TIMESTEP

Workforce Development for Undergraduate Majors in the Physical Sciences at the U of A

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TIMESTEP trains and supports UofA undergraduates to enter the workforce upon graduation, realizing career paths in both industry and academia. The TIMESTEP Summer Internship Program (2018-present) is a unique opportunity for UofA undergraduates in the Physical Sciences to connect with Tucson-based, small- to mid-sized businesses, in the Space/Defense and Data Science/AI/ML sectors. A robust technical internship program improves student retention and post-graduate job placement. Student engagement in the Tucson business community also creates pathways for local employment and strengthens the economic development of Southern Arizona.

Critically, TIMESTEP supports UofA faculty to design, pilot, and expand student engagement/workforce development programs that are key components of grant proposals. TIMESTEP has supported **over $16M in federal grants** led by UofA PIs since 2020 and raised **~$441K** through foundations and industry partners. TIMESTEP has been supported by the ORP since 2021, helping to grow the program from 3 students in 2018 to 20 in 2025 through TRIF funding – this support in TIMESTEP has a substantial return on investment.

Critical Programmatic Needs Met by TIMESTEP

- Advancing retention and career success of majors in the Physical Sciences requires industry pathways as graduate program acceptance rates are low (UofA Astronomy: ~5%)
- Industry Internships are needed as curriculum modernization is not keeping pace with rapid technology developments, particularly in the ML/AI Sectors.
- Most Physical Science degree programs do not offer technical internship opportunities for undergraduates, particularly in the space sector: TIMESTEP is unique.

Strategic Imperative: *Success for Every Student*

1. Foster academic excellence, connection, and opportunity, preparing graduates from all backgrounds and from any community for impactful careers.
2. Prepare students to lead with foundational skills and increase emerging technological competency.
3. Offer expansive opportunities to ensure every student graduates with co-curricular learning experiences that foster career preparation, critical thinking, cultural competency, and entrepreneurship.

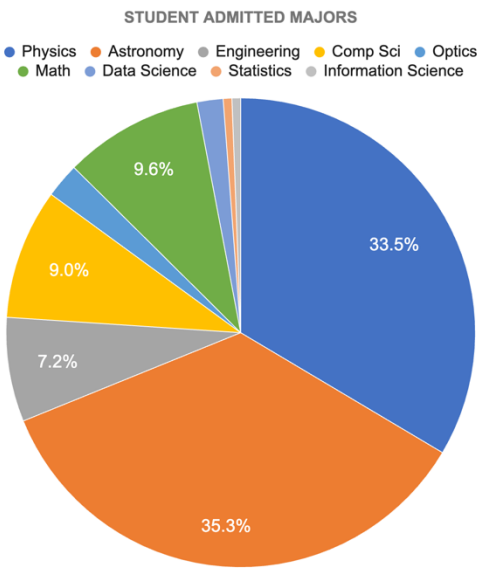
Student Intern and Applicant Demographics (2018-2025)

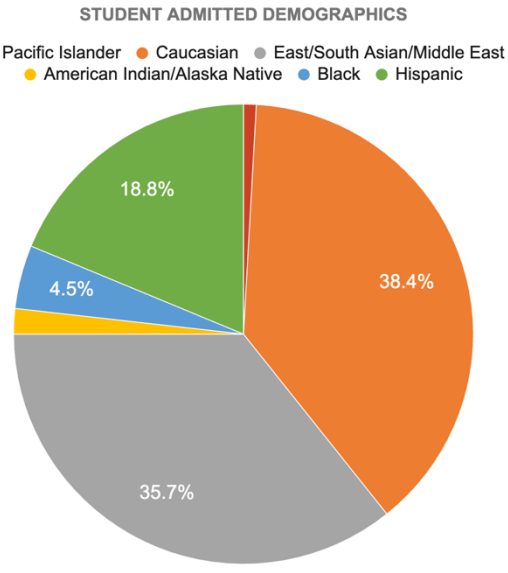
Applicants 2018-2025 (**269 total**):
26% Female (vs. AST 37%, PHY 23%)

Admitted 2018-2025 (**107 total**):
30% Female (vs. AST 37%, PHY 23%)

The admitted population is representative of the demographics of scholars in Astronomy and Physics at the UofA.

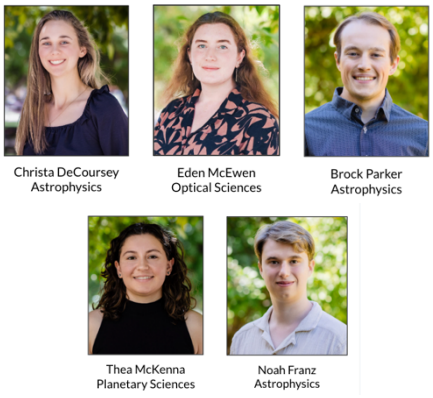
A record **70 students applied** and **20 students were admitted** in 2025. The popularity of the program has grown by a factor of ~10, since 2018.







A team of 5 Graduate Students mentor teams of 5 student interns, providing opportunities for leadership.



Employer Information

Small to mid-sized companies in the **Space/Defense and Data Science/AI/ML sectors** are targeted to strengthen the economic development of Southern Arizona. Companies are identified in partnership with **UA Tech Launch and UACI**. TIMESTEP provides part-time funding for interns (20hrs/week, $5000).

Benefits to Employers:

- Access to a talented pool of students with strong physics, math and computing backgrounds.
- Increase economic competitiveness (only ~ 54% of UofA graduates stay in Arizona; 2022).
- The opportunity to scout talent for full-time positions in their organization.
- Employers report that the TIMESTEP program is mutually beneficial for both students and employers.

"This program is a great alternative for organizations that have interesting technical projects that may otherwise go unfilled. Seemed like a win-win for the student and the company." **– Rick Kettner, FreeFall Aerospace, 2024**

"It is a great opportunity to make an impact on future engineers. Many other internships shove them into a large company, but an internship at your small company is impactful for different reasons. They get to truly see the ins and outs of not just the engineering within a small business but the operations of a small business as well." **- Joel Berkson, Fringe Metrology, 2025**

"TIMESTEP offered an affordable and low-risk way to engage with undergraduate students. It created a pathway for students to become employees that we may have never of had the privilege to meet or work with." **- Buck Strasser, Clear Core, 2024**

"The TIMESTEP interns we have worked with have been enthusiastic and creative. The matching process ensures that the interns have appropriate skills." **– Joel Huebner, Rincon Research 2025**

The program has featured 41 unique employers since 2018. **The Summer 2025 program featured 12 unique employers (listed below according to the topic of the internship). All 12 are returning companies, having participated over the past 2-8 years**. Returning industry partners typically pay to participate, providing a total of ~$35K/year. However, given the economic climate, this funding reduced to $17.5K in 2025.

#Years in Program	Defense/Space Projects	Data Science/AI/ML	Other Hardware
8		Madden Media	
5	Rincon Research	Airth.io	
4	IR Labs, Paramium	NOIRLab	Ampcera
3		OppsSpot	
2	Leonardo Electronics	Go For Vertical	Fringe Metrology

Past defense/space sector companies have included: Arete, Securaplane, KinetX, WorldView, FreeFall Aerospace, Lunasonde, BlackSky, Paragon, Revolute Robotics.



2023 TIMESTEP intern Chance Lawrence walking toward Rincon Research Corporation's 6.1 meter millimeter-wave antenna

Goal 1: To Build a Program Valued by Both Students and Employers.

Experience of Employers Participating in the 2025 Program:

- 100% reported that students provided a meaningful contribution to the company.
- 100% reported that students met or exceeded expectations.
- 100% reported they would recommend the TIMESTEP program to other companies.
- 100% reported being interested in participating in the Summer 2025 program.

"Working with TIMESTEP has allowed us to build and sustain a data analysis solution that processes several hundred billion rows of data each day. We've sold this reporting platform to over 40 clients and it continues to grow as a profitable new part of the business. We might not have invested in prioritizing this platform if it were not for the TIMESTEP interns who enabled us to prototype these efforts ahead of product development" **- Dan Janes, Madden Media 2022**

"The UA TIMESTEP program is important because it provides interns with real-world experience in innovation and entrepreneurship, allowing them to apply their skills in meaningful ways. At OppsSpot, interns have gone beyond learning to actively ideate and implement valuable extensions to our Project's web platform. This collaboration not only benefits students by preparing them for future careers but also strengthens companies like OppsSpot and others by bringing fresh perspectives, energy, and tangible innovations that support long-term growth." **- Sonia Vohnout, OppsSpot, 2025**

Students Report:

- Across 2018-2025 (107 interns), **99% of Interns would recommend** this program to other students.
- 87% of Interns from 2021-2025 (95 interns) reported that TIMESTEP **helped clarify their career path**.
- 60% of Interns from 2020-2024 (32 respondents) **reported leveraging their TIMESTEP experience** to advance their professional goals (e.g networking, obtaining internships and research opportunities).

"Everything about the TIMESTEP internship program has helped me. It has helped me clarify precisely what about technical jobs and problem solving I enjoy and thus what kind of career path I want to pursue, but it also gave me a handful of skills that maximized my competency in both an academic and career setting." **– 2025 Intern**

"TIMESTEP completely revamped my professional image and gave me actionable leads and introductions to researchers with open positions. This in turn led to several work opportunities across every following semester (spring, summer, or fall). By the time I graduated, I had developed a competitive resume of work experience and skills even without having published any papers by that point. This was crucial in my interview to get into the Ph.D. program at UA." **- 2023 Intern 2 years later**

Goal 2: To Improve Retention and Graduation Rates among UofA Students

TIMESTEP aims to improve retention and graduation rates by exposing students to industry career pathways and increasing their confidence in achieving those careers.

- ~80% of interns (2020-2025) report that **TIMESTEP is helping motivate them to continue their degrees**.
- 98% of interns (2018-2023) have graduated.



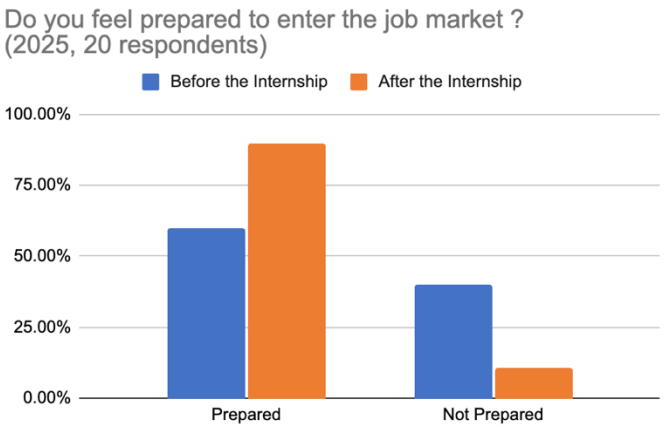
"The program gave me real-world engineering experience and showed me how class concepts apply in industry. It also sparked my interest in optical engineering, which I now want to pursue further in graduate studies." **- 2025 Intern**

"My TIMESTEP internship helped me connect my technical experience to broader professional goals. It exposed me to projects that combined optics, artificial intelligence, and machine learning, fields that have shaped my current research interests and improved my ability to think like a researcher." **– 2025 Intern**

Above: Students shared their experiences with their peers at the TIMESTEP Internship symposium on Sep. 3rd in partnership with the UofA Space Institute (ASI). Here, the audience listens to the keynote given by Dr. Erika Hamden (director of ASI). The symposium was attended by Astronomy & Physics majors, TIMESTEP employers, funders of the program, faculty and staff – 78 individuals RSVPd.

Goal 3: To Give Students the Experience and Confidence to Directly Enter the Workforce Upon Graduation

After the 2025 Internship, 90% of interns reported feeling prepared to enter the job market, vs. 60% at the start of the internship (*see bar chart*).



***"This internship has given me a taste of what it is like to hold a professional job, manage personal progress, and work with others. These are experiences that my degree has not remotely prepared me for. Thus, the TIMESTEP internship program has prepared me with skills needed to enter the workforce."* – 2025 Intern**

***"I have been able to use my responsibilities at OppsSpot [TIMESTEP Internship company] to secure a full-time software engineering role at Credit One Bank, and then Google."* – 2023 Intern, 2 years later**



Above: Madden Media team (led by Dan Janes and Carl Cox) at a conference dinner in 2022, including 3 past TIMESTEP interns who are now employed full time.

TIMESTEP Interns have a high success rate in entering the job market:
- 47% of interns (2018-2023) have positions in industry
- 31% of interns (2018-2023) are in graduate school

The TIMESTEP Program has successfully connected students with regional employers: **49% of interns (2018-2023) found employment in Tucson/Phoenix after graduation.**

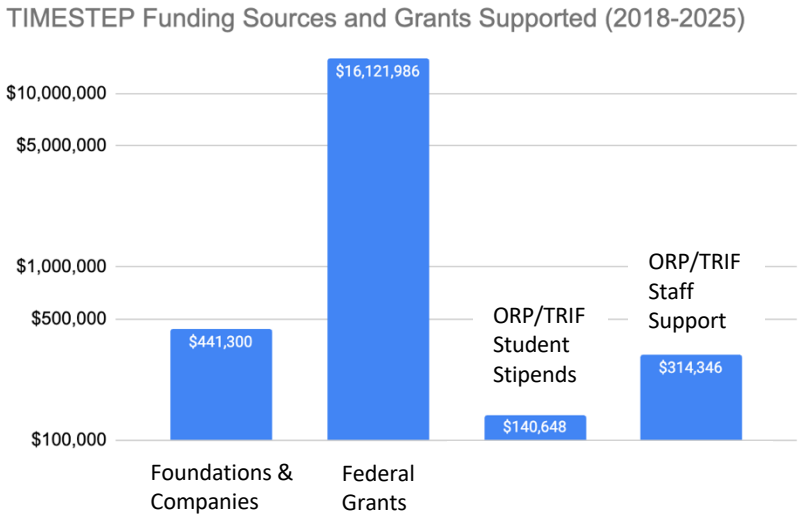
***"TIMESTEP is a cornerstone of my resume and I still intern with the same company"* – 2024 Intern, 1 year later**

***"[TIMESTEP] connects the city of Tucson with the University and encourages the workforce to remain Tucson-local."* – Reuben Bautista, Madden Media, 2024**

Goal 4: To Develop a Program with a High Return on Investment

TIMESTEP has supported broader impact programming that has enabled UofA faculty in Astronomy, Physics, Planetary Science and the Data Science Institute to apply for over **$16 Million in grant funding.**

- $5.2M awarded – including 2 NSF CAREER awards and an NSF SPACE DCL for space workforce development through TIMESTEP
- $8M+ submitted in 2025 – including an NSF ACSS II award and NSF MSRI1
- $2.9M declined



Furthermore, since 2018, TIMESTEP has secured **$441K** in funding from Foundations (TRBF, Marshall) and Participating Companies.

***"TIMESTEP was instrumental for the development of the COmputer and Mathematics Program for incoming Arizona Science Students (COMPASS) that was part of my NSF CAREER award. The initial computer workshops I developed for TIMESTEP helped me identify what incoming students needed in terms of their education to succeed as STEM students at our university."* – Vasilis Paschalidis (Associate Professor, Astronomy, 2025)**

ORP has supported the TIMESTEP program since 2021 through TRIF AWS and SEOS, providing a total of **~$455K** in funding to TIMESTEP from 2021-2025. TRIF/ORP currently funds 1.5 FTE in staff and ~ 5 interns a year. <u>The ROI in TIMESTEP is substantial.</u>

The Future: The TIMESTEP Astronomical Software Engineering Internship

The TIMESTEP Astronomical Software Engineering Internship is being launched in Fall 2025, funding 4 UA Astronomy undergraduates to build a new student software engineering team for the Event Horizon Telescope Collaboration, focusing on software optimization for massive data sets using AI platforms. This transdisciplinary program will enable new partnerships between Astronomy and Software Engineering at UA.





Left: The Event Horizon Telescope Collaboration made the first image of the material around a Super Massive Black Hole (above).

Left: The 2025-2026 cohort for the TIMESTEP Astronomical Software Engineering Internship. Students are holding a copy of the "Pragmatic Programmer" which is the textbook we are using to support training workshops. Students are standing in front of an image of Albert Einstein in the Theory Visualization Lab at Steward Observatory at UA, which is where they will each have a desk and computer.

Motivation: The "grand challenges" facing the field of Astronomy require computational solutions and massive data sets, making computational training imperative in undergraduate education. The Event Horizon Telescope collaboration, with a key science team at UofA, is at the forefront of this effort, where observational programs generate *several tens of petabytes* of data. Such data scales present major data engineering challenges. Furthermore, astrophysical data present unique challenges in data quality and calibration that poorly overlap with general data science skills. Software engineers with backgrounds in Astronomy and skills to handle large datasets in astrophysically useful ways are critically needed to develop the local space workforce. However, there is no existing standardized pathway for Astronomy majors to pursue such software careers anywhere in the US.

Solution: TIMESTEP has obtained $40K in funding from the Marshall Foundation to pilot a novel Astrophysics Software Engineering branch to the successful TIMESTEP Summer Internship program. Our goal is to build a new training pathway for entry into the Astrophysics workforce that can be replicated at national scales. Through this program, UofA astronomy majors will take part in some of the most daunting software engineering challenges in modern Astrophysics.

Funding Partners

We are grateful for funding from the below sponsors who supported the Summer 2025 TIMESTEP program.

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