

Fast Fourier Optimization in Designing Telescope Masks

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Motivation: The Search for Life Beyond Earth

- We are looking for extra-solar planets in the habitable zones of their respective stars.
- The challenge:
 - ▶ Overcoming the diffraction limit in order to distinguish between a planet and its star.
- Solutions:
 - ▶ Innovations in adaptive optics
 - ▶ New techniques in high contrast imaging

Utilizing Methods in High Contrast Imaging

- One technique involves designing telescope masks to allow increased resolution
- These masks block specific sections of light from entering the telescope
- By strategically choosing where to block light the contrast between two different objects, such as a star and one of its planets, can be increased

Utilizing Methods in High Contrast Imaging

- These masks can be modeled using Fourier Transformations
- Problem: Fourier Transforms can be extremely expensive computationally
- Solution: Increasing the complexity of the model in order to reduce computational complexity
- Better Solution: Fast Fourier Optimization

My Project

- Exploring some of the models that Dr. Vanderbei has created
- Designing masks of my own for a telescope soon to be decided upon
- Delving into the world of linear programming and optimization

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