# ZHANPEI FANG

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**interests**

Novel computational approaches for analyzing large space- and earth-observation datasets.

**education**

Ph.D., dual major in Artificial Intelligence & Geography, Oregon State University. 2022–
Co-advised by Profs Jamon Van Den Hoek (Conflict Ecology group in Geography) and Fuxin Li (Deep Machine Vision group in EECS).

M.S. Applied and Engineering Physics, Stanford University. 2019-2020

B.S. Physics, B.A. Art Practice, Stanford University. 2015-2019
Concentration in astrophysics.

**research**

Conflict Ecology & Deep Machine Vision, Oregon State University, Corvallis, OR. 9/2022–
Funded as a Provost's Distinguished Fellow for the first year of the Ph.D. Currently funded on a NASA Land Cover & Land Use Change Program grant for "Multi-sensor Mapping of Refugee Agricultural LCLUC Hotspots in Uganda", developing deep-learning approaches to smallholder agricultural field segmentation in multispectral satellite imagery of global-South humanitarian contexts.

Junior Machine Learning Scientist, Orbital Sidekick, San Francisco, CA. 1–9/2022
Conducted research for problems in hyperspectral remote sensing, particularly algorithm development for target detection, and exploring the potential for automated mapping of methane plumes with future spaceborne imaging spectrometers.

Applied Science Intern, Descartes Labs, Santa Fe, NM. 6–8/2019
Built supervised random-forest-regression model trained on Sentinel-2 multispectral satellite imagery, derived vegetation indices, & digital elevation model to predict changes in percent tree canopy cover at 20m resolution across the continental US.

Kavli Institute for Particle Astrophysics & Cosmology, Stanford, CA. 4/2018–3/2020
As a student researcher, worked in Prof Risa Wechsler's GFC group to test predictions of abundance and clustering properties of dark matter halos given by the UniverseMachine simulation. Worked with Prof Daniel Holz to infer host galaxy properties of merging compact binaries detectable by LIGO; paper published in *ApJ* [1].

Caltech LIGO Laboratory, Pasadena, CA. 6–8/2017
As an undergraduate SURF Fellow working with Dr Rory Smith, quantified computational costs of a gravitational-wave search algorithm that replaces matched filtering with Bayesian hypothesis testing.

Carnegie Institution Department of Global Ecology, Stanford, CA. 7/2016–6/2017
Working with Profs Chris Field & Katharine Mach, analyzed passive-microwave satellite imagery to quantify effects of changing sea ice cover upon the vulnerability of an Alaskan indigenous village. Presented at Stanford's Symposia of Undergraduate Research and Public Service (SURPS) & published as first author in *Arctic Science* [2].

**TAship**

GEOG 451/551, Planning Principles & Practices for Resilient Communities. 9–12/2024
GEOG 464/564, Geospatial Perspectives on Intelligence, Security and Ethics. 4–6/2024
GEOG 481/581, Satellite Image Analysis. 1–3/2024

**other teaching**

Mentor, Prison Mathematics Project. 3/2024–
Correspondence-based volunteer mentorship of incarcerated people self-studying mathematics.

Mentor, CEOAS GUIDE, Oregon State University, Corvallis, OR. 1–4/2023
Mentorship of undergraduate students in OSU's College of Earth, Ocean, and Atmospheric Sciences.

Physics and Calculus Tutor, University Tutoring, Seattle, WA. 8–12/2021
Privately tutored high-school students in primarily calculus, physics and chemistry, both remotely & in-person. Created study plans for & tutored students preparing for the SAT/ACT exams.

Teaching Assistant, Summer Science Program, online. 6–7/2020, 6–7/2021

Taught celestial mechanics, astronomy, & calculus to 36 high-school students in a 5.5-week intensive astrophysics research program (typically residential, converted to Zoom for 2020 & 2021). Graded problem sets, helped write & debug Python code for asteroid orbit determination, and acted as a mentor while ensuring student well-being. Continue to provide service to the program through yearly mentorship of younger alumni and serving on the admissions committee.

## honors

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| Gordon Matzke Scholarship | 2024 |
| Warren W. Denner Memorial Graduate Fellowship | 2024 |
| Evans Family Graduate Fellowship in Humanitarian Engineering | 2023–24 |
| Arthur Parenzin Memorial Graduate Research Fellowship | 2023 |
| Oregon State University Provost's Distinguished Graduate Fellowship | 2022–23 |
| Gage Academy of Art BIPOC Scholarship | 2020 |
| Barbara & Sandy Dornbusch Award in Painting | 2019 |
| Caltech LIGO Summer Undergraduate Research Fellowship (SURF) | 2017 |
| Stanford Earth Summer Undergraduate Research (SESUR) Program Grant | 2016 |
| Edmund Maxwell Foundation Scholarship | 2015–19 |
| Northshore Council PTSA Scholarship | 2015 |
| National Merit Scholarship | 2015 |

## skills

selected graduate coursework: machine learning, artificial intelligence, deep learning, advanced computer vision, convex optimization, differential geometry, topological data analysis, general relativity, cosmology, gravitational radiation, quantum materials, AMO physics, biophysics, computational materials modeling, GIS, satellite image analysis.

coding: Python, Mathematica, Linux/Unix, Bash shell scripting, Git, LaTeX.

data analytics: Python for data science (`numpy`, `scipy`, `pandas`, `sklearn`, `pytorch`, `torchvision`, `opencv`, `pillow`); data visualization (`matplotlib`, `seaborn`, `jupyter`, `tensorboard`). Familiarity with detection & estimation theory and high-performance scientific computing.

domain expertise: expertise in scientific image & signal processing, particularly for astrophysical and Earth observation (`rasterio`, `xarray`) datasets. Strong knowledge of remote sensing science including sensor design & calibration, radiative transfer modeling and data processing pipelines; algorithms for common tasks such as anomaly/target detection, endmember extraction, change detection, classification & regression, instance & semantic segmentation across diverse sensing modalities. Geospatial tools including ArcGIS/QGIS, Google Earth Engine, Python for geospatial development (`gdal`, `pyproj`, `geopandas`, `fiona`, `ipyleaflet`).

human languages: English (native), Mandarin Chinese (∼HSK5), French (∼CEFR C1).

## papers


[1] S. Adhikari, M. Fishbach, D.E. Holz, R.H. Wechsler, and Z. Fang, "The binary-host connection: Astrophysics of gravitational wave binaries from their host galaxy properties," *The Astrophysical Journal*, 2020, vol. 905, no. 1, doi:10.3847/1538-4357/abbfb7.

[2] Z. Fang, P.T. Freeman, C.B. Field, and K.J. Mach, "Reduced sea ice protection period increases storm exposure in Kivalina, Alaska," *Arctic Science*, vol. 4, no. 4, pp. 525–537, 2018, doi:10.1139/as-2017-0024.


## conferences

"'The purpose of a system is what it does, and science is a thing which people do': from AI epistemology to AI military ethics," [poster]
*Harms and Risks of AI in the Military*, Mila - Quebec AI Institute, 2-3 Dec 2024.

"Conflict at the Edge of Visibility," [invited talk]
*Unfiguring* conference, Mahindra Humanities Center at Harvard University, 23 Mar 2024.
Architects for Gaza workshop, American University of Cairo, 15 Feb 2024.

## service

Reviewer for AAAI-AISI (AI for Social Impact Track). 2025