

# ANA M. TARANO

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Data Scientist, Aircraft Center for Earth Studies, University of Miami

## EDUCATION

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- Ph.D. in Aeronautics and Astronautics** 01/2016 - 12/2020  
Stanford University, Stanford, CA  
*Dissertation:* [Automated Inference of Impacting Asteroids' Physical Properties and Motion](#)  
*Advisors:* Professor Sigrid Close and Dr. Donovan Mathias  
*Relevant Courses:* Machine Learning, Optimization, Statistics, Sensors, Smart Product Design, Mechatronics  
*Graduate-Level Course Assistantship:* Spacecraft Design and Laboratory
- M.S. in Aeronautics and Astronautics** 09/2013 - 12/2015  
Stanford University, Stanford, CA  
*Graduate-Level Course Assistantships:* Classical Dynamics, Spacecraft Design and Laboratory
- B.S. in Aeronautics and Astronautics** 09/2009 - 03/2014  
Stanford University, Stanford, CA  
*Undergraduate-Level Teaching Assistantship:* Linear Algebra

## RESEARCH EXPERIENCE

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- Data Science from Optical Remote Sensing** 06/2022 - Present  
*Data Scientist at Aircraft Center for Earth Studies, University of Miami* Miami, FL
- Applying machine learning, including image segmentation using a fully convolutional neural network, and statistical analysis for shallow-marine habitat mapping from remotely sensed multispectral imagery for PICOGRAM, a NASA program for ecological forecasting, and MarineVERSE, a NASA program for biodiversity studies.
  - Supporting in field campaigns and proposal writing for reef-scale imagery mapping of the Florida Keys' Horseshoe Reef, a NOAA/National Marine Sanctuary Foundation restoration effort.
  - Translating the NeMO-Net app into Spanish for OCEANOS, a NASA program for Science Activation Program Integration.
  - Pre-processing raw satellite data and converting to top of atmosphere radiance based upon calibration values and sun angles from satellite vendor.
  - **Tools:** Python, Tensorflow, Jupyter, AWS, Unity, C#, Visual Studio, NASA HEC.
- Natural Language Processing (NLP): An Interactive AI** 11/2021 - 06/2022  
*Project Manager at Stanford University Human-Centered AI* New York, NY
- Provided machine learning, technical and human-computer interaction leadership for Being, a conversational AI chatbot who is a poet and educator with human-centered traits that users engage through a microphone, speakers, and screen from a Unity game app.
  - The AI Being received the Prix Ars Electronica's Golden Nica for Computer Animation in 2022.
  - Developed and deployed a Python Flask web app for a poet to generate poetry in a specific style by curating a dataset, fine-tuning NLP transformers, and evaluating optimal hyperparameters.
  - Led the strategy, execution, and quality assurance of the NLP engines, dataset, development stack, data monitoring web interface, and game app through design, research, analysis, and testing.
  - Collaborated with artists, game developers, engineers, venue production teams, creative director, educators, filmmakers, and dancers to document, test, design and execute the best user experience, and to assess data needs in order to improve diversity and quality of dataset.
  - **Tools:** Python, Visual Studio, OpenAI API, GPT-J, Github, Microsoft Azure Cognitive Services, AWS.

## Machine Learning and Optimization from Optical Remote Sensing

Research Associate at NASA Ames and PhD Student at Stanford University

06/2016 - 12/2020

Moffett Field, CA

- Funded by NASA's Asteroid Threat Assessment Project at NASA Advanced Supercomputing Division for automating the inference of asteroid velocity, entry angle, and physical properties from satellite and ground-based light curve (radiometry) data.
- Generated a synthetic but realistic physics-based dataset to overcome a limited quantity of real labeled data since this was the first time classification, regression, or clustering approaches were applied.
- Designed, built, and tested end-to-end data pipelines, including combinations of pre-processing algorithms with spatial algorithms, optimization, supervised and unsupervised machine learning methods, and evaluated that the most accurate and generalizable methods used scaled and logarithmically transformed features with deep neural networks, such as a CNN, and random forest regression.
- Extended the Probabilistic Asteroid Impact Risk model that assesses the risk that potential asteroid strikes pose to Earth's population by improving the impact consequence modeling and defining relative damage probabilities.
- **Tools:** Python, Keras, TensorFlow, Scikit-Learn, Jupyter, C++, MATLAB, computational modeling.

## Data Analysis from Radar Remote Sensing

Scientific and Engineering Student Intern at NASA Goddard Space Flight Center

06/2014 - 09/2015

Greenbelt, MD

- Processed and analyzed raw meteor radar data from 8-antenna transmitting array at NASA Heliophysics Science Division.
- Derived 3D true velocities of detected parent meteoroids using interferometry (an imaging radar technique) to reproduce geospatial trajectories and compared angles of radar beam, detections, and Earth's magnetic fields to investigate plasma instability hypotheses behind unexpected detections.
- Implemented a detection algorithm from SNR returns using signal and image processing that facilitated statistical studies of a large dataset.
- **Tools:** MATLAB, signal processing, image processing, statistics, computational modeling.

## RECENT SOFTWARE ENGINEERING PROJECTS

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### Mobile App Development

Data Engineer at Develop for Good (Spring Cycle)

03/2021 - 06/2021

Remote

- Pivoted to a developer role 3 weeks in to ensure the team met deadline and nonprofit client's expectations.
- Spearheaded the full-stack development of the monetary transaction and splash pages for a mobile app in collaboration with designers, project managers, other developers, and non-profit leadership.
- Was the second (out of 4) most prolific contributor to the codebase in spite of being the most novice.
- **Tools:** Flutter, Firebase, Android Studio, XCode, Github, Figma, Slack, Notion.

### Mobile Augmented Reality Development

Project at Augmented Reality (AR) Bootcamp

01/2021 - 02/2021

Remote

- Designed and developed a mobile AR app with the ability to detect planes, track images and faces, and place 3D objects in scenes with light-responsive shadows using real-time ray tracing.
- Added user interface interactables for navigating between different AR scenes.
- **Tools:** Unity, C#, AR Foundation, XCode.

## SELECTED TEACHING EXPERIENCE

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### Laboratory-Based Class

Course Assistant for Spacecraft Design and Laboratory (AA236C), Stanford University

03/2016 - 06/2016

Stanford, CA

- Supervised 20 students from a range of disciplines and from both undergraduate and graduate degree programs in the design, prototyping, building, and testing of a small satellite for in-situ measurements of the middle and lower thermosphere.

- Identified and engineered solutions to mission critical issues, such as the inertia matrix imbalance for the attitude determination and control subsystem.
- Oversaw all communications with SSL to test our satellite in their thermal chamber and vibrating table and collaborated with project PIs to fulfill progress reports for National Science Foundation and von Karman Institute for Fluid Dynamics.
- Managed communications with university financial personnel about procurement and legal personnel about international students' involvement due to restrictions with International Traffic in Arms Regulations (ITAR) when testing at SSL.
- Administered and reported the satellite's integration, functional, and verification tests.
- Met schedules and set milestones.

### Lecture-Based Class

09/2015 - 12/2015

*Course Assistant for Classical Dynamics (AA242A), Stanford University*

*Stanford, CA*

- Prepared and instructed problem sessions for seventy graduate Aeronautics and Astronautics students from diverse academic backgrounds.
- Held efficient and collaborative office hours.
- Graded homework and exams.

### Lecture and Laboratory-Based Class

09/2014 - 03/2015

*Course Assistant for Spacecraft Design and Laboratory (AA236A/B), Stanford University*

*Stanford, CA*

- Led a group of 30 students to develop software, electrical and mechanical hardware, and control systems for a small satellite for an international consortium QB50 led by the von Karman Institute for Fluid Dynamics.
- Independently designed and presented a lecture on the space environment effects on spacecraft.
- Created end of quarter deliverable standards that subsequent course assistants continue to use as final report guidelines.
- Guided students through group labs, such as writing a multitasking application with the Salvo real-time operating system to implement a single-cell Lithium-Polymer battery charger.
- Advised and evaluated students on cross-functional and multi-disciplinary final projects.

### Lecture-Based Class

08/2011 - 08/2011

*Teaching Assistant for Linear Algebra (MATH51), Stanford University*

*Stanford, CA*

- As part of the teaching team for Stanford Summer Engineering Academy, a four-week academy for fifty newly admitted Stanford freshmen interested in engineering who have been systemically marginalized in engineering.
- Graded homework and exams, and held office hours and review sessions for 25 students.
- Designed problem sessions to reflect engineering use of linear algebra concepts and initiated worksheets so students could follow along during section highlighting most important concepts.

## SELECTED PUBLICATIONS

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1. **Tarano, Ana M.**, Chirayath, V., Segal-Rozenhaimer, M., Purkis, S. (2022). Toward Global Coral Resilience and Biodiversity Assessments Using NASA NeMO-Net and Fluid Lensing. *AGU Fall Meeting Abstracts* (Vol. 2022).
2. **By-Invitation Only: Tarano, Ana M.**, Chirayath, V., Couch, C., Oliver, T. (2022). Informing coral reef resilience-based management through prediction of individual coral organismal growth, recruitment, and mortality (PICOGRAM). Presented at *NASA Biodiversity and Ecological Forecasting Team Meeting*, 20-22 Sept. 2022 College Park, MD.
3. **Invited Speaker: Tarano, Ana M.**, Gee, J., Wheeler, L., Close, S., Mathias, D. (2020). Automating the Inference of Asteroid Physical Properties and Motion. *AGU Fall Meeting Abstracts* (Vol. 2020, pp. P008-02).

4. **Tarano, A. M.**, Wheeler, L., Close, S., Mathias, D. L. (2019). Inference of meteoroid characteristics using a genetic algorithm. *Icarus*, 329, 270-281.
5. Aftosmis, M. J., Mathias, D. L., **Tarano, A. M.** (2019). Simulation-based height of burst map for asteroid airburst damage prediction. *Acta Astronautica*, 156.
6. **Tarano, A. M.**, Gee, J., Wheeler, L., Close, S., Mathias, D. (2019). Using Deep Learning to Automate Inference of Meteoroid Pre-Entry Properties. *AGU Fall Meeting Abstracts* (No. ARC-E-DAA-TN76511).
7. **Tarano, A. M.**, Wheeler, L., Close, S., Mathias, D. L. (2018) Automation of Meteor Modeling Using a Genetic Algorithm. Presented at American Astronomical Society, *DPS meeting #50*, 22 October 2018 Knoxville, Tennessee.
8. **Tarano, A. M.**, Mathias, D. L., Wheeler, L., Close, S. (2017) Genetic Algorithm-based Optimization to Match Asteroid Energy Deposition Curves. Presented at American Astronomical Society, *DPS meeting #49*, 15-20 October 2017 Provo, Utah.
9. Mathias, D., Wheeler, L., Dotson, J., Aftosmis, M., **Tarano, M. A.** (2017). Asteroid Impact Risk: Ground Hazard versus Impactor Size. In *Annual Division for Planetary Sciences Meeting* (No. ARC-E-DAA-TN48109).
10. Mathias, D. L., Wheeler, L., Dotson, J., Aftosmis, M.J., **Tarano, A. M.** (2016). Ensemble Risk Assessment in Support of the 2016 NEO Science Definition Team. Presented at *IAA Planetary Defense Conference* 15-19 May 2017 Tokyo, Japan.

## AWARDS AND DISTINCTIONS

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Invited Speaker of “ <a href="#">Machine Learning for Planetary Science</a> ”, American Geophysical Union ( <i>Remote</i> ).	2020
Engineer of the Future Leadership Award, Straubel Foundation ( <i>Woodside, CA</i> ).	2020
Champion Advocate Award, Associated Students of Stanford University ( <i>Stanford, CA</i> ).	2019
Community Impact Award, Stanford Alumni Association ( <i>Stanford, CA</i> ).	2019
Group Achievement Award to Asteroid Threat Assessment Project, NASA ( <i>Washington, DC</i> ).	2018
Honor Award for NEO SDT Risk Assessment Team, NASA Ames ( <i>Moffett Field, CA</i> ).	2017
Outstanding Poster Award, Stanford University Opportunity Job Fair ( <i>Washington, DC</i> ).	2017
Sharon Kay Stanaway Award Summer Doctoral Fellowship, Stanford Aero/Astro Dept. ( <i>Stanford, CA</i> ).	2016
Enhancing Diversity in Graduate Education Doctoral Fellowship, Stanford University ( <i>Stanford, CA</i> ).	2016
Travel Fellowship Grant Award, USNC-URSI North American Radio Science Meeting ( <i>Boulder, CO</i> ).	2016
Dean’s Packard Diversity Fellowship, Stanford University School of Engineering ( <i>Stanford, CA</i> ).	2014-2015
Outstanding Leadership Award, Stanford University School of Engineering ( <i>Stanford, CA</i> ).	2013
Academic Excellence Community Award, Stanford University ( <i>Stanford, CA</i> ).	2013
Outstanding Student Paper Award, American Geophysical Union, 2nd author ( <i>San Francisco, CA</i> ).	2012

## SELECTED SERVICE

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Mentor for a PhD student in Ocean Sciences department, University of Miami ( <i>Miami, FL</i> ).	2022
Young professional mentor for an undergraduate student, Zed Factor Fellowship ( <i>Denver, CO</i> ).	2021
Graduate research mentor for two graduate students, NASA Ames ( <i>Moffett Field, CA</i> ).	2018-2020
Enhancing Diversity in Graduate Education mentor, Stanford University ( <i>Stanford, CA</i> ).	2018-2020
Diversity and Advocacy Committee co-chair, Stanford University ( <i>Stanford, CA</i> ).	2018-2019
Graduate Student Council School of Engineering representative, Stanford University ( <i>Stanford, CA</i> ).	2018-2019
Journal reviewer, <i>Astrophysics and Space Science Journal</i> ( <i>Moffett Field, CA</i> ).	2018
Recruiter, Society of Hispanic Professional Engineers Leadership Development Conf. ( <i>New York, NY</i> ).	2018

Graduate Pathways in STEM Student Recruitment committee, Stanford University (*Stanford, CA*). 2018  
 Women in Aero/Astro mentor, Stanford University (*Stanford, CA*). 2017-2020  
 First-gen/Low-Income mentor, Stanford University D-Gen Office (*Stanford, CA*). 2017-2020  
 Graduate Pathways in STEM Peer Adviser committee, Stanford University (*Stanford, CA*). 2017  
 Stanford University Aero/Astro Student Advisory Council, Stanford University (*Stanford, CA*). 2015-2017  
 Stanford Meteor Environment and Effects Workshop organizer, Stanford University (*Stanford, CA*). 2015  
 Executive Secretary, NASA Program Proposal Review Panels (*Washington, DC*). 2014-2015  
 Graduate research mentor for one undergraduate student, Stanford University (*Stanford, CA*). 2014  
 Graduate and Professional Peer Advisor, Stanford University School of Engineering (*Stanford, CA*). 2011-2020