Starshade Data Challenge: Status Update & Strategy Description From Team Tanner

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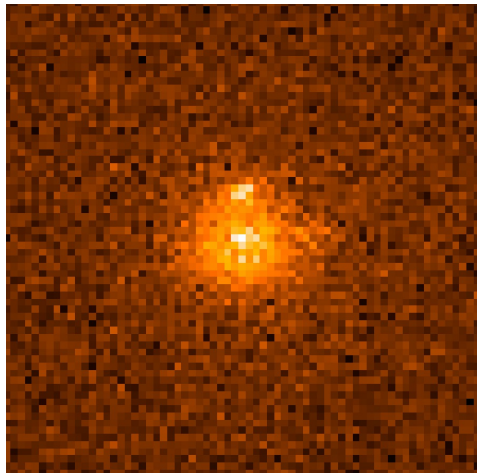
Presented on behalf of the team.

Status Report

We are currently working on Data Release 1, with an emphasis on (1) disk modeling and subtraction, (2) evaluation of post-subtraction planet sensitivities, and (3) measuring impact of data parameters on planet detection sensitivities.

<u>Guiding Data Characteristic</u>: The Release 1 data shows exozodiacal light as the dominant factor in exoplanet detection sensitivities.



Data Analysis Strategy

For subtracting the exozodiacal disk, we use a Monte Carlo "brute force" approach that compares a library of simulated disks with the exozodiacal signal.

Our planet detection sensitivity is based on the residual background signal after disk subtraction.

We repeat with each simulated science image, and investigate the impact of data parameters (e.g. signal-to-noise, jitter, disk geometry) on planet detection and planet photometry.

Disk Modeling

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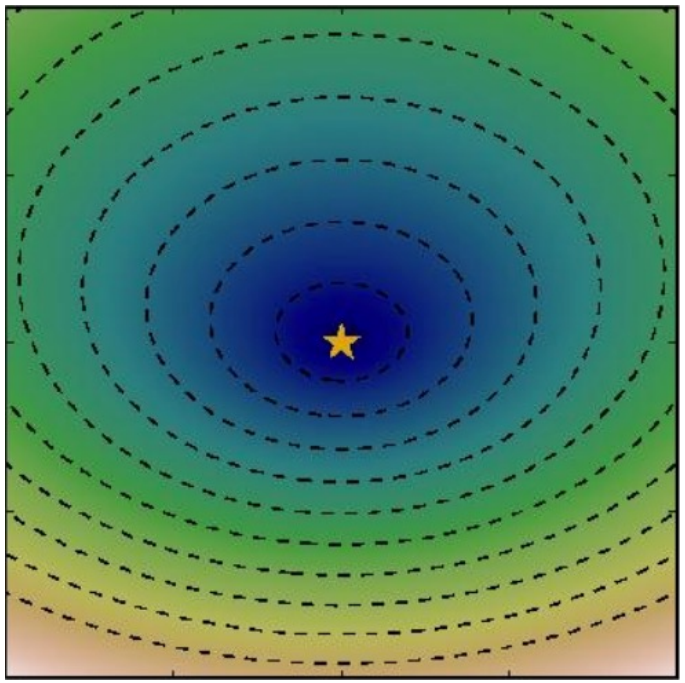
As part of the Monte Carlo “brute force” approach, a library of disk properties are near-randomly generated and the optimal match is determined.

Our current disk modeling approach assumes minimal a-priori assumptions.



Evaluating Planet Detection Sensitivities

The planet detection sensitivity floor is based on the residual background of the post-subtraction image, after it has been convolved with a PSF.

The statistical distribution of the residual background signal is evaluated during this analysis.

We are investigating planet photometry bias and flux correction as a function of data parameters.

Additional Needed Work & Lingering Questions

All aforementioned work is still in progress.

Does the simulated data provide an adequately diverse representation of disk/planet properties? We desire additional inserted fake planets, to evaluate planet signal loss as a function of position, signal-to-noise and other parameters.

We intend to expand our disk modeling work to integrate more a-priori information. Opportunities exist to vary our Monte Carlo disk fitting approach (e.g. Markov Chain, Bayesian, machine learning).

Efforts to mitigate glint, stray light, and other sources of signal interference have yet to be significantly investigated by our team.

We have yet to investigate beyond Data Release 1.

Please give us feedback on what you want from our work.