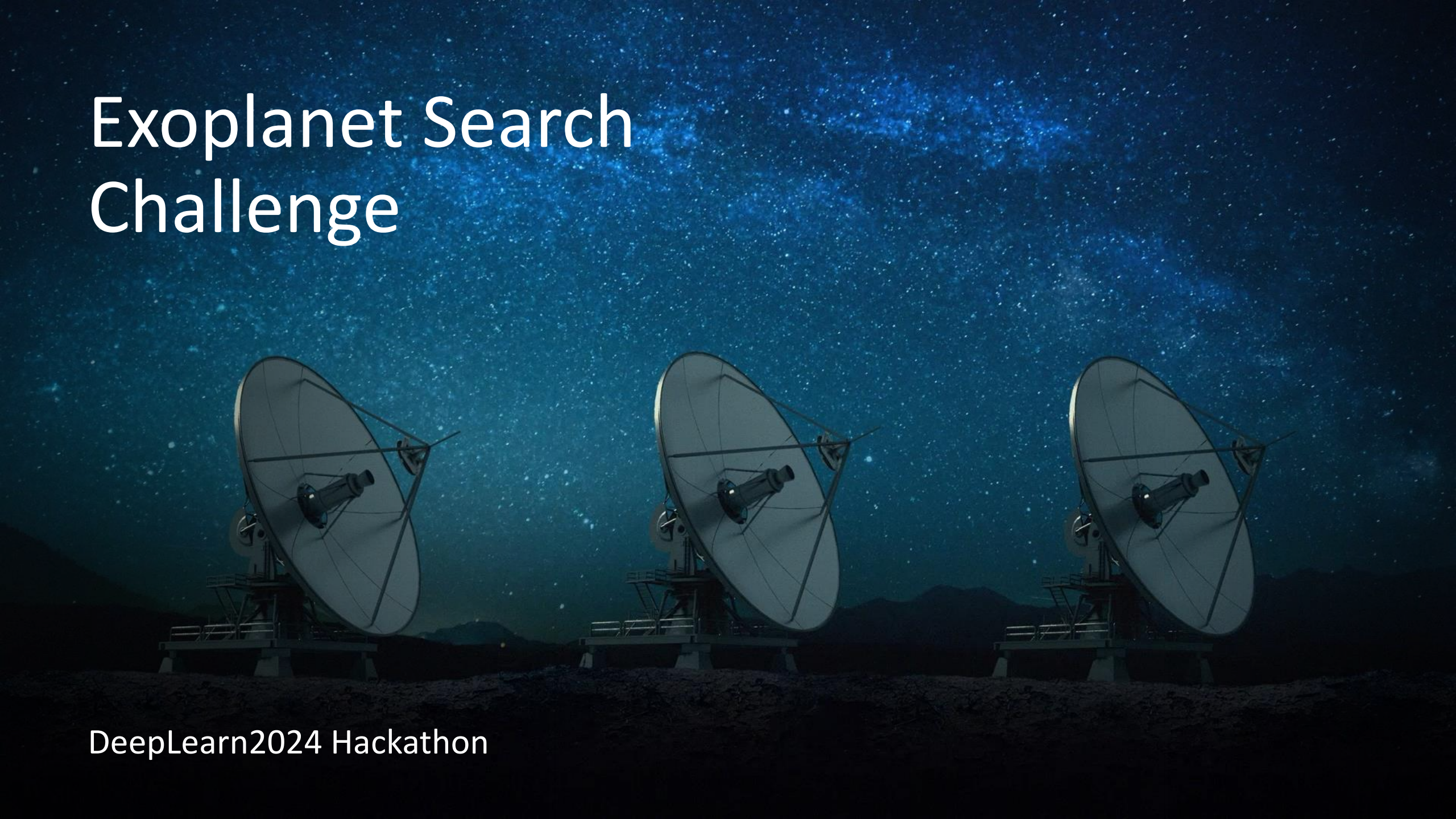
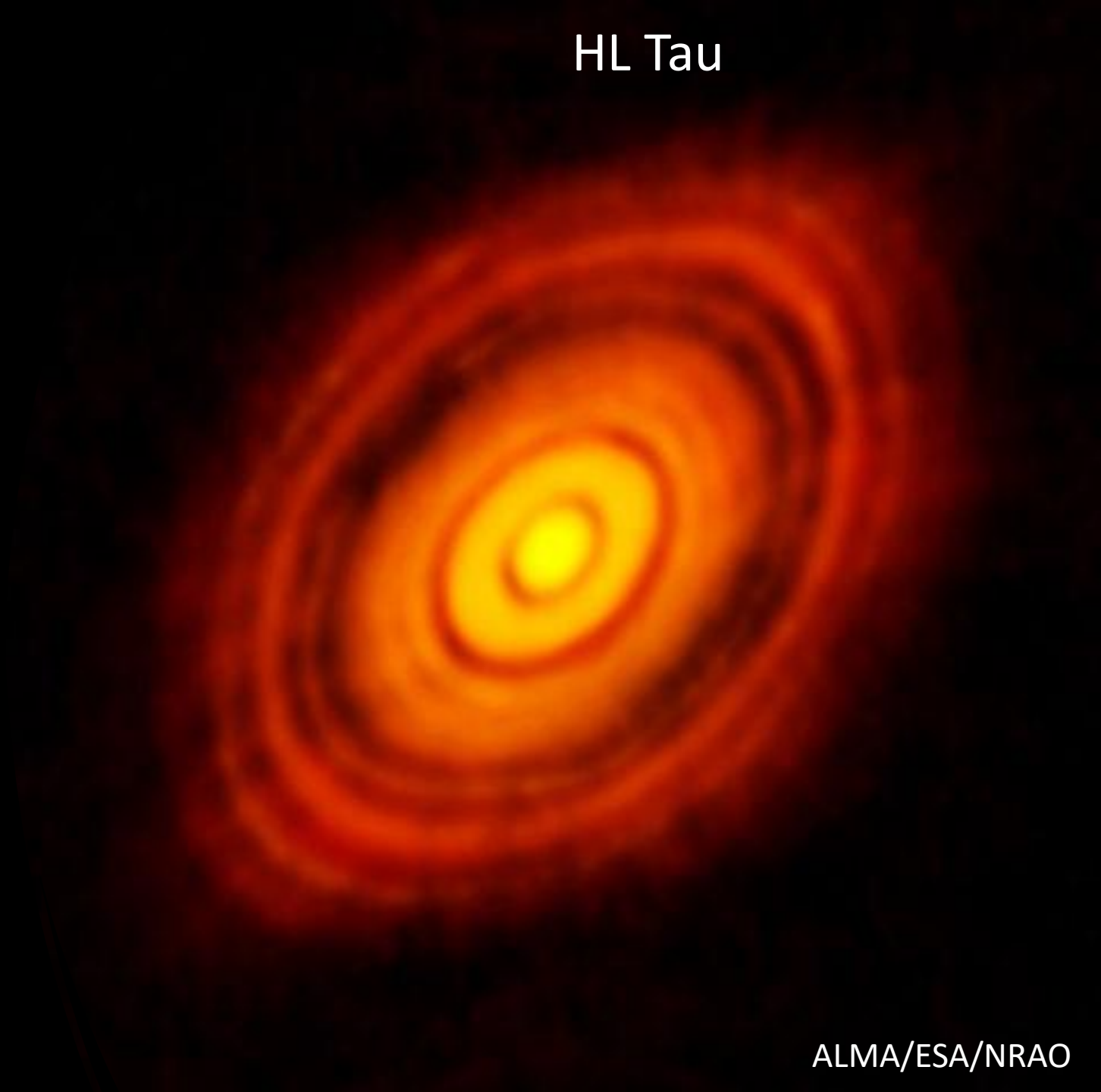
Exoplanet Search Challenge

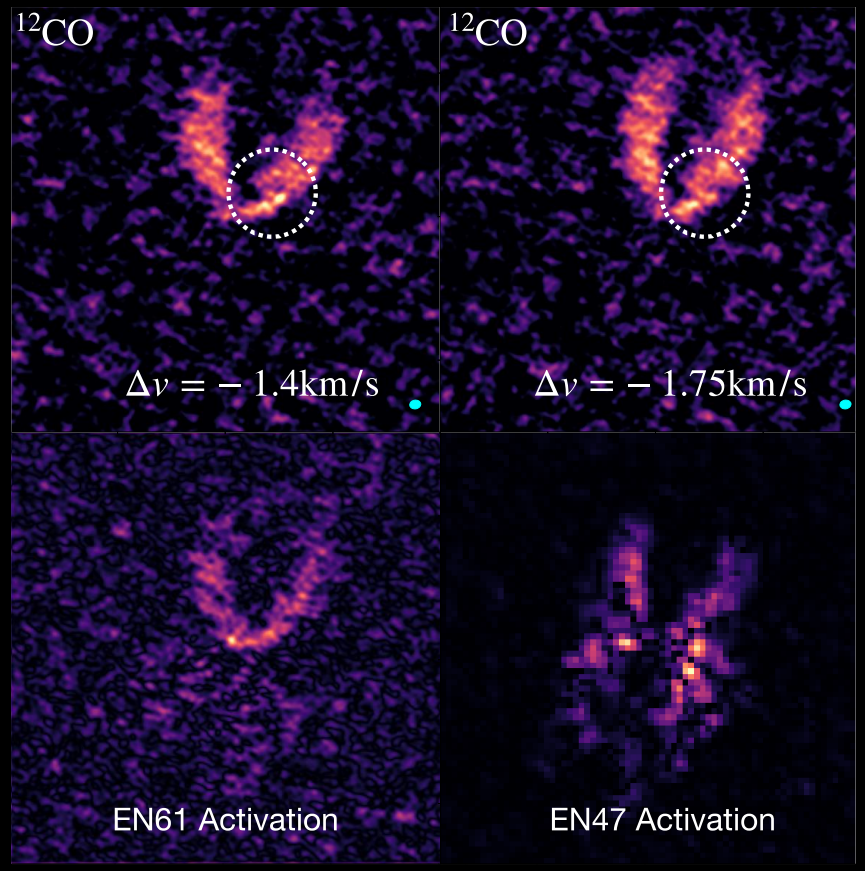


DeepLearn2024 Hackathon

Exoplanet Search Challenge

- Planets form in protoplanetary disks
- Identifying planets in disks informs planet formation theory
- New observatories gather data of unprecedented quality
- Machine learning can help find planets in observations
- Task: classify disks as planet(s) vs. no planets using synthetic observations



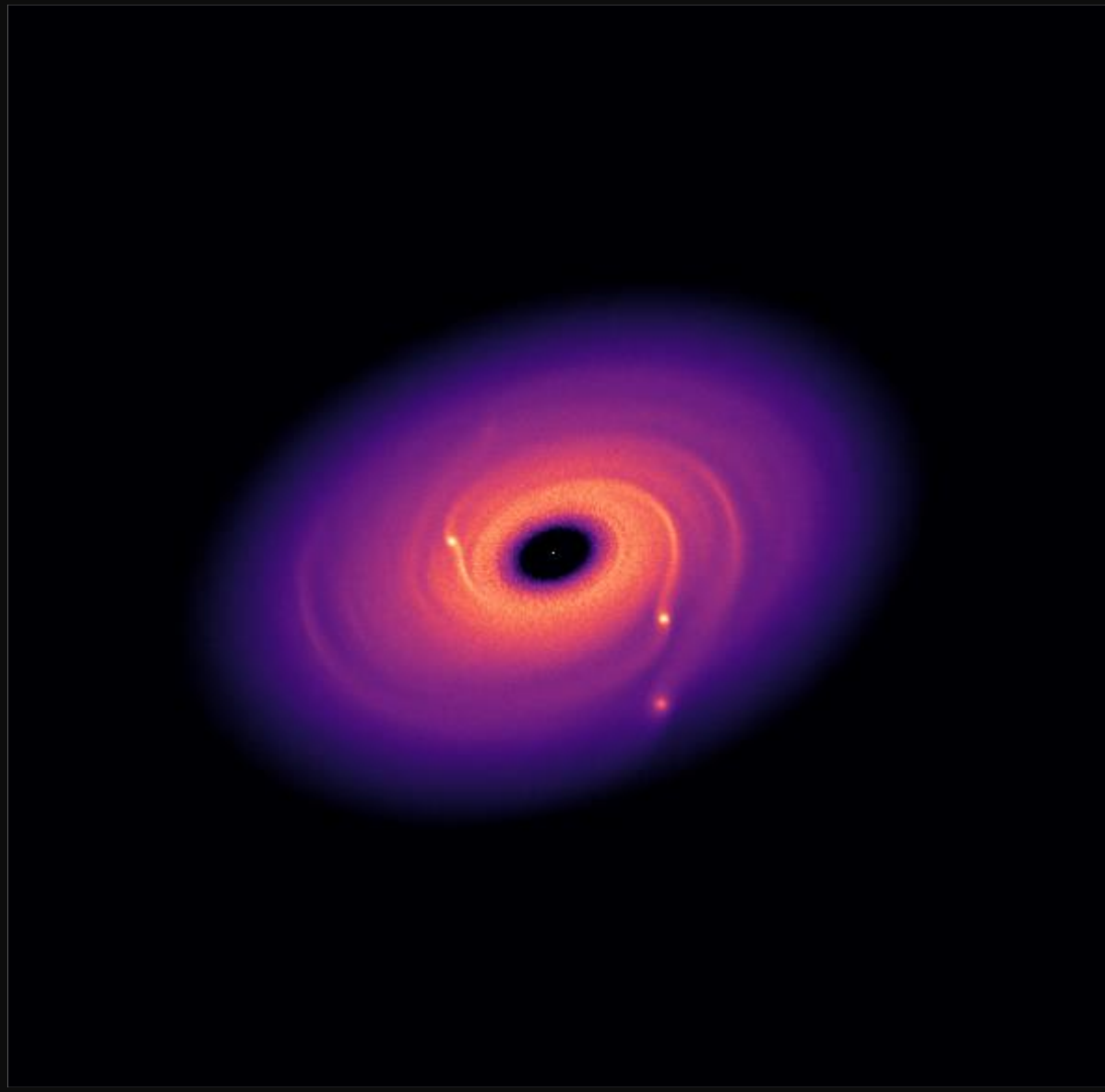


Machine Learning and Protoplanetary Disks

- Train with synthetic observations of protoplanetary disks
- Generated using hydrodynamics simulations
- Terry et al. (2022, 2023) trained models that identified a planet in the disk HD 142666

Data

- 1250 μm synthetic observations
- .fits files
- Same simulations as Terry et al. (2022)
- Simulations have between 0 - 4 planets



Disk with 4 planets

Task

- Use synthetic observations to classify disks as having at least one planets vs. no planets
- 861 training simulations
- Withheld 114 test simulations
- 5 ALMA observations

Metrics

- AUC on 20% of provided training data
  - 5 points
- AUC on withheld test set
  - 10 points
- Accuracy with ALMA observations
  - 5 points

Deliverables

- Jupyter Notebook on Google Colab
- PDF of same
- Trained model in easily accessible format (e.g., .pyt, etc.)
- Notebook should be able to run with minimal modification