

A Survey of Computational Tools in Solar Physics [SH010-0001]

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Monica G. Bobra (Stanford University), Stuart J. Mumford (Aperio Software), Russell J. Hewett (Virginia Tech), Steven D. Christe (NASA Goddard), Kevin Reardon (National Solar Observatory), Sabrina Savage (NASA Marshall), Jack Ireland (NASA Goddard), Tiago M.D. Pereira (University of Oslo), Bin Chen (New Jersey Institute of Technology), David Pérez-Suárez (University College London)

Introduction

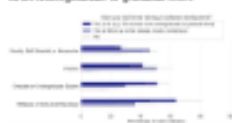
The SunPy Project (see [10.26434/chemrxiv-2020-00001](https://doi.org/10.26434/chemrxiv-2020-00001) by Murray et al.) is happy to announce the results of the solar physics community survey!

In 2019, the SunPy Project asked the solar physics community to fill out a survey about software and hardware.

We definitely asked some of the same questions as [Gardner and Tollerud \(2012\)](#), who informally surveyed 1,132 members of the astrophysics community. A total of 364 community members, across 32 countries, took our survey.

Education and Training

We found that most respondents (54%) have a degree in computer science, physics, or an undergraduate or graduate level.



[Munro et al. \(2013\)](#) also found that most astrophysicists also lack formal training in software development.

Software Tools

We found that 98% of people who responded to our survey use software in their research. Nearly everyone in the solar physics community relies on scientific software. A large fraction (85%) of respondents use Python. Most respondents use both Interactive Data Language (IDL) and PyTorch.



However, students are twice as likely as faculty, staff scientists, and researchers to use Python. In the astrophysics community, [Munro et al. \(2013\)](#) found that Python is the most popular programming language, but in many it is still a second choice category.

Hardware Tools

Most of the people who responded to our survey work with astronomical data taken by ground-based or space-based instruments (92%). And about half (47%) work with numerical simulations. Some work in both categories.

Although some instruments and numerical models in solar physics generate variable data volumes, only a small fraction of respondents use a regional cluster, national cluster, or the commercial cloud for their research. About a third (28%) use exclusively a laptop or desktop for their research.



Citing Scientific Software

Finally, we found that 42% of respondents regularly cite scientific software.



Half the respondents who don't cite software said they didn't know how.



Our paper

Please check out our paper! We included all of these results, and more, in a paper published in *Solar Physics* on April 20, 2020 ([DOI: 10.1007/s11207-020-02001-7](https://doi.org/10.1007/s11207-020-02001-7)). We also included an appendix on how to cite scientific software. You can also take a look at all the survey responses (anonymized and not-anonymized), along with the code to reanalyze these data, at github.com/sunpy/sunpy.org.

Contributors to this paper were Monica G. Bobra et al. (2020) and [SunPy](https://doi.org/10.26434/chemrxiv-2020-00001) community for survey results.

ABSTRACT CONTACT AUTHOR PRINT GET POSTER

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PRESENTED AT:



Introduction

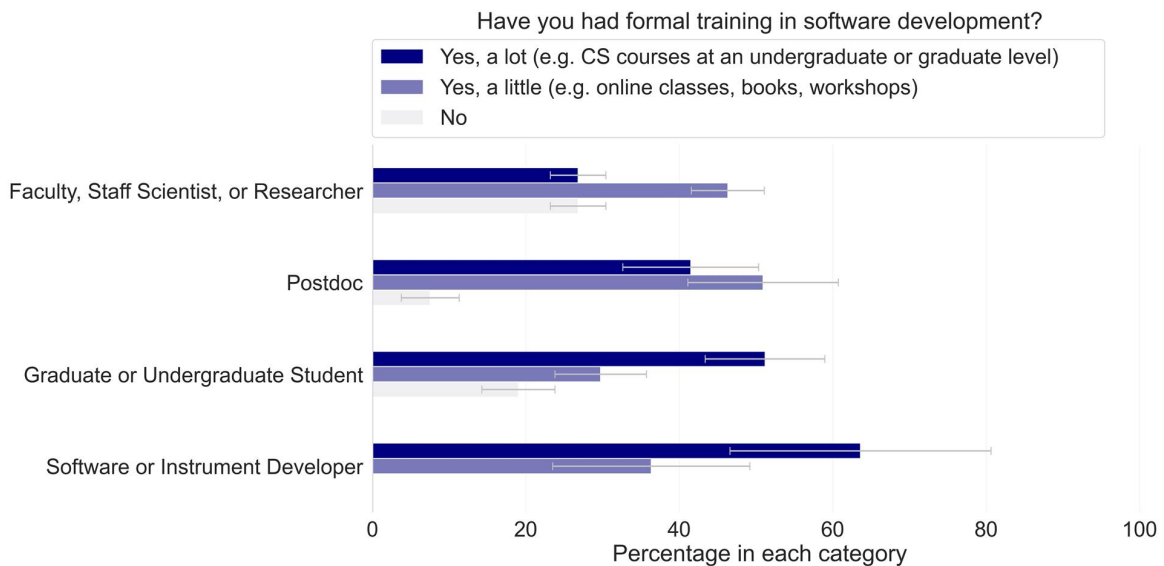
The SunPy Project (see SH010-006 (<https://agu2020fallmeeting-agu.ipostersessions.com/Default.aspx?s=F9-01-83-A8-6E-E0-C3-98-6A-66-5A-EA-32-55-AC-E4>) by Murray et al.) is happy to announce the results of the solar physics community survey!

In 2019, the SunPy Project asked the solar physics community to fill out a survey about software and hardware.

We deliberately asked some of the same questions as Momcheva and Tollerud (2015) (<https://arxiv.org/abs/1507.03989>), who informally surveyed 1142 members of the astrophysics community. A total of 364 community members, across 35 countries, took our survey.

Education and Training

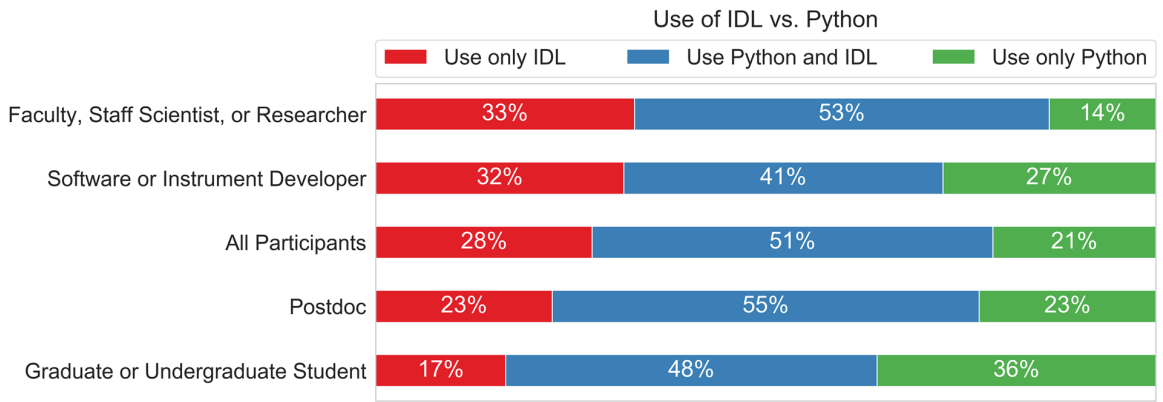
We found that most respondents ($63 \pm 4\%$) haven't taken any computer science courses at an undergraduate or graduate level.



Momcheva and Tollerud (2015) also found that most astrophysicists also lack formal training in software development.

Software Tools

We found that $99\pm0.5\%$ of people who responded to our survey use software in their research. Nearly everyone in the solar physics community relies on scientific software. A large fraction (66%) of respondents use Python. Most respondents use both Interactive Data Language (IDL) and Python.

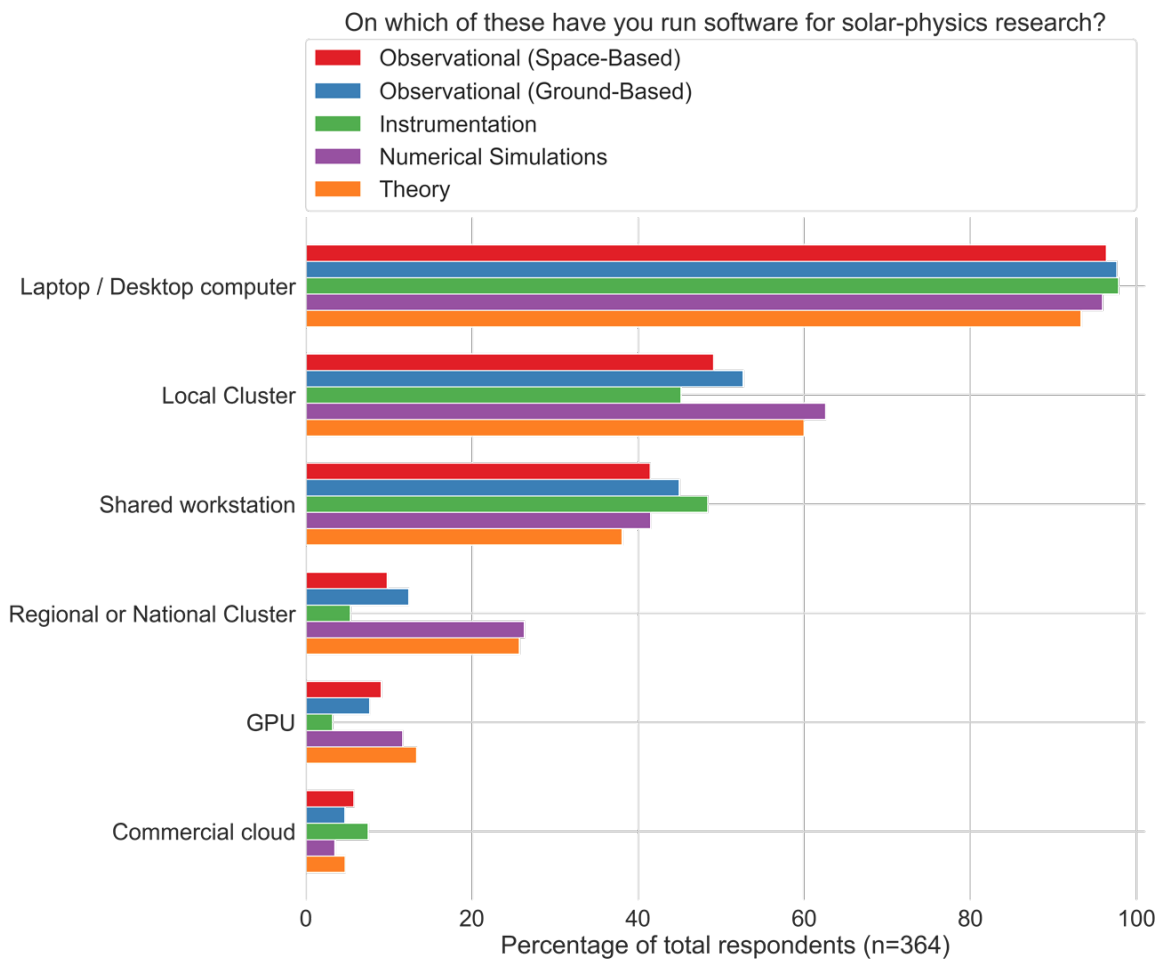


However, students are twice as likely as faculty, staff scientists, and researchers to use Python. In the astrophysics community, Momcheva and Tollerud (2015) found that Python is the most popular programming language within every individual career category.

Hardware Tools

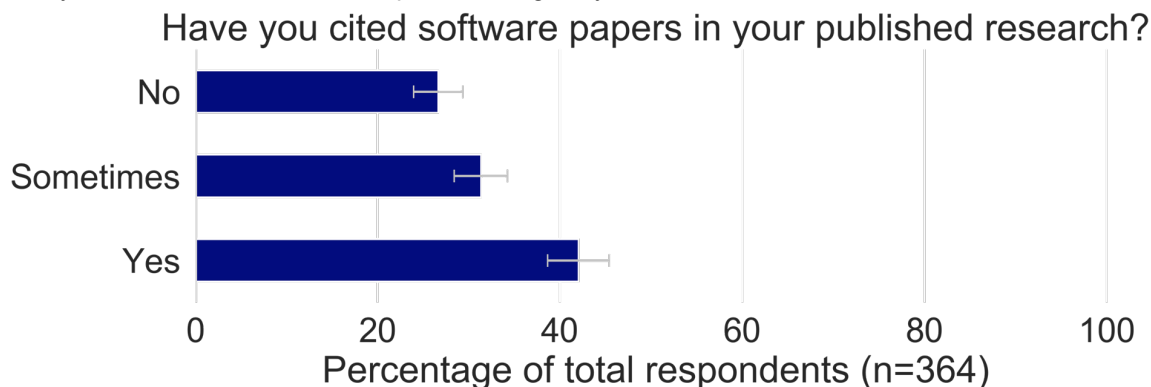
Most of the people who responded to our survey work with observational data taken by ground-based or space-based instruments (82%). And about half (47%) work with numerical simulations. Some work in both sub-disciplines.

Although some instruments and numerical models in solar physics generate sizeable data volumes, only a small fraction of respondents use a regional cluster, national cluster, or the commercial cloud for their research. About a third (29%) use exclusively a laptop or desktop for their research.

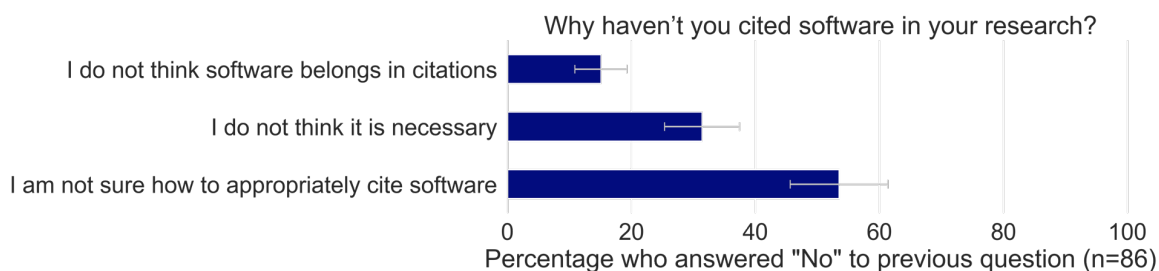


Citing Scientific Software

Finally, we found that $42 \pm 3\%$ of respondents regularly cite scientific software.



Half the respondents who don't cite software said they didn't know how.



Our paper

Please check out our paper! We detailed all of these results, and more, in a paper published in *Solar Physics* on April 20, 2020 (DOI: 10.1007/s11207-020-01622-2 (<https://doi.org/10.1007/s11207-020-01622-2>)). We also included an appendix on how to cite scientific software. You can also take a look at all the raw survey responses (anonymized and randomized), along with the code to analyze these data, at github.com/sunpy/survey (<https://github.com/sunpy/survey>).

Contents for this poster were taken from Bobra et al. 2020 and a SunPy blog post (http://sunpy.org/posts/2020/2020-04-27-sunpy_survey) announcing the survey results.

ABSTRACT

The SunPy project is happy to announce the results of the solar physics community survey!

For six months last year, between February and July 2019, the SunPy Project asked members of the solar physics community to fill out a 13-question survey about computational software and hardware. A total of 364 community members, across 35 countries, took our survey.

We found that $99\pm0.5\%$ of respondents use software in their research and 66% use the Python scientific software stack. Students are twice as likely as faculty, staff scientists, and researchers to use Python. In this respect, the astrophysics and solar physics communities differ widely: 78% of solar physics faculty, staff scientists, and researchers in our sample uses IDL, compared with 44% of astrophysics faculty and scientists sampled by Momcheva and Tollerud (2015).

We also found that most respondents ($63\pm4\%$) have not taken any computer science courses at an undergraduate or graduate level. We found that a small fraction of respondents use the commercial cloud (5%) or a regional or national cluster (14%) for their research. Finally, we found that $73\pm4\%$ of respondents cite scientific software in their research, although only $42\pm3\%$ do so routinely.

Our survey results are published in the journal Solar Physics and available via open access at the following URL:
<https://doi.org/10.1007/s11207-020-01622-2>.