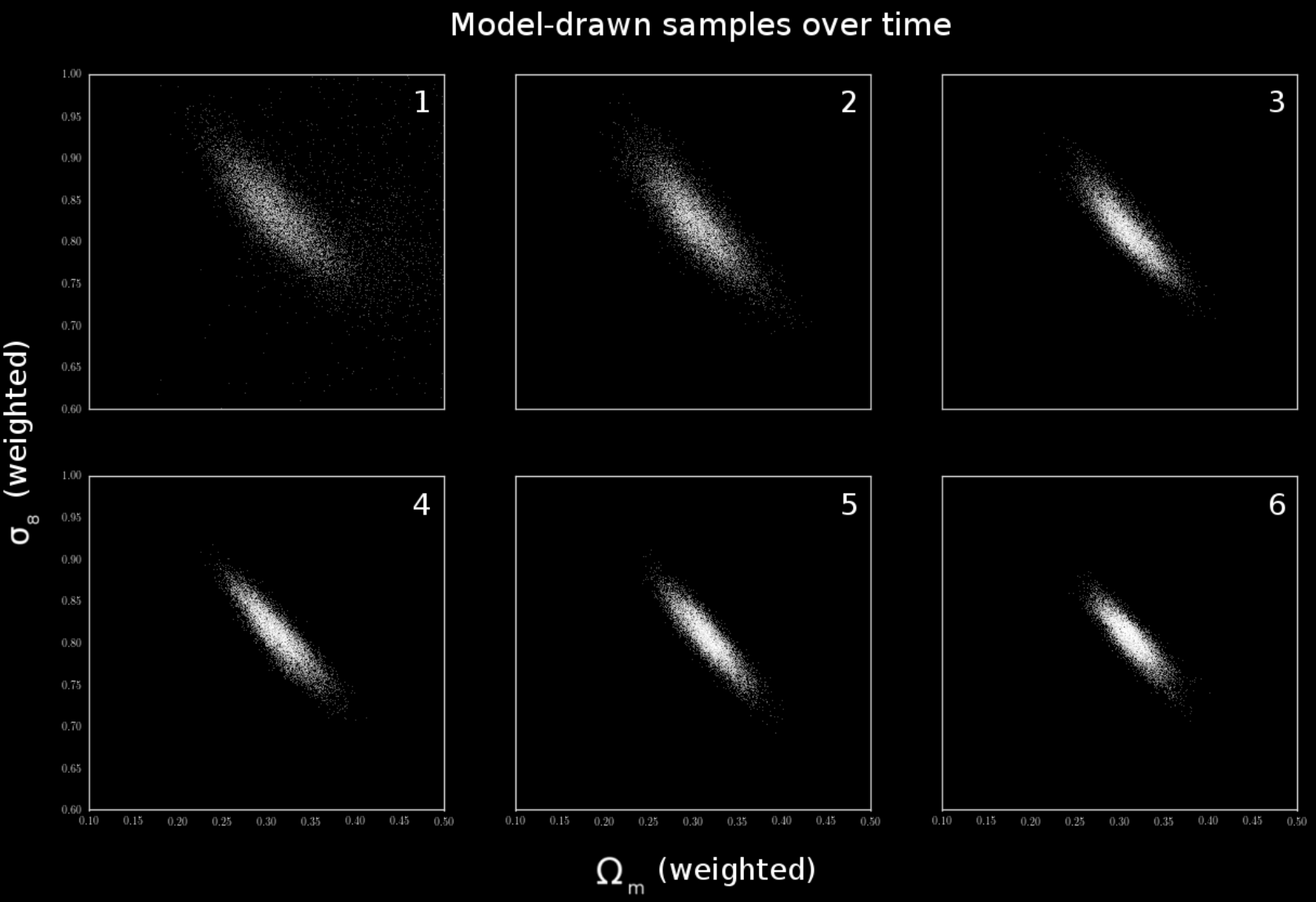
Simple, fast and robust high-dimensional CPE

- Building on related PMC approaches, e.g. CosmoPMC
- Dynamically shrinking convergence threshold for fitting
- Robust against potentially dominating high-posterior points
- Use of kernel density estimation for low-dimensional problems
- Optional return of the model and its importance weights
- Built-in option for multi-process parallelization and MPI

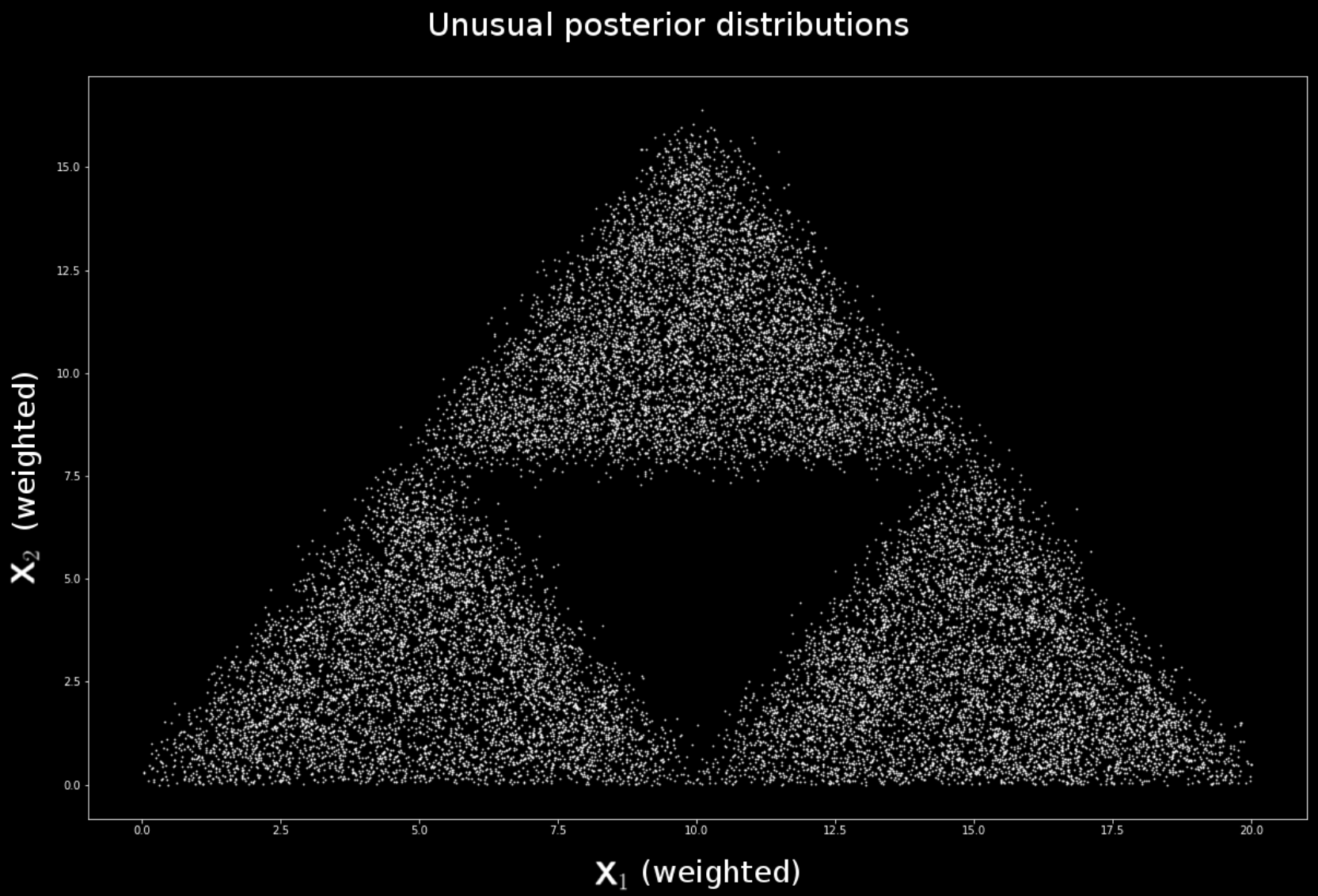
Testing the functionality on a toy example



Testing `gaussbock` on an actual DES SV example



Testing approximations of uncommon posteriors



Spread the word by testing and using it yourself

It's on PyPI, and easy to install with a single console command!

```
pip install gaussbock
```

(The paper will appear on arXiv shortly.)

Contact: ben.moews@ed.ac.uk