(1) Instructions on how to run SEDEX.

(1) Create a Gaia account, and change the username and password in the routine access_crossmatch_from_Gaia at Gaia.login(user='username', password='password')
(2) Prepare a list of targets in the file, "UserInputData.csv" with these columns: starID, teff, tefferr, logg, loggerr, feh, feherr, Av, Averr. Note that the starID has to be Gaia DR3 source_id. Av, Averr can be NaN. Place this file in Data/Input_Fits/TOIs/. The sample name, TOIs, can be changed in the file inlist.py.
(3) Configure the inlist file, inlist.py. Suggest to use default values.
(4) Run submit.sh, if the single star mode is set, or run submit_slurm for HPC, if the batch mode is set.
(5) Derived parameters are damped into this filet:
Data/Output_Fits/TOIs/SEDFits/MARCS/Output_SED_Fits_Final.csv
The figures of the Blackbody fitting and SED fitting are stored at /Figures/TOIs/.

(2) Below are the functions of some key routines.

4_BlackBodyFit.py

Some general remarks.

This script is used to exclude outlier photometry by comparing observed and predicted flux densites.
The latter is derived by fitting blackbody to the observed SED. Note that in this circumstance, extinction can be simply set to zero, because it would not affect rejecting photometric outliers. Effective temperature and the scaling factor optimized from this fitting are of course biased accordingly.

The steps of this script is as follows:

(1) load input photometry and convert magnitudes to fluxes.
(2) exclude invalid data points by fitting a Planck function.
(3) determine Av. This can be done through a blackbody fitting, use pre-known values, or set to be 0.
(4) with Av determined above, optimize Teff
(5) save predicted flux densities to files, and save figures.

6_SedFit.py

Part 1. Without interpolation of MARCS models

(1) load photometry for a given target star
(2) select closest MARCS model(s) using input Teff and logg.
(3) Find the best-fitting model from preselected models given input photometry.
(4) reject outlier photometry by iteratively performing SED fitting and looking for any photometric measurement that is too different (a threshold is pre-defined by user) from model prediction.
(5) extrapolate the best-fitting MARCS model spectrum in the wavelength range [20, 30] micron.
(6) save the best SED-fitting parameters, and predicted and deextincted observed fluxes.

Part 2. Interpolating of MARCS models.

(1) select four closest logg models and 4 teff models, leading to 16 points in the teff-logg space.
(2) interpolate model fluxes to a grid of Teff and logg
(3) optimize Av and scaling factor for each node of the grid.
(4) find the best fitting model out of all the interpolated and original models.

Note.

1. The red square, blue diamond, and green asterisk indicate input parameters, best-fitting model parameters without interpolation, and best-fitting model parameters with interpolation, respectively.
2. Marcs spectra have wavelength in units of Å, and fluxes in units of erg/cm^2/s/Å. But the SED fitting code has manually changed wavelength in units of micron, but keep flux units untouched.