Population Monte Carlo

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Helmholtz school on
Monte Carlo methods in advanced statistics applications and data analysis
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RELEVANT FILES

PMC.CC

Main function; tune configuration options of hierarchical clustering and pmc

PLOTSCRIPT.PY

Plot marginal distributions. Get help with

```
plotScript.py --help
```

The most useful options for now:

```
--pmc-proposal # plot proposal components
--pmc-step 0 # select step. If omitted: final step
--pmc-stats # plot evolution of convergence criteria
            # and evidence estimate
--integrate # compute evidence
            # and uncertainty estimate
```

EXERCISES: RUN PMC I

Prerequisite: You ran `mcmc` and created the output `mcmc.hdf5` with default settings.

1. Go to `exercises/pmc/`, take a look at `pmc.cc`, compile the code, run it, and check `stdout`:

```
cd exercises/pmc; make && ./pmc
```

2. Plot the proposal function, step by step (output: `pmc_prop.pdf`)

```
plotScript.py pmc.hdf5 --pmc-proposal --pmc-step 0
plotScript.py pmc.hdf5 --pmc-proposal --pmc-step 1
...
plotScript.py pmc.hdf5 --pmc-proposal # final step
```

3. Plot the 2D marginal from the final results (output: `pmc_hist.pdf`)

```
plotScript.py pmc.hdf5 --single-2D 0 1
```

Exercises: run PMC II

4. Plot the evolution of convergence diagnostics and the evidence (output: `pmc_stats.pdf`)

```
plotScript.py pmc.hdf5 --pmc-stats
```

5. Compute the integral evidence along with an uncertainty estimate and compare with the correct value 12.5664.

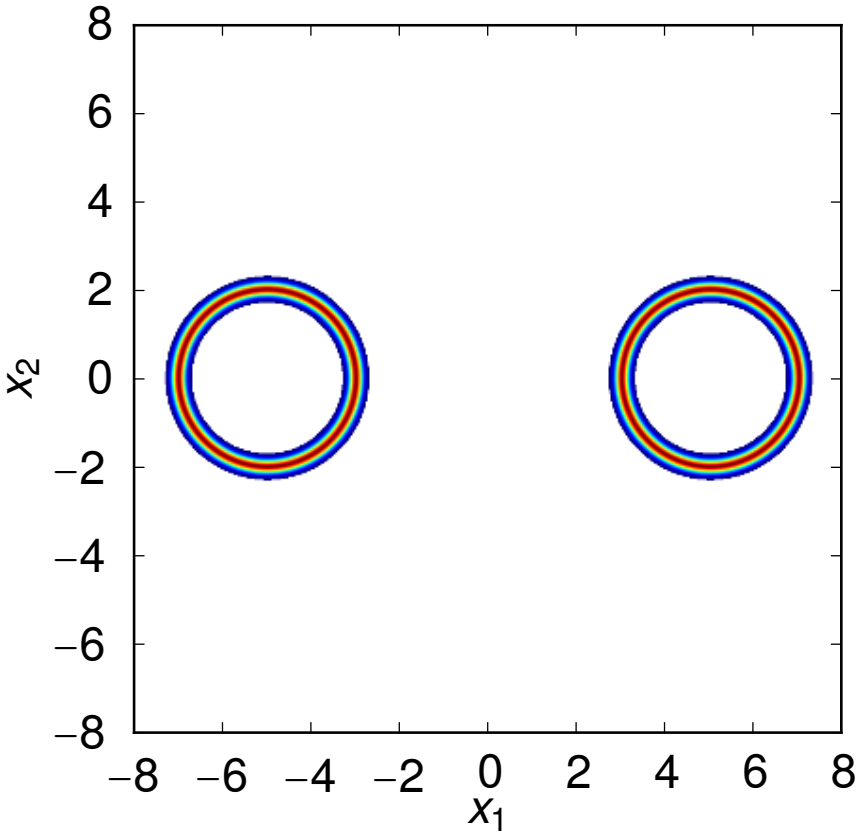
```
plotScript.py pmc.hdf5 --integrate
```

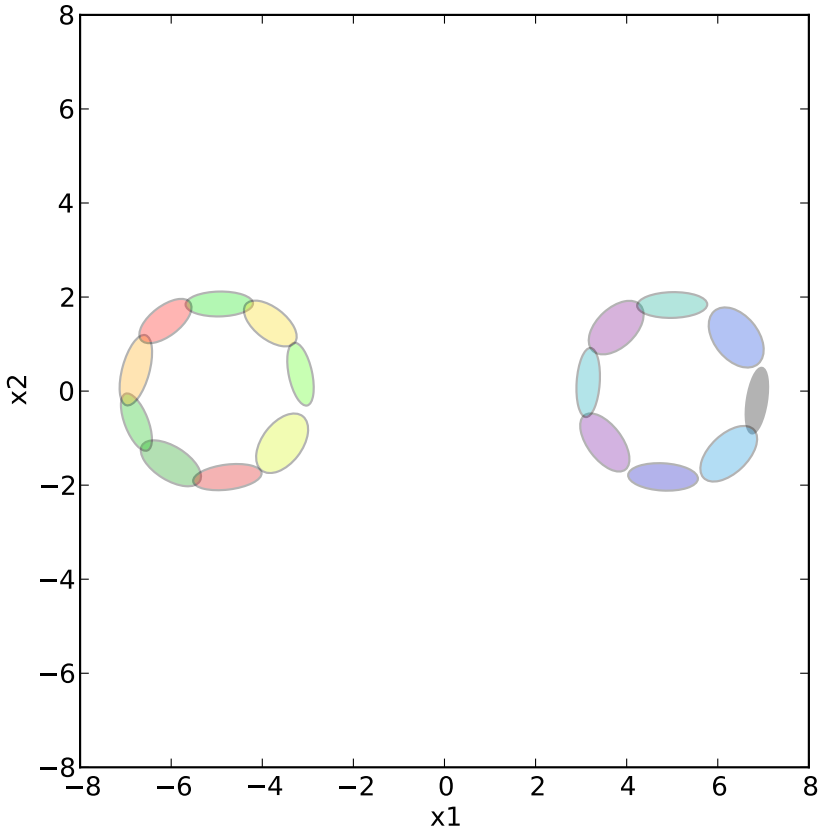
6. Play with the hierarchical-clustering and pmc parameters, one at a time: change `patch_length`, `target_ncomponents` and `samples_per_component`. Look at the proposal in the final step. Check the program output for the number of components that survive. When does it fail?

EXERCISES: RUN PMC III

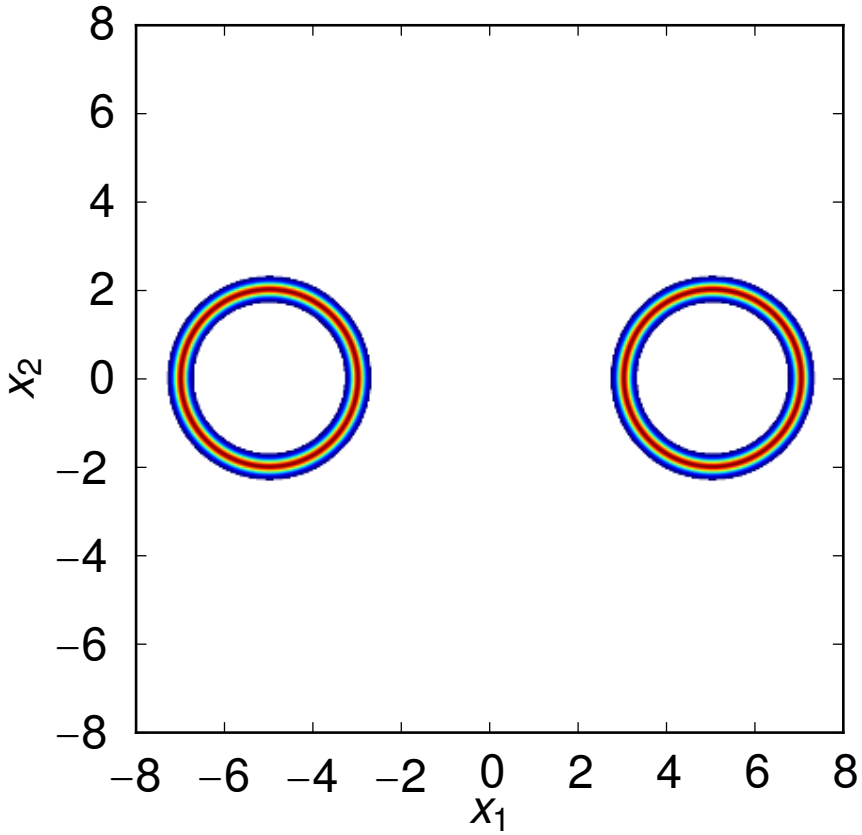
7. [Bonus] Increase the dimension and redo MCMC and PMC. You may have to increase `target_ncomponents` and `samples_per_component`, among others. How high can you go?

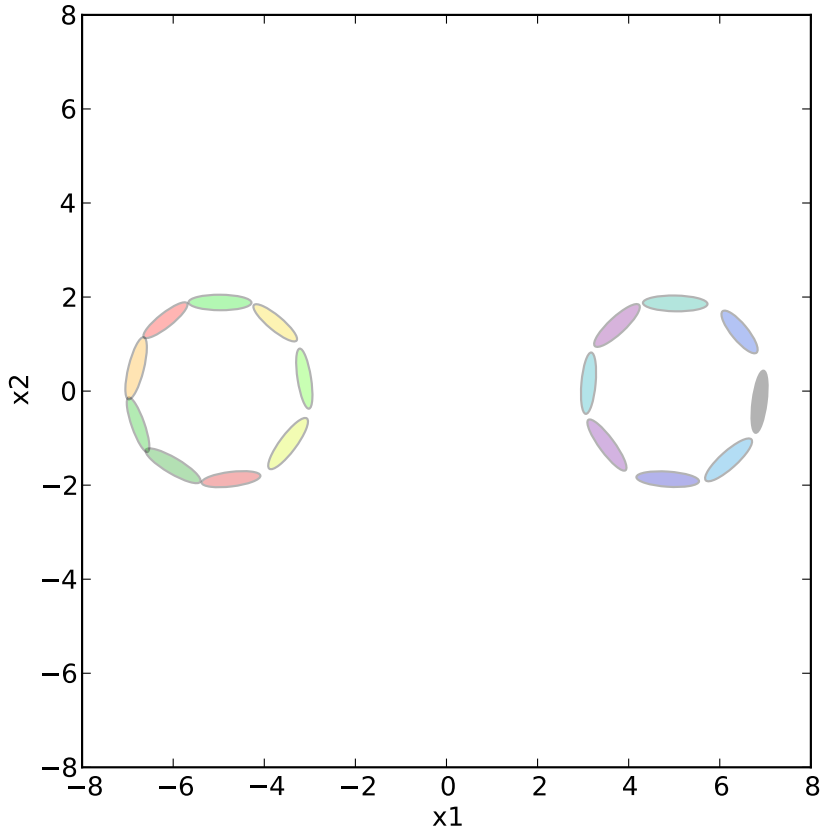
Solutions



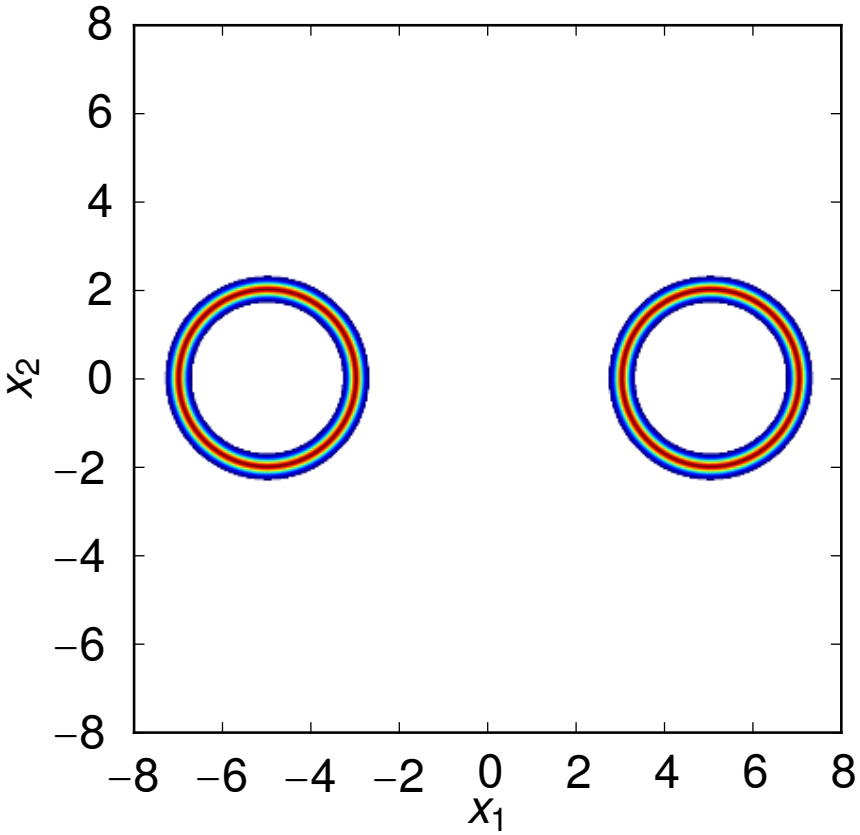


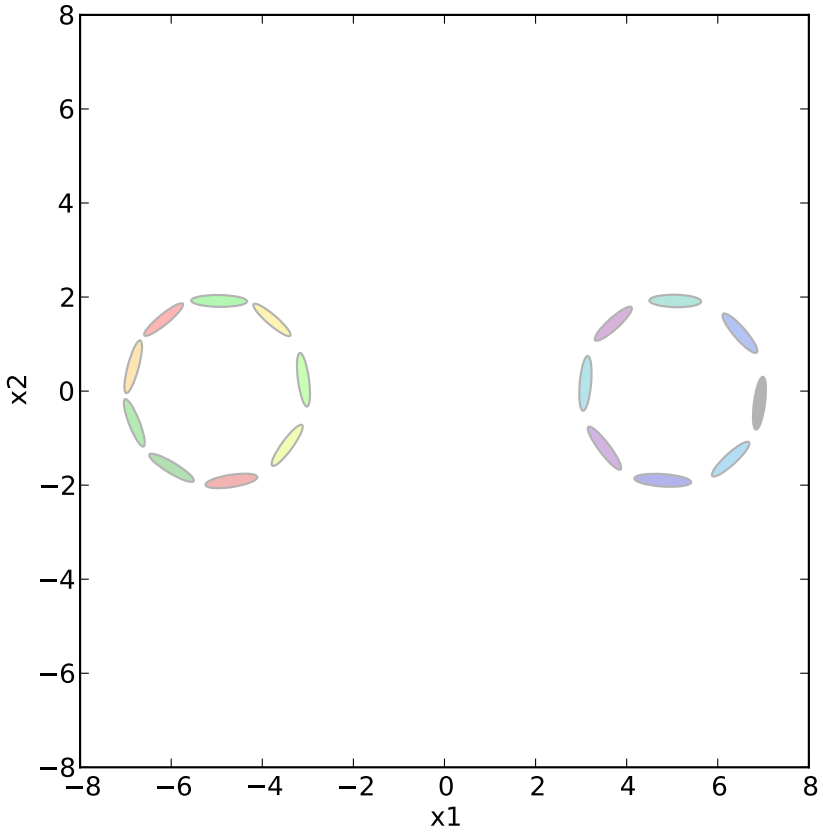
step 0



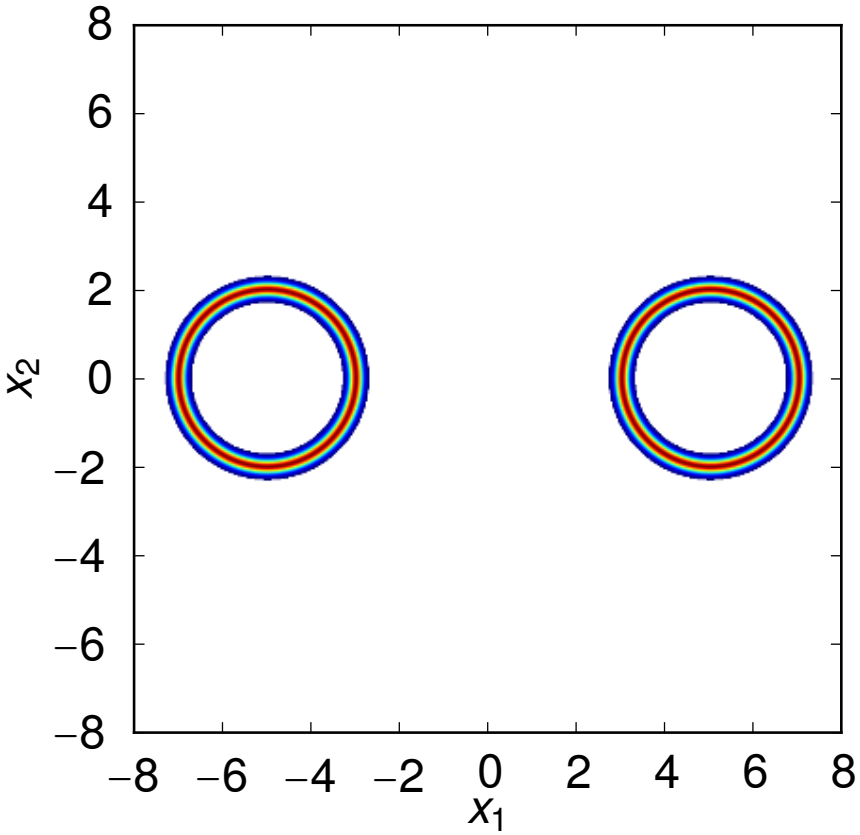


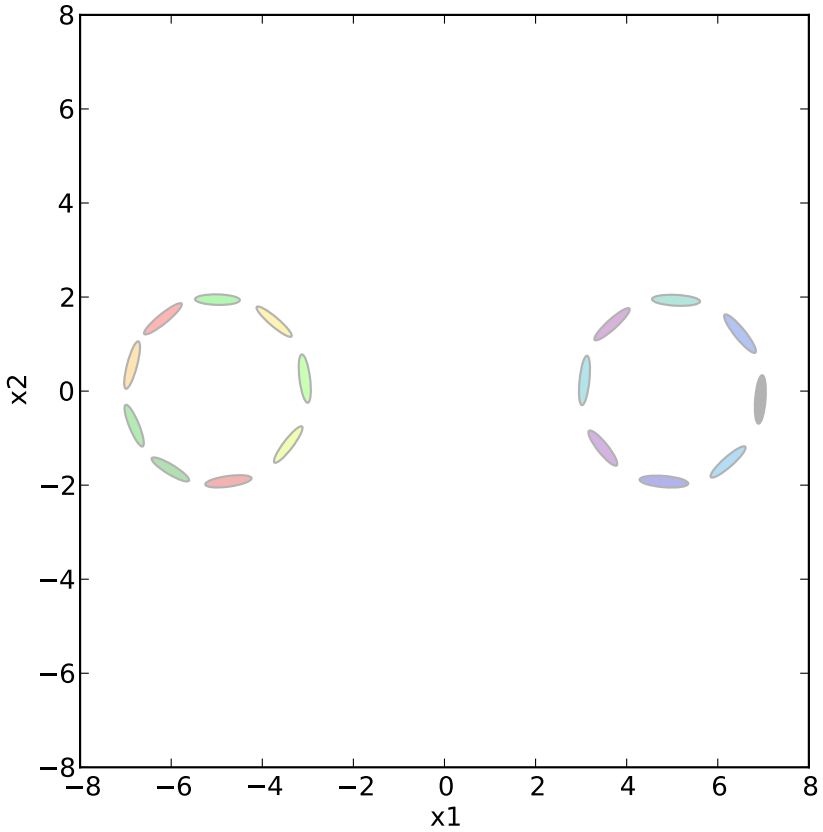
step 1



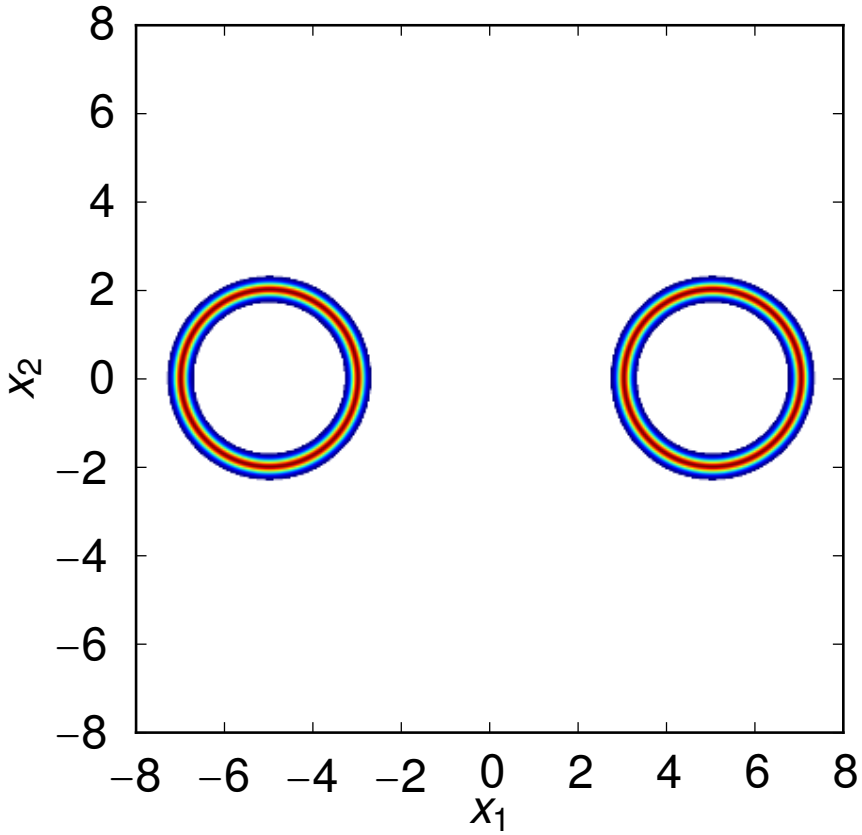


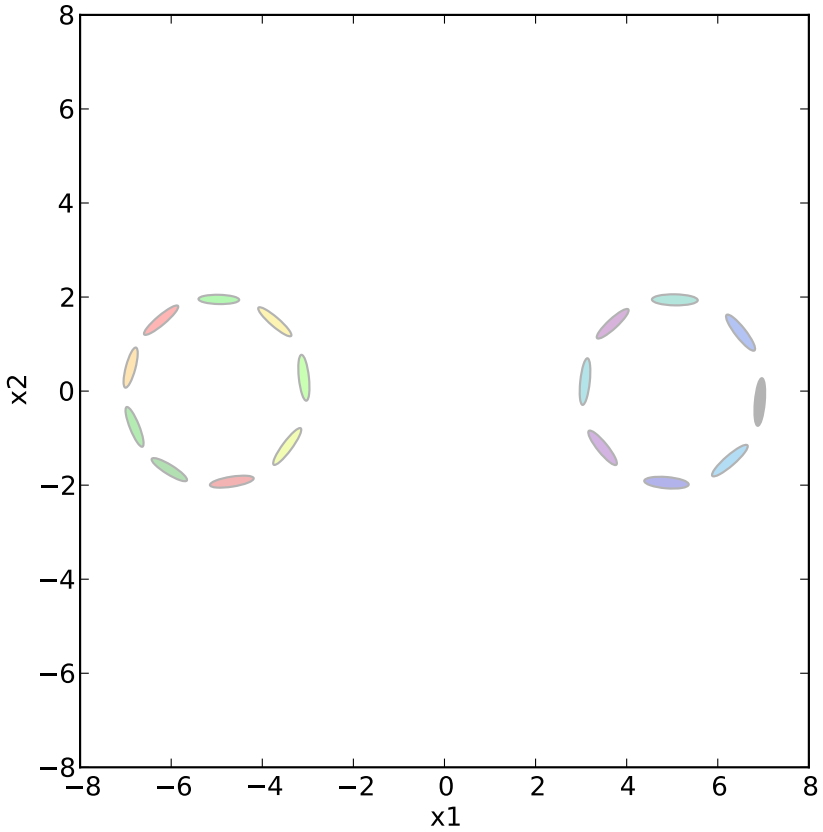
step 2



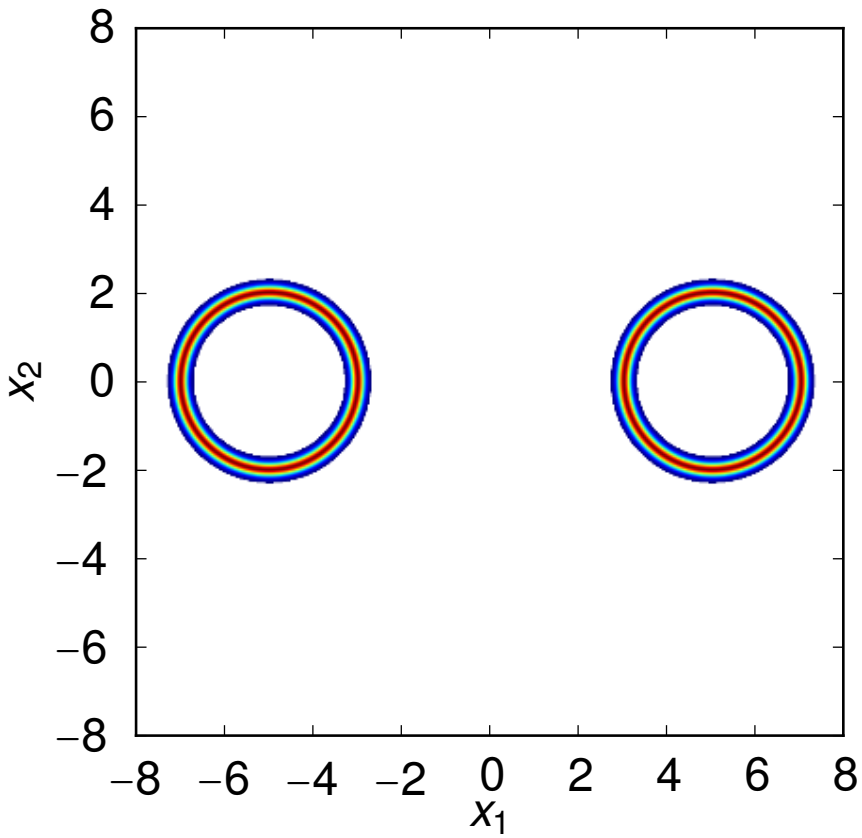


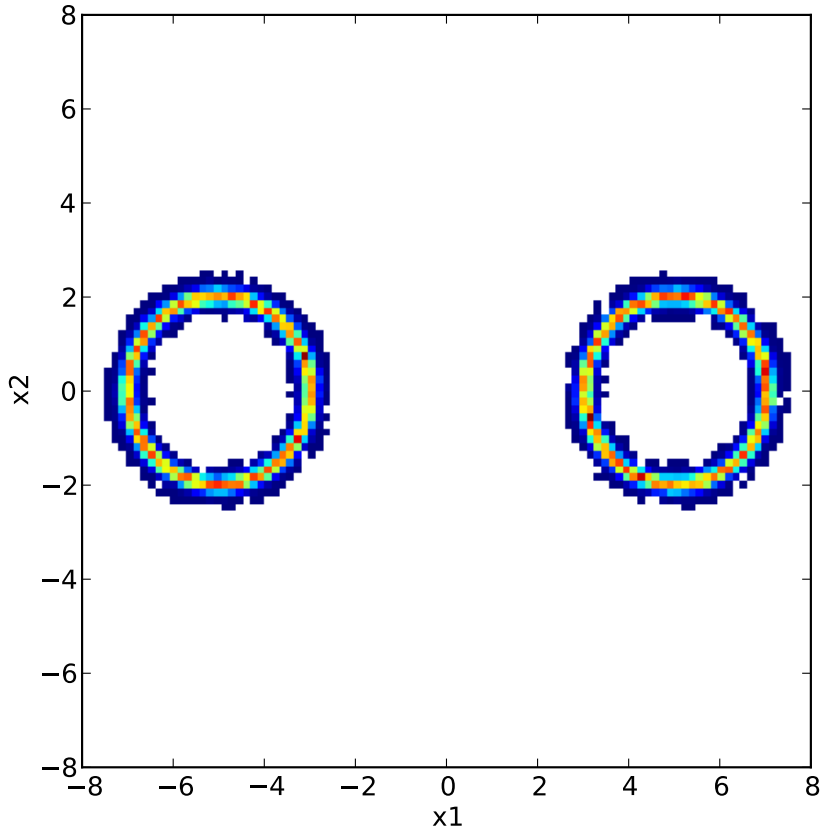
step 3



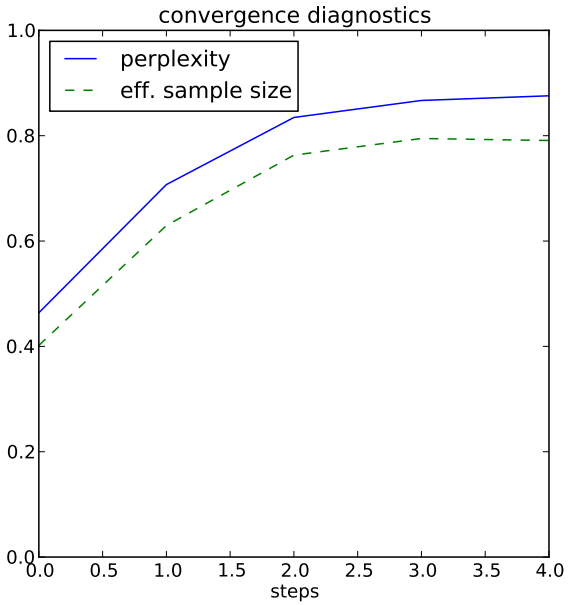


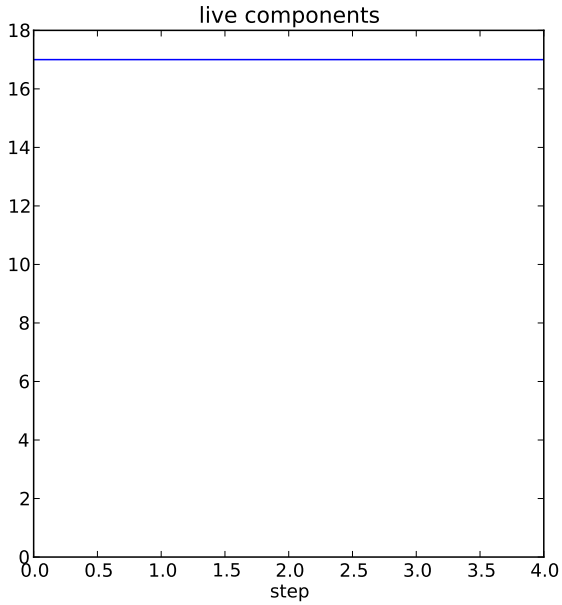
final step

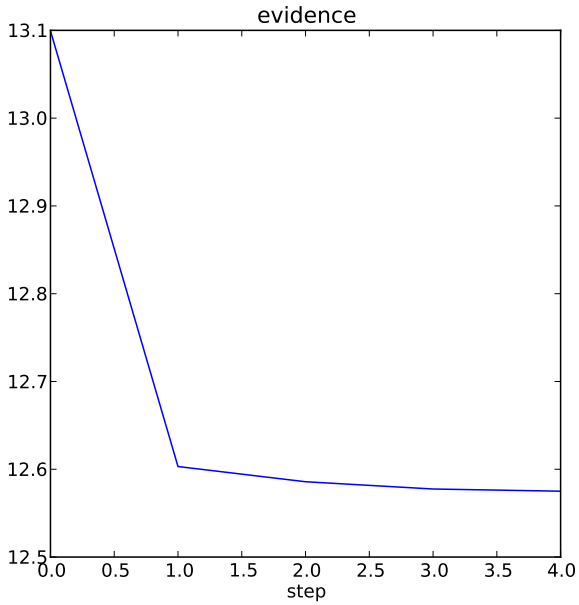




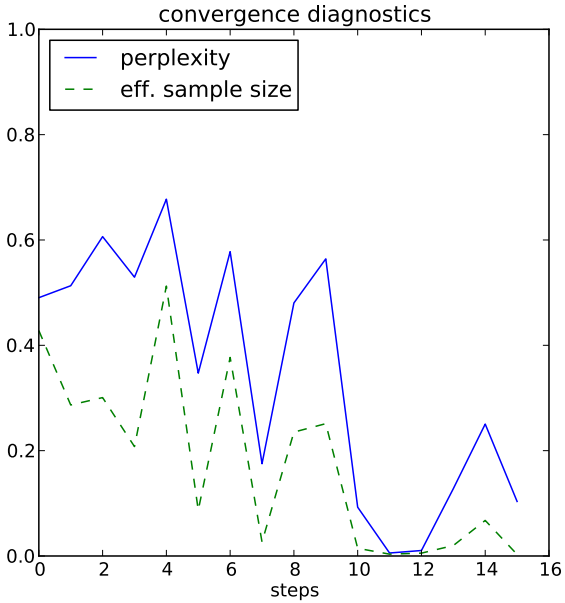
final step, 50k samples

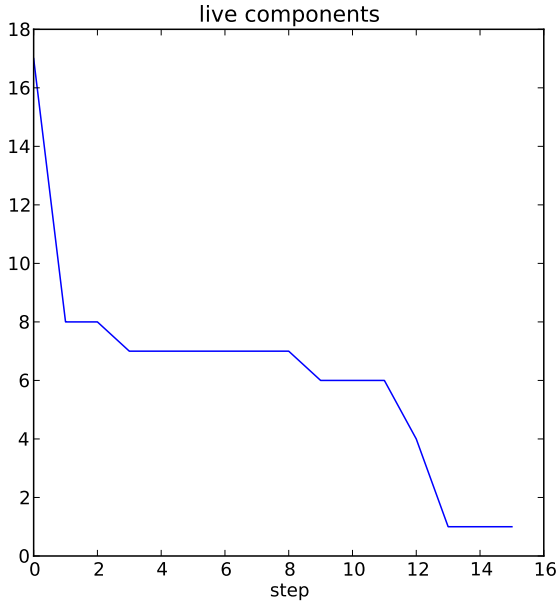


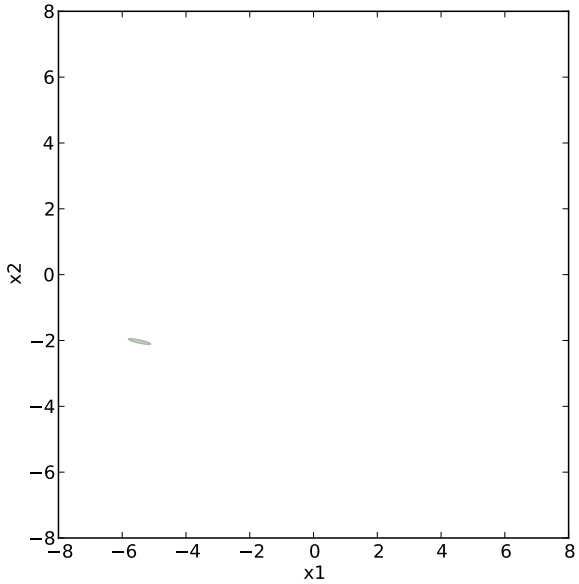




- good convergence and evidence estimate







A failure

```
...
// too few samples
pmc_config.samples_per_component = 20;
...
// doesn't converge
pmc_config.maximum_relative_std_deviation = 0.01;
...
```