Example 28 is an example of why ensemble methods will not always perform better than independent walker multi-start methods. In general, ensemble methods are typically better, but one should not assume they are \*always\* better.

For this example, we will not explain the scientific context of the model, we will simply provide the comparison to demonstrate the above issue.

**EJS with 12 walkers**

runfile\_316\_EJS.py uses an EJS with 12 walkers (which are not totally independent). With 1 million walkers, this takes up to 1 day on a regular desktop computer. The graphs are in the output folder. The graphs, we see that the convergence diagnostics do not show convergence as having occurred, even though the scatter plots show a mode very clearly (and also that the mode is well explored). Note that each walker will have taken on the order of 100,000 steps because of 1 million steps total.

From the histograms and ACT graphs, we see behavior that doesn’t look converged. That is because there are some trapped walkers that never left their original position. This also results in a mu\_AP that is not a good solution.

**MH with multi-start. (independent walkers)**

runfile\_316\_MH\_multistart.py uses a multi-start with 12 separate MH MCMC runs. (independent walkers)

When it finishes, there are some files in the logs\_and\_csvs and the graphs, including :

multistart\_initial\_points\_parameters\_values.csv

multistart\_MAP\_logP\_and\_parameters\_values.csv

mcmc\_logP\_and\_parameter\_samples.csv

The final distributions for the posterior, and the convergence checks, all belong to the run with the highest MAP logP value (meaning, all of the other independent “walkers” info was discarded). We see that by confining to the “best” walker, we see convergence and also nice distributions (although the sampling is somewhat sparse because this MH had a fairly high rejection rate). The mu\_AP and MAP are reasonably close to each other.

Furthermore, when we look at the following two files, we see that most of the separate runs did find the mode. It turns out that in this problem (which is an unusual case), the simple-MH based walkers did not get stuck as easily as the EJS walkers. This serves as a cautionary example that one should not assume EJS will always give the best result.

multistart\_initial\_points\_parameters\_values.csv

multistart\_MAP\_logP\_and\_parameters\_values.csv

**Another, and possibly better way to get around this scenario is for restarting the an ensemble sampling with the walkers directly within the mode.** PEUQSE has a feature to start the walkers directly in the HPD region, and that was done in a subsequent run, for more information see the Example 28 section of ExamplesAndTutorialAndGettingStarted.rtf