GQPMC Report

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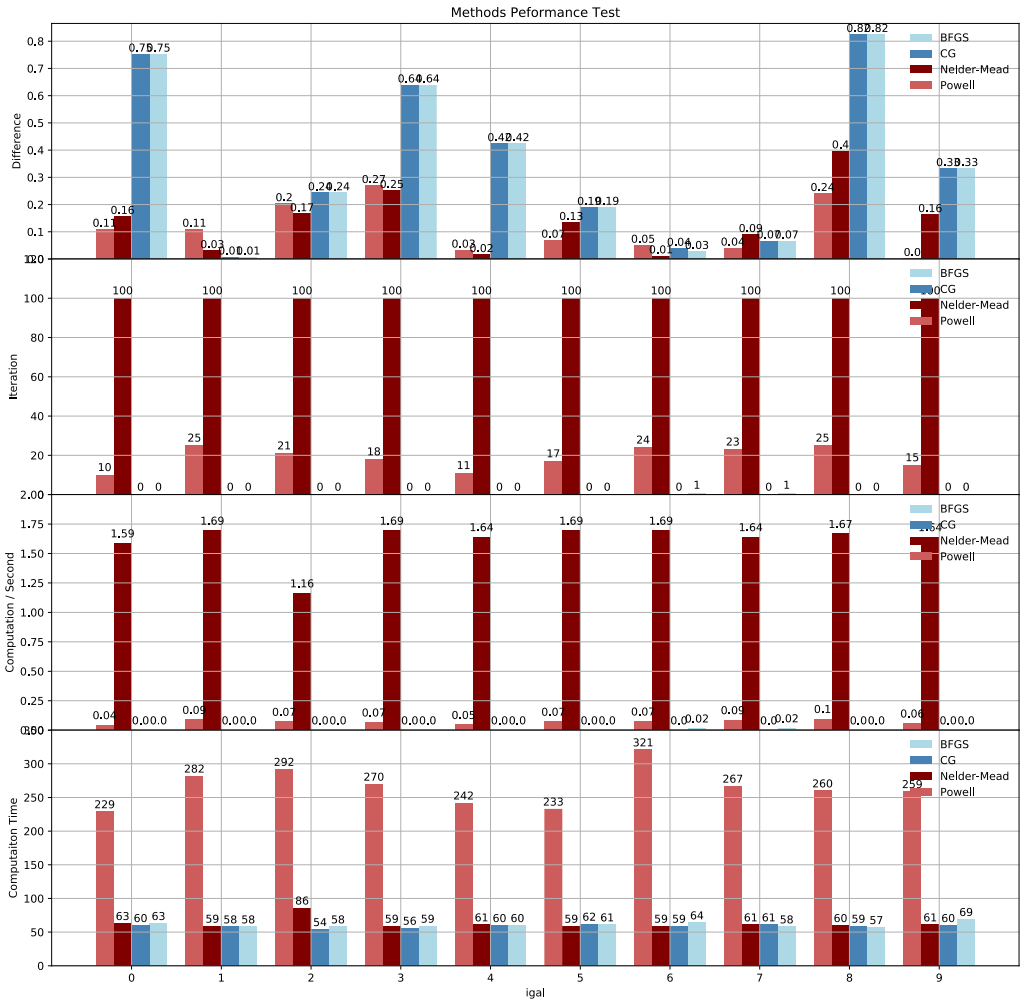
1. **Computational Time / Iteration Number Measurement**

   Comment:

   Bizarrely, SLSQP, L-BFGS-B only works for the igal = 0. Following is the error raised when SLSQP was called during igal = 1 chain. The same error is raised for igal = 2. Rest of the galaxies were not tested for this issue. BFGS, CG, Powell, Nelder-Mead were tested for all galaxies.

```
getting initial theta
Traceback (most recent call last):
  File "/Users/jameskwon/Documents/Research/DESI/gqp_mc/run/mini_mocha.py", line 478, in <module>
    nwalkers=nwalkers, burnin=burnin, niter=niter, overwrite=overwrite, justplot=justplot)
  File "/Users/jameskwon/Documents/Research/DESI/gqp_mc/run/mini_mocha.py", line 439, in MP_fit
    for igal in args: fit_func(igal, **kwargs)
  File "/Users/jameskwon/Documents/Research/DESI/gqp_mc/run/mini_mocha.py", line 365, in fit_spectrophotometry
    silent=False)
  File "/Users/jameskwon/.local/lib/python3.7/site-packages/gqp_mc-0.1-py3.7.egg/gqp_mc/fitters.py", line 248, in MCMC_spectrophoto
  File "/Users/jameskwon/.local/lib/python3.7/site-packages/gqp_mc-0.1-py3.7.egg/gqp_mc/fitters.py", line 581, in _emcee2
  File "/opt/anaconda3/envs/gqp/lib/python3.7/site-packages/scipy/optimize/_minimize.py", line 608, in minimize
    constraints, callback=callback, **options)
  File "/opt/anaconda3/envs/gqp/lib/python3.7/site-packages/scipy/optimize/slsqp.py", line 399, in _minimize_slsqp
    fx = func(x)
  File "/opt/anaconda3/envs/gqp/lib/python3.7/site-packages/scipy/optimize/optimize.py", line 326, in function_wrapper
    return function(*(wrapper_args + args))
  File "/Users/jameskwon/.local/lib/python3.7/site-packages/gqp_mc-0.1-py3.7.egg/gqp_mc/fitters.py", line 565, in <lambda>
  File "/Users/jameskwon/.local/lib/python3.7/site-packages/gqp_mc-0.1-py3.7.egg/gqp_mc/fitters.py", line 729, in _lnPost_spectrophoto
  File "/Users/jameskwon/.local/lib/python3.7/site-packages/gqp_mc-0.1-py3.7.egg/gqp_mc/fitters.py", line 768, in _Chi2
  File "/Users/jameskwon/.local/lib/python3.7/site-packages/gqp_mc-0.1-py3.7.egg/gqp_mc/fitters.py", line 86, in model
ValueError: setting an array element with a sequence.
(gqp) Jamess-MacBook-Pro:run jameskwon$
```

   The plot of the result is attached, and summary of the result provided in the next page:



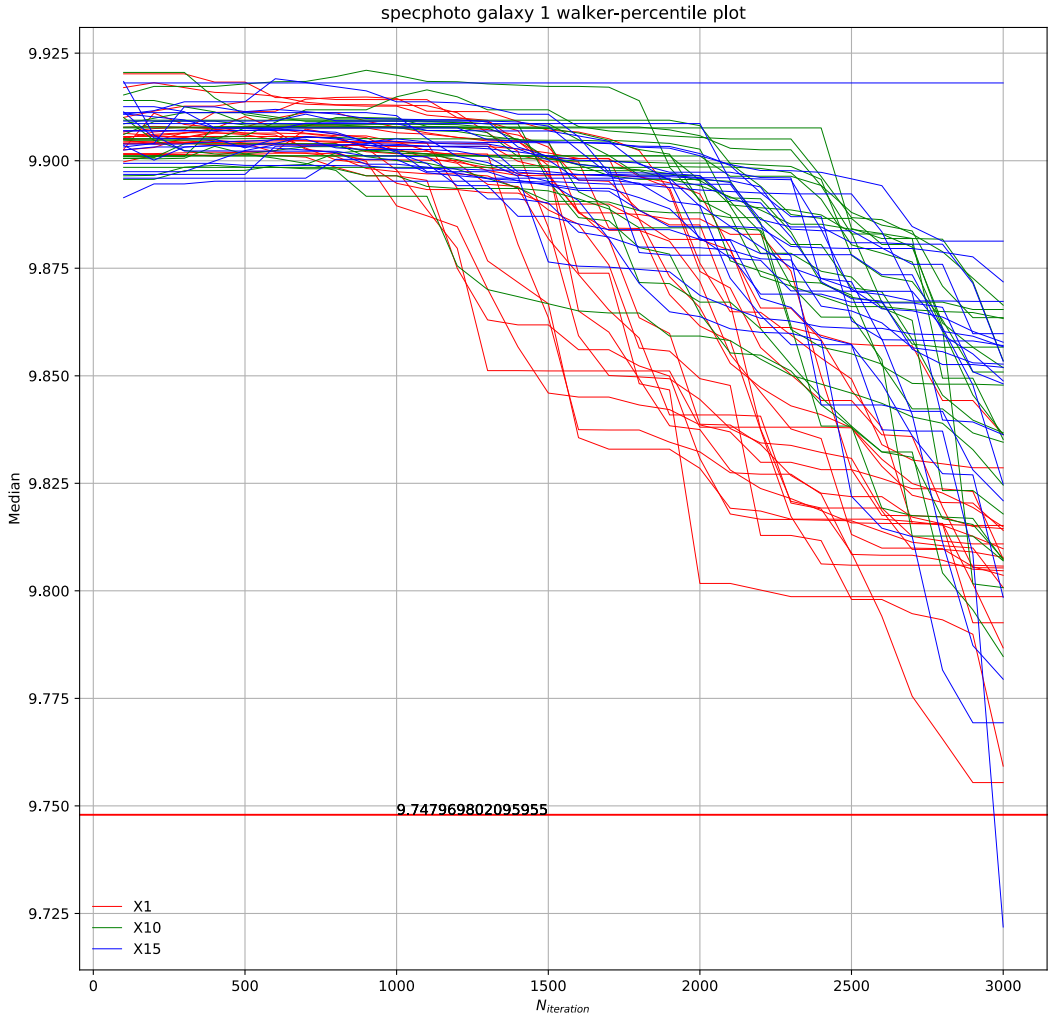
Summary:

a) The accuracy of the optimization varied for galaxies.

b) BFGS and CG optimization had 0 or 1 iteration for all galaxies, which might explain its discrepancy between the walkers' initial positions and the truths; optimization did not initiate at all. There was no error raised, and the reason why they had no iteration is still unclear. But given that Nelder-Mead (NM) and Powell methods perform pretty well, it seems having those two working is good enough for now.

c) It is hard to tell which of Powell and NM is better in terms of optimization accuracy, but the computation time required for NM for all galaxies were much shorter than that of Powell. In addition, we see that NM reached the max iteration number (100) for all galaxies and still required shorter amount of computation time compared to Powell. I propose to increase the max iteration number and compare the performance between Powell and NM.

2. Scattering Magnitude Test (SMT); incomplete



Summary:

a) The scattering magnitude plot in the previous report shows the chains were initiated at median ~10.4 and ~9.9 this plot.
b) Increased accuracy in the initiating position seems to lessen the importance of the scattering magnitude as the three scattering magnitudes plotted above do not significantly differ from each other.
c) Regardless, more galaxies are being tested and it's taking bit of a time.