Binary Fitting with CANDID
Practical session

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1 Binary search

We are going to use `CANDID` to search for the most probable location of a companion, if any. For this, `CANDID` will fit a binary model for each point of a specific grid.
One of the dataset you are going to use are CHARA/MIRC observations of the binary Cepheid V1334 Cyg. The primary component is a Cepheid star with a pulsation period of 3.33 days and an average angular diameter of ~ 0.5 mas. The secondary component is a hot main-sequence star (angular diameter not resolved), with an orbital period of 1939 days and an orbital separation < 20 mas.

1. Open the `CANDID` GUI (by writing "GUIcandid" in a terminal, if in the PATH)
2. Load an oifits file[1] and check the outputs (baselines, wavelength,...)
3. Enter the parameter for the grid search according to the dataset
4. Select the observable and the first guess parameters
5. Start the grid search
6. Check the output and go back to item 3 if necessary.

`CANDID` also has implemented the possibility of analytically removing a detected companion in order to search for a second (fainter) component. For this, check the corresponding box in the GUI and restart the previous steps. You should not see detections $> 3\sigma$.

[1]Several oifits files can be loaded by loading a directory, however, it has to be with the same instrument and same wavelength table.

2 Final astrometric parameters and uncertainties

To assess the final parameters and uncertainties, `CANDID` has implemented a bootstrap function (with replacement), with by default 1 000 bootstrap samples. From the final distributions, the median value, the 16 % and 84 % percentiles are calculated.
The bootstrap can be done on the MJD (default, if enough data) or/and the baselines. A Monte Carlo analysis (MC) is also possible, where all data are considered but with random errors added (each data point is randomly distributed around its corresponding error given in the oifits file).

1. In the bootstrap panel, select the parameters to be used for bootstrapping (should be the same as for the grid search)
2. Run the bootstrap and check the final parameters

3 Detection limits

To check the dynamic range that can be reached with a given set of data and any interferometric combiner, `CANDID` has implemented two methods. The injection (Gallenne) method is more robust with biased dataset. If you previously detected a companion, it is important to remove it from the data otherwise the contrast limit will be biased.

1. Select the σ threshold you want, i.e. $3\sigma, 5\sigma$, ...
2. Choose the observables and set the limits of the map (step, ...)
3. if necessary, check the box "remove Comp." and run the map.