MAXED Neutron Spectrum Unfolding

Introduction to MAXED

- what is dual annealing

- How is MAXED different

- What inputs does MAXED need

- How does MAXED measure the quality of its output

MAXED successes from literature

My MAXED results

- Real world detector response from LLNL

- Real world detector response from AWE

Quality of results

- The statistic measure that MAXED uses χ^2

- Comparing the output detector response and the output spectrum

Previously described: what neutron spectrum unfolding is

What I need to do:

✓ Find LLNL real world detector response

✓ Determine the source used to get that DR

1. Get detector response matrices for the following three sources:

    ✓ Plane source
    • **On hold** Point source
    ✓ Surrounding source

    I'm going to make a new script that will scrape the appropriate MCNP output files to get the detector response matrix for each example. It will be in it's own folder in my local repo and will save each DRM as its own .csv file. There will be **two** versions of each DRM. One in which the TLDs are depth averaged and the other in which they are not.

✓ Determine what the error is for the TLDs that are modeled (it will be called something like counting error). The error is saved in a separate matrix file. My code will need to sum up the error appropriately.

✓ Make a script that takes all of the IAEA spectra and interpolates them to the 84 energy bin structure. Save this as a .csv

2. Run MAXED with the following examples:

    ✓ CASE 1: LLNL detector response, depth-averaged DRM for planar source, guess spectrum at exact reported value of IAEA.
    • (ON HOLD UNTIL I GET POINT SOURCE DRM) LLNL detector response, depth-averaged DRM for point source, guess spectrum at exact reported value of IAEA.
    ✓ CASE 2: LLNL detector response, depth-averaged DRM for surrounding source, guess spectrum at exact reported value of IAEA.
    ✓ CASE 3: LLNL detector response, depth-averaged DRM for planar source, guess spectrum at 90% reported value of IAEA.

- (ON HOLD UNTIL I GET POINT SOURCE DRM) LLNL detector response, depth-averaged DRM for point source, guess spectrum at 90% reported value of IAEA.
- ✓ CASE 4: LLNL detector response, depth-averaged DRM for surrounding source, guess spectrum at 90% reported value of IAEA. **The Planar Source, Depth Averaged DRM is the best one, although they all are very good.**
- ✓ CASE 5: LLNL detector response, best DRM, guess spectrum at 50% reported value from IAEA
- ✓ CASE 6: LLNL detector response, best DRM, D2O moderated Cf Spectrum at 100% reported value from IAEA
- ✓ CASE 7: LLNL detector response, best DRM, H2O moderated PuBe at 100% reported value from IAEA
- ✓ LLNL detector response, random DRM, correct spectrum at 100% reported value from IAEA

✓ Make a nice script that will generate pretty graphs for everything I need for this description of MAXED.
Details for this script

- Points to folder that contains all three DRMs (plane source, point source, surrounding source)
- Points to folder containing the IAEA spectra (these spectra have already been interpolated to the 84 energy bins.
- Points to folder containing the LLNL detector response
- Runs each MAXED example described above.
- Makes the pretty graphs for each.