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# fgivenx: a python package for functional posterior plotting

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**Software**

- Review
- Repository
- Archive

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## Summary

Scientists are often concerned with numerical values of parameters in scientific models. Our knowledge of such things can be quantified and presented as a probability distribution:

The age and size of the universe, as measured using Planck 2018 data. (non-Astro)Physicists may have noted that 14 Gigaparsecs is roughly 46 billion light years. The fact that the observable universe is roughly three times larger in light years in comparison with its age is explained by the expansion of space over cosmic history.

Plots like the above can be created using two-dimensional kernel density estimation using packages such as scipy, getdist and corner, where the samples provided as inputs to such programs are typically created by a Markov-Chain-Monte-Carlo analysis.

As well as uncertain parameters, scientists may also be interested in quantifying uncertainty in functional relationships. Take as a universally relatable case the equation of a straight line `y = m*x + c`. If one measured the gradient `m` and intercept `c` with some uncertainty, then our ability to predict `y` from `x` using the straight line relationship would also be uncertain, and plotted thus:

The above example is a little over-simplified, but the code has been used in the latest two Planck inflation papers (**???**)(**???**) to quantify our knowledge of the primordial power spectrum of curvature perturbations, by (Hee et al. 2016) in examining the dark energy equation of state (and later by (Hee et al. 2017)), by (Higson et al. 2017) for measuring errors in parameter estimation and by (Higson et al. 2018) for providing diagnostic tests for nested sampling.

`fgivenx` is a python package for functional posterior plotting, currently used in astronomy, but will be of use to any scientists performing any Bayesian analysis which have predictive posteriors that are functions. The source code for `fgivenx` is available on github and has been archived to Zenodo with the linked DOI: (Handley 2018)

## Acknowledgements

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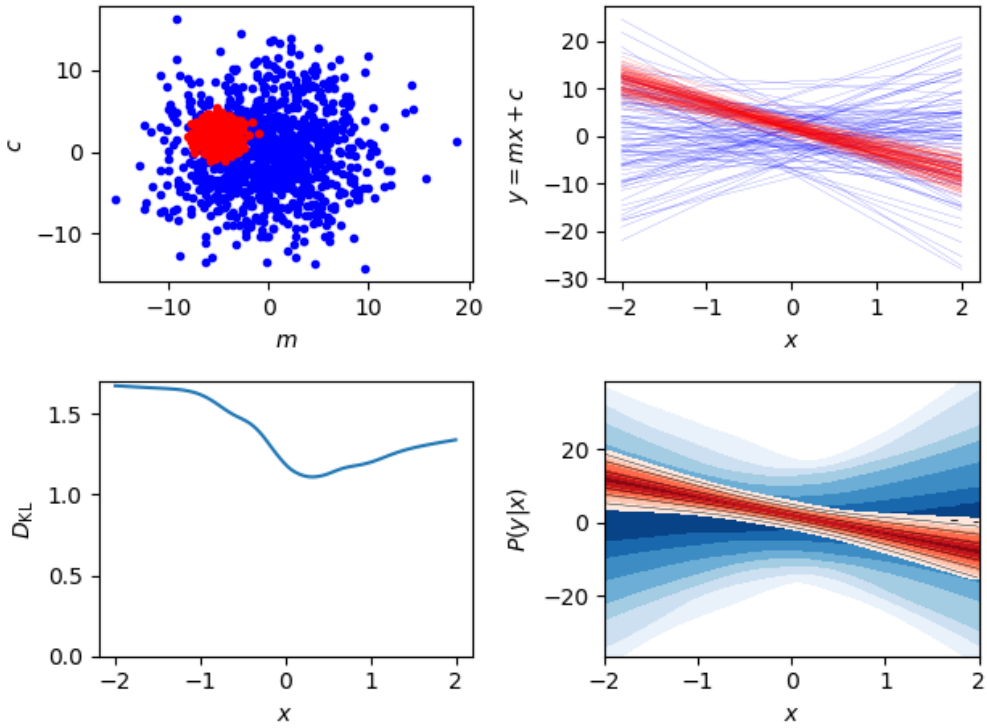


**Figure 1:** An example of plots fgivenx is capable of producing

## References

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