

NSF Unidata Internship

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Type of Experience (select from assignment description)	<i>Professional Development</i>
Date or Date Range (<i>e.g. Sept. 2, 2024 <u>or</u> May 6, 2024-August 6, 2024</i>)	<i>May 19, 2025 – August 1, 2025</i>

For the summer of 2025, I participated in an internship with NSF Unidata, a part of the University Corporation for Atmospheric Research, in Boulder, CO. This role included acting as a software development intern for the meteorology visualization and calculation software MetPy. I learned new skills, gained valuable industry experience, furthered my career plans, and immersed myself in the culture of UCAR and Boulder, CO.

In the fall of 2024, it became time to think about my plans for next summer. I knew I wanted to get hands-on experience to complement the knowledge I had gained from my meteorology major and computer programming minor. I applied to a variety of positions, but one that caught my eye while I was attending the American Meteorological Society's annual meeting in January of 2025 was the student internship position at NSF Unidata. I knew a bit about Unidata's services and programs, but visiting their table at the student conference made me realize that I was incredibly excited about being a part of their work. NSF Unidata has the goal of providing tools for scientists (especially at universities) that make meteorology calculations and visualization intuitive and powerful. Diving into this more technical part of the field of meteorology seemed a great way to complement my existing computer programming knowledge.

After an application and interview, I was informed that I had landed the position and was thrilled. When summer rolled around, I packed up the car and headed out to Boulder, where I would be sharing housing with other University Corporation for Atmospheric

Research students. Before my internship even began, I found myself surrounded by other weather nerds with a passion for science, research, and technology.

My actual work at this internship was not quite what I expected, but I would not change a thing. I ended up working on one of the most technical internship projects that Unidata interns had undertaken in years: benchmarking the meteorology Python package MetPy. Benchmarking is the act of timing snippets of code to determine exactly how fast a codebase runs. I also worked to incorporate this benchmarking into a Continuous Integration/Continuous Development workflow. This was extensive coding, and while I was working with some atmospheric topics, I was primarily a software engineer.

This was not, and is still not, exactly what I want to do as a long-term career. But for summer, this was perfect. I learned that while I like coding and development, it is not what I want to study. I will not be switching to a pure computer science major. Even so, I learned many practical skills, software development mindsets, and gained beneficial experience that I can use in my future endeavors, like research or forecasting. I also enjoyed working on a technical project and could see myself working in the realm of atmospheric dynamics modeling in the future.

The most challenging part of this experience was the bane of every programmer's existence: debugging. I was integrating an advanced development topic into an existing codebase, and there were numerous bugs to work out along the way. However, even from this

challenge rose another invaluable future skill: pair programming and collaborative development. I collaborated with staff across the Unidata roster – from the deputy director to the technical writer to the server maintainer – to iron out these challenges. I learned how to effectively communicate my struggles and work together in a collective development setting. This will come in handy for my future work – models also have bugs and being able to effectively communicate and problem-solve with a team is vital for any career.

One thing I did not expect to learn quite so much about this summer was the community collaboration involved in open-source software development. Open-source and FAIR (Findable, Accessible, Interoperable, and Reusable) software ensures that the development and use of the software is open to the community at large. In my case, I was working on Unidata's MetPy package. MetPy strives to be active in the meteorology and software development communities. In my case, I found that most of the projects, including the one I worked on, were from issues and conversations opened in the GitHub repository by members of the community. My supervisor showed me the Twitter thread where someone had tried to loop over some slow calculations, and it took some insane amount of time, on the order of 10 hours. It was amazing to be able to see the exact person who kicked off my work and know that I am helping the meteorology community do their calculations faster and more efficiently.

Another community connection was my participation in the MetPy telecon calls. These were Google Meet calls, open to the public, where the developers discussed the work happening on MetPy and community contributors gave feedback while talking about their

future contributions as well. Seeing the expanse of the users of MetPy was amazing: there were National Weather Service forecasters, college professors, and armchair forecasters who wanted to contribute to MetPy through their feedback and, in many cases, through their code. I was able to see and connect with the community that I was serving, which provided both a clear motivation and invaluable advice on how to make my project as transparent as possible.

While the work was a chunk of my time this summer, and something that I will take with me for the rest of my academic career and future, I also made meaningful connections with other interns. I participated in hikes with members of the SOARS (Significant Opportunities in Atmospheric Research and Science) program, and we explored Boulder landmarks like the Flatirons and Chataqua Park. The other Unidata intern and I shared an office wall and worked on similar projects. He's working on his PhD on planetary atmospheres – specifically Jupiter – and hearing his perspective on the intersection of astronomy and atmospheric science opened another world that I had no idea existed.

Overall, this summer internship was an invaluable experience that provided me with tools for my future courses of study and research-based career. I learned about the importance of community both within meteorology and within the places that you live. Finally, and arguably most importantly, I felt that I learned something new every day this summer and want to continue to do so for the rest of my life.