

AST1501 - Introduction to Research

Jo Bovy

Intro to academic writing

Overview

- Different kinds of academic writing
- Structure of a scientific paper
- Make content engaging
- Tools:
 - LaTeX
 - Overleaf

Different types of academic writing

Many different types of academic writing

- Papers
- Proposals
- Emails
- Conference abstracts
- Internal reports in collaborations, wiki pages, ...
- Documentation (code, data)
- ...



Structure of a scientific paper

Purpose of a paper

- Purpose of a paper is to report on a novel scientific investigation of a topic of interest
- Introduction: motivate and contextualize the problem:
 - discuss broader area and how the specific question you are investigating fits into this,
 - discuss prior and related work,
 - give overview of the paper structure
- Data/methods sections: Need to spell out the data and methods used in sufficient detail to allow for exact replication —> completeness trumps brevity
- Results section: discuss results and immediate implications
- Discussion section: broader implications, compare to previous work
- Conclusion: recap most important results, look a bit to the future
- Can make sense to split these basic sections up further

The abstract

- For many people, the only part of your paper they will ever read!
- Generally ~250 words (~12 to 15 sentences)
- Mini-version of the paper: introduce/motivate (1-2 sentences), give method (2-3 sentences), results (3-4 sentences), implications (1-2 sentences)
- A&A uses an explicit template: (Context), Aims, Methods, Results, (Conclusions)
- Generally best not to cite anything unless absolutely necessary
- Mention results (including numbers) that you *really* want people to take away from your paper

Writing style

- Write in a largely impersonal, yet engaging manner
- Avoid passive voice, mainly use present tense:
 - ~~In this paper, the relation between the mass and the velocity dispersion of a cluster is derived~~ —> In this paper, we derive the relation between the mass and the velocity dispersion of a cluster
 - ~~We cross-matched data from Gaia DR3 and Pan-Starrs DR2 and used it to create a deep Color-magnitude diagram~~ —> We cross-match data from Gaia DR3 and Pan-Starrs DR2 and use it to create a deep Color-magnitude diagram
- Astro references are AUTHOR (YEAR) [+variations], but cite impersonally
 - Generally prefer (AUTHOR YEAR) to AUTHOR (YEAR): ~~Aardvark (2019) and Armadillo et al. (2020) found that cluster masses can be derived from observed velocity dispersions~~ —> Previous work has shown that cluster masses can be derived from observed velocity dispersions (Aardvark 2019; Armadillo et al. 2020)
 - Always remember that you are citing a paper, not a person: ~~Aardvark was the first to show that cluster masses can be derived from observed velocity dispersions. She did this by starting from the general ...~~ —> Aardvark (2019) was the first to show that cluster masses can be derived from observed velocity dispersions. They did this by starting from the general ...

Figures and figure captions

- Figures are often the most viewed parts of papers (e.g., journal clubs)
- So make them as self-explanatory as possible!
- Label things directly on the figure rather than explaining in the caption, use lines/arrows rather than legends when practical
- Caption should explain what the figure shows and everything that isn't immediately obvious about a figure. For results/implications figures, they should also mention the take-away message ("This figure clearly shows the trend between X and Y that is present in our data").
- Try to be as brief as possible! But again completeness trumps brevity.

Other tips

- Everything in the reference list should be cited in the text
- Everything cited in the text should be in the reference list (incl. references in figures)
- Use footnotes sparingly and never for anything that a reader should read
- Avoid too much jargon and too many abbreviations, but do abbreviate long terms that you would otherwise use a lot (e.g., “Giant Molecular Cloud” —> “GMC”)
- Aim to be as consistent as possible in terms and math symbols used —> LaTeX macros to the rescue!

Make content engaging

1. **What is the primary purpose of the study?**

2. **Who were the participants in the study?**

3. **What were the main findings of the study?**

4. **How was the data collected?**

5. **What were the limitations of the study?**

6. **What are the implications of the findings?**

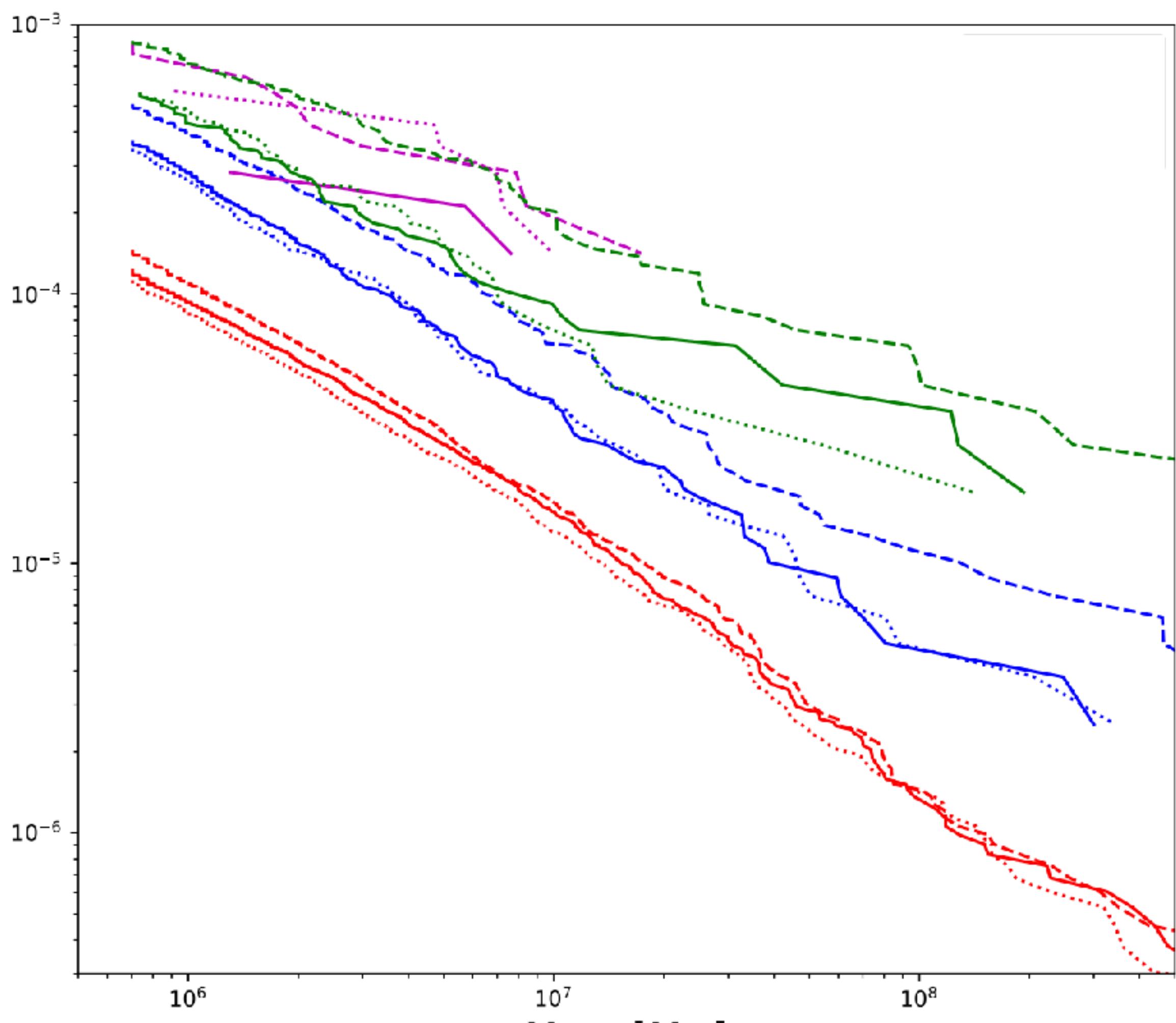
7. **What are the strengths of the study?**

8. **What are the weaknesses of the study?**

9. **What are the conclusions of the study?**

10. **What are the recommendations of the study?**

README



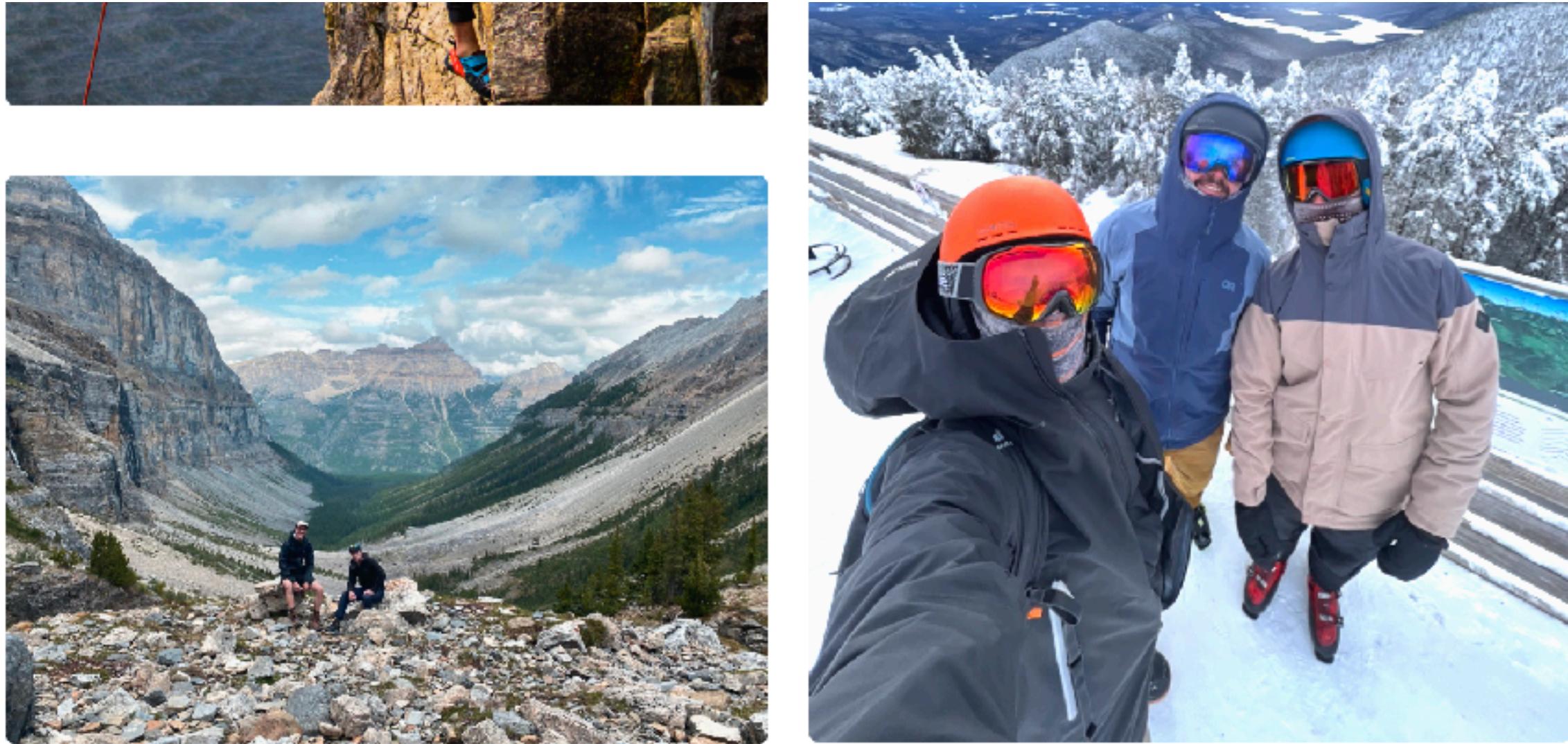
MATTIAS LAZDA

[HOME](#) [MY RESEARCH](#) [PHOTOS](#)



localize FRBs to their host galaxies. I joined CHIME/FRB in 2021 where I have since worked on commissioning two new radio telescopes. My undergraduate thesis lead to the development of the software pipeline that now enables the newly built telescopes to point at any particular point in the sky, a process known as beamforming.

Outside of school, I love to travel! I've included some of my favourite photos from my trips on my photos page.



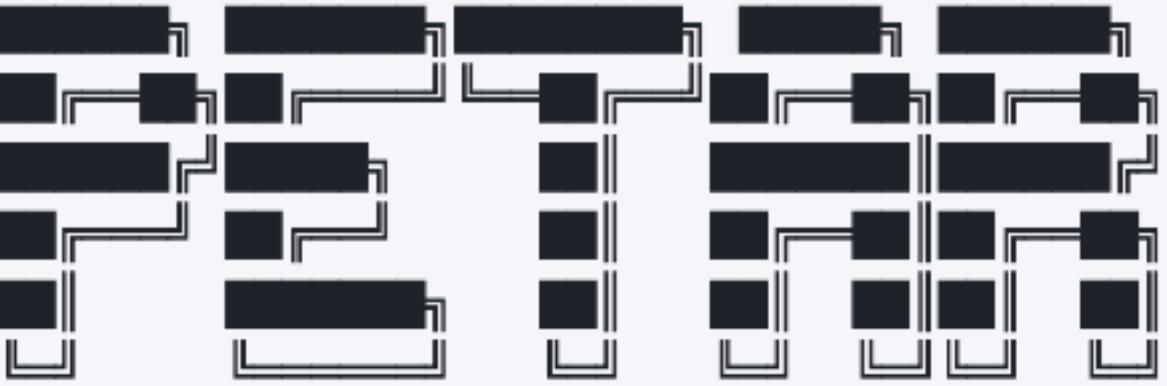
[MORE PHOTOS](#)

Current Institution: McGill University | Email: mattias.lazda@mail.mcgill.ca



Copyright © 2023 Mattias Lazda

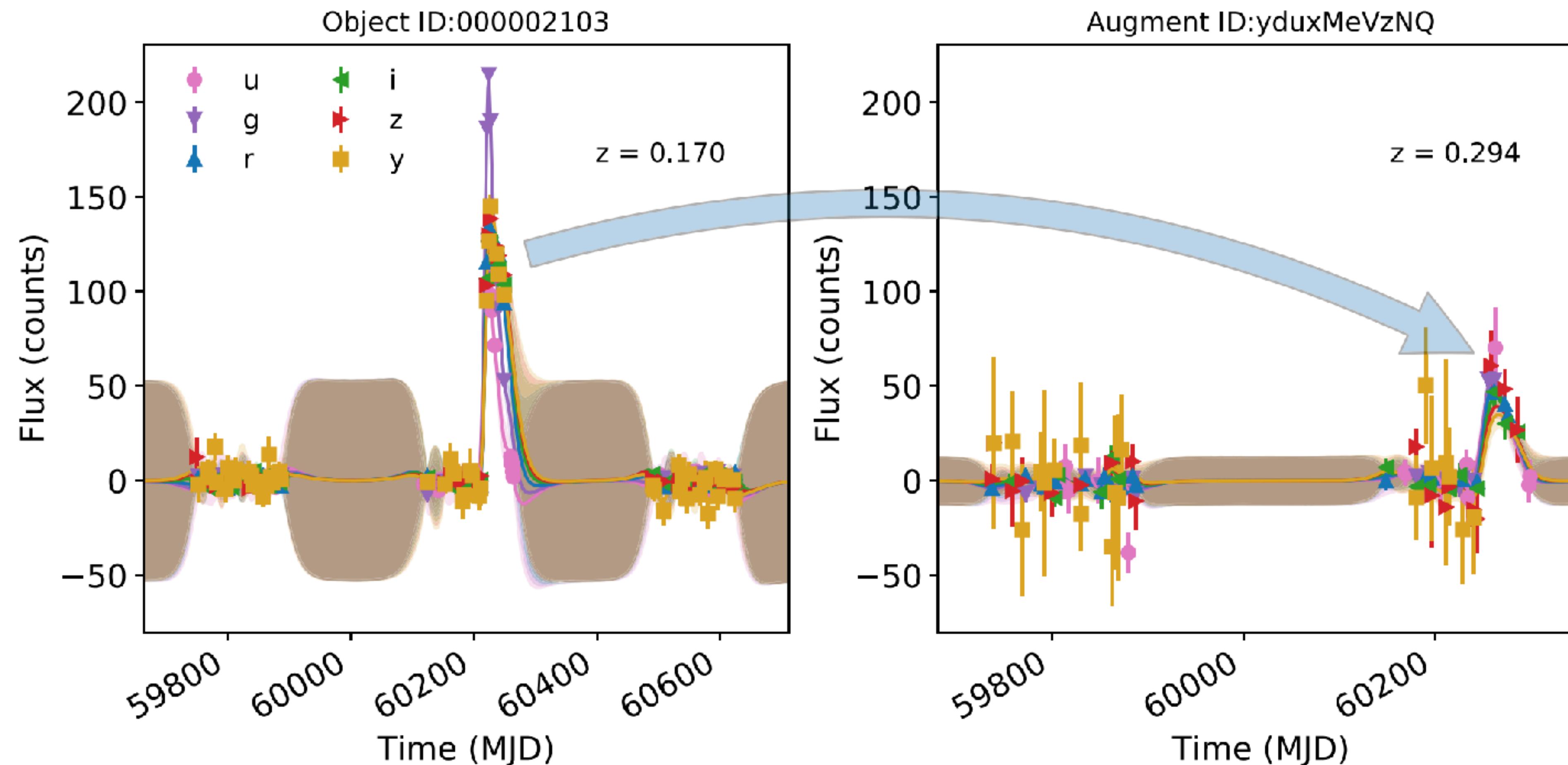
☰ README.md



PeTar is a N-body code designed to model collisional stellar systems, where multiplicity (binaries, triples ...) and close encounters are important for dynamical evolution. It combines three integration methods:

- The Barnes-Hut tree (Barnes & Hut 1986) is used to calculate long-range forces between particles, which are integrated with a second-order symplectic leap-frog integrator.
- The fourth-order Hermite integrator with block time steps (e.g., Aarseth 2003) is applied to integrate the orbits of stars and the centers-of-mass of multiple systems with short-range forces.
- The slow-down algorithmic regularization method (SDAR; Wang, Nitadori & Makino 2020) is used to integrate the multiple systems, such as hyperbolic encounters, binaries and hierarchical few-body systems.

This readme provide a complete and short documentation to describe how to install and use the code. Please carefully read it first before asking questions to developers. More detail of the algorithms are described in Wang et al. (2020, arXiv: <https://arxiv.org/abs/2006.16560>). The detailed documentation for developers is under

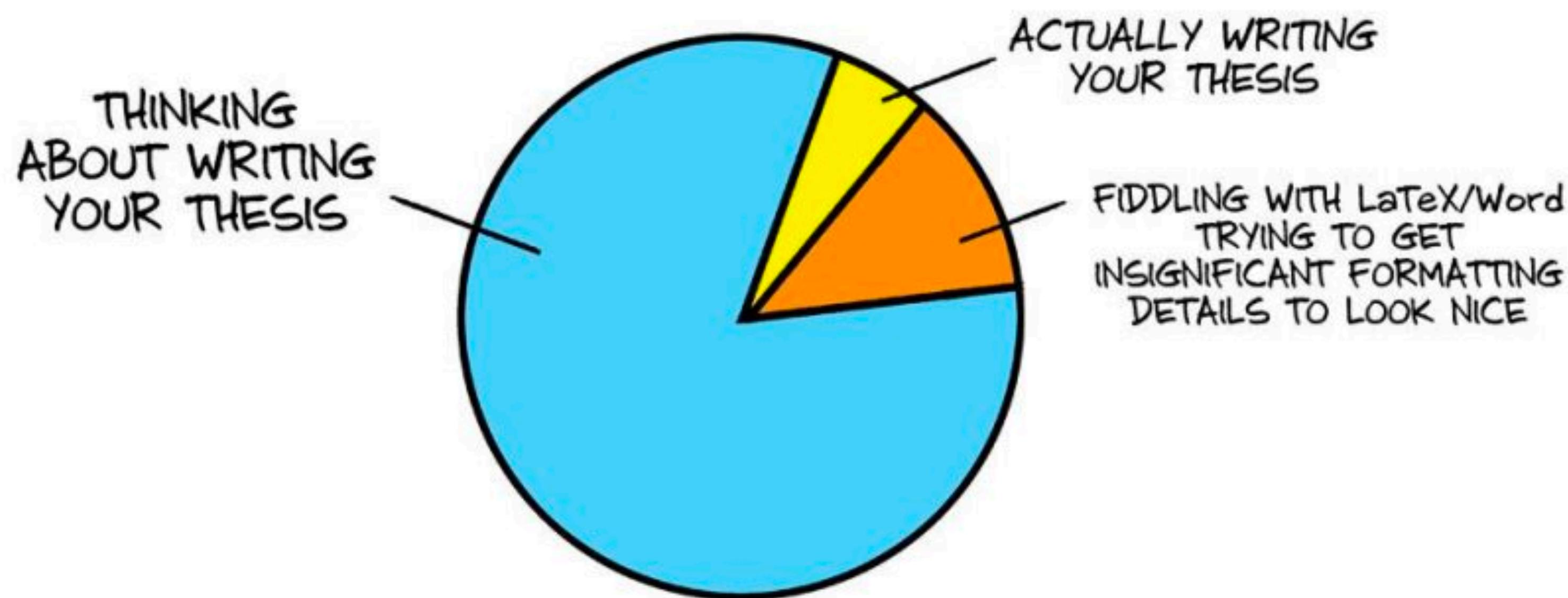


Hlozek et al. (2023)

Tools

LaTeX

WRITING YOUR THESIS:



LaTeX

- You all indicated that you know LaTeX already, so we won't go through it in detail here
- LaTeX to me has two parts:
 - Full system for producing scientific papers, books, reports, proposals, your dissertation —> write all text in plain text file, compile, get output
 - Math engine used far more broadly (e.g., MathJax on the web [incl. Jupyter notebooks], plot labels in matplotlib, equations in presentations)
- People at UofT generally publish either in AAS journals or MNRAS (probably on its way out...) —> use their LaTeX templates
- Use macros for units, consistency of terms/symbols, comments

```
% Basic setup. Most papers should leave these options alone.  
\documentclass[fleqn,usenatbib]{mnras}  
  
% MNRAS is set in Times font. If you don't have this installed (most LaTeX  
% installations will be fine) or prefer the old Computer Modern fonts,  
comment  
% out the following line  
\usepackage{newtxtext,newtxmath}  
% Depending on your LaTeX fonts installation, you might get better results  
with one of these:  
%\usepackage{mathptmx}  
%\usepackage{txfonts}  
  
% Use vector fonts, so it zooms properly in on-screen viewing software  
% Don't change these lines unless you know what you are doing  
\usepackage[T1]{fontenc}
```

```
++  
45 %%%%%% AUTHORS - PLACE YOUR OWN PACKAGES HERE %%%%%%  
46  
47 % Only include extra packages if you really need them. Common packages are:  
48 \usepackage{graphicx}    % Including figure files  
49 \usepackage{amsmath}     % Advanced maths commands  
50 % \usepackage{amssymb}   % Extra maths symbols  
51 \usepackage{color}  
52 \usepackage{tikz}  
53 \usetikzlibrary{positioning}  
54 %\usepackage{needspace}  
55 % hypertex insanity  
56 \definecolor{linkcolor}{rgb}{0,0,0.25}  
57 \hypersetup{  
58 colorlinks=true,          % false: boxed links; true: colored links  
59 linkcolor=blue,           % color of internal links  
60 citecolor=blue,            % color of links to bibliography  
61 filecolor=blue,             % color of file links  
62 urlcolor=blue,              % color of external links  
63 draft=False,  
64 }
```

```
84 \newcommand{\henry}[1]{\color{red} Henry: #1}
85 \definecolor{darkgreen}{rgb}{0.0, 0.7, 0.0}
86 \newcommand{\jo}[1]{\color{darkgreen} Jo asks/comments: #1}
87 \definecolor{darkblue}{rgb}{0.0, 0., 0.7}
88 \newcommand{\sugfig}[1]{\color{darkblue} Suggested Figure: #1}
89
90
91 \newcommand{\gaia}{\emph{Gaia}}
92 \newcommand{\tess}{\emph{TESS}}
93 \newcommand{\kepler}{\emph{Kepler}}
94 \newcommand{\tmass}{\emph{2MASS}}
95
96 \renewcommand{\vec}[1]{\ensuremath{\mathbf{#1}}}
97 \newcommand{\teff}{\ensuremath{T_{\mathrm{eff}}}}
98 \newcommand{\logg}{\ensuremath{\log g}}
99 \newcommand{\xh}[1]{\ensuremath{[\mathrm{#1/H}]}}
100 \newcommand{\xfe}[1]{\ensuremath{[\mathrm{#1/Fe}]}}
101 \newcommand{\cn}{\ensuremath{[\mathrm{C/N}]}}
102 \newcommand{\alpham}{\ensuremath{[\alpha/\mathrm{M}]}}
103 \newcommand{\dex}{\ensuremath{\mathrm{dex}}}
104 \newcommand{\um}{\ensuremath{\mu \mathrm{m}}}
```

```
137 % Title of the paper, and the short title which is used in the headers.  
138 % Keep the title short and informative.  
139 \title[Towards an astronomical foundation model for stars]{Towards an  
astronomical foundation model for stars with a Transformer-based model}  
140  
141 % The list of authors, and the short list which is used in the headers.  
142 % If you need two or more lines of authors, add an extra line using  
% \newauthor  
143 \author[Leung \& Bovy]{  
144 Henry W. Leung\$^{\{1\}}$\thanks{E-mail: henrysky.leung@utoronto.ca} \&  
145 Jo Bovy\$^{\{1,2\}}$  
146 \newauthor  
147 \\  
148 % List of institutions  
149 \$^{\{1\}}$David A. Dunlap Department of Astronomy and Astrophysics, University  
of Toronto, 50 St. George Street, Toronto, Ontario, M5S 3H4, Canada\\  
150 \$^{\{2\}}$Dunlap Institute for Astronomy and Astrophysics, University of  
Toronto, 50 St. George Street, Toronto, Ontario, M5S 3H4, Canada  
151 }  
152 % These dates will be filled out by the publisher  
153 \date{Accepted XXX. Received YYYY; in original form ZZZ}  
154  
155 % Enter the current year, for the copyright statements etc.  
156 \pubyear{2023}  
157  
158 % Don't change these lines  
159 \begin{document}  
160 \label{firstpage}  
161 \pagerange{\pageref{firstpage}--\pageref{lastpage}}  
162 \maketitle
```

Towards an astronomical foundation model for stars with a Transformer-based model

Henry W. Leung¹★ & Jo Bovy^{1,2}

¹*David A. Dunlap Department of Astronomy and Astrophysics, University of Toronto, 50 St. George Street, Toronto, Ontario, M5S 3H4, Canada*

²*Dunlap Institute for Astronomy and Astrophysics, University of Toronto, 50 St. George Street, Toronto, Ontario, M5S 3H4, Canada*

Accepted XXX. Received YYY; in original form ZZZ

Some useful LaTeX tools

- Detexify: hand-drawn symbol → LaTeX

The image consists of three separate screenshots arranged horizontally.

Screenshot 1 (Left): A vertical Sephora advertisement. At the top, it says "JUST DROPPED". Below are several beauty products: a dark bottle labeled "Gloss", a small bottle labeled "Ordinary", a white bottle labeled "function", and a white bottle labeled "JILLIAN FERNANDEZ". At the bottom, it says "SEPHORA" and "SHOP NOW".

Screenshot 2 (Middle): The Detexify website. It features a green "TD" logo and a "Get started today." button. Below that is a search bar with the word "Detexify" and two buttons: "classify" and "symbols". A large input field contains a hand-drawn black arrow pointing right. To its right is a red "X" button. Below the input field, the text "Want a Mac app?" is followed by a paragraph about the Mac app being stable and a link to a Vimeo video. Another paragraph discusses a restriction regarding unlicensed use. A "Buy Detexify for Mac" button and a "GUMROAD" logo are at the bottom.

Screenshot 3 (Right): A TD Insurance advertisement. It features a woman with curly hair looking at her phone. A green box on the right contains the text: "See how much you could save on home or car coverage with TD Insurance." and a "Get a quote" button. To the left of the woman, there is a list of LaTeX symbols and their scores:

- \curvearrowleft Score: 0.08443100140110471 \usepackage{ amssymb } \gtrsim mathmode
- $\approx\approx$ Score: 0.12348029554028109 \usepackage{ amssymb } \gtrapprox mathmode
- $\geq\geq$ Score: 0.13753207485740243 \usepackage{ amssymb } \geq mathmode
- $\succsim\succsim$ Score: 0.14061526630628612 \usepackage{ amssymb } \succsim mathmode
- $\geqq\geqq$ Score: 0.14814596849864098 \usepackage{ amssymb } \geqq mathmode

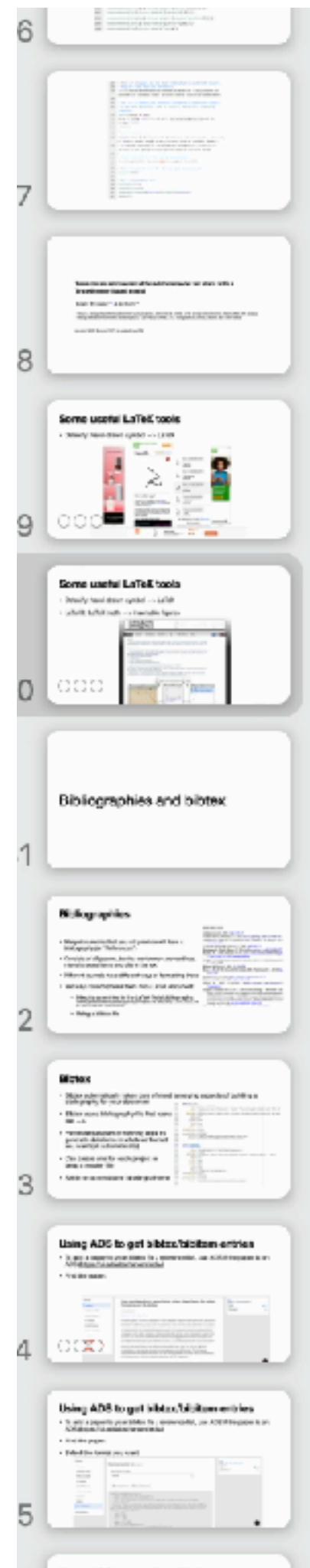
At the bottom of the advertisement, it says "Did this help?" and "Hosting Detexify costs money and if it helps you may".

Bottom Navigation: The bottom of the page includes links for "The Home Depot", "Gorilla Ladders 3-Step Steel Lightweight Step Stool Ladder Type II Duty Rating \$57.68 Shop Now", and a rating of "★★★★★ (54)".

Some useful LaTeX tools

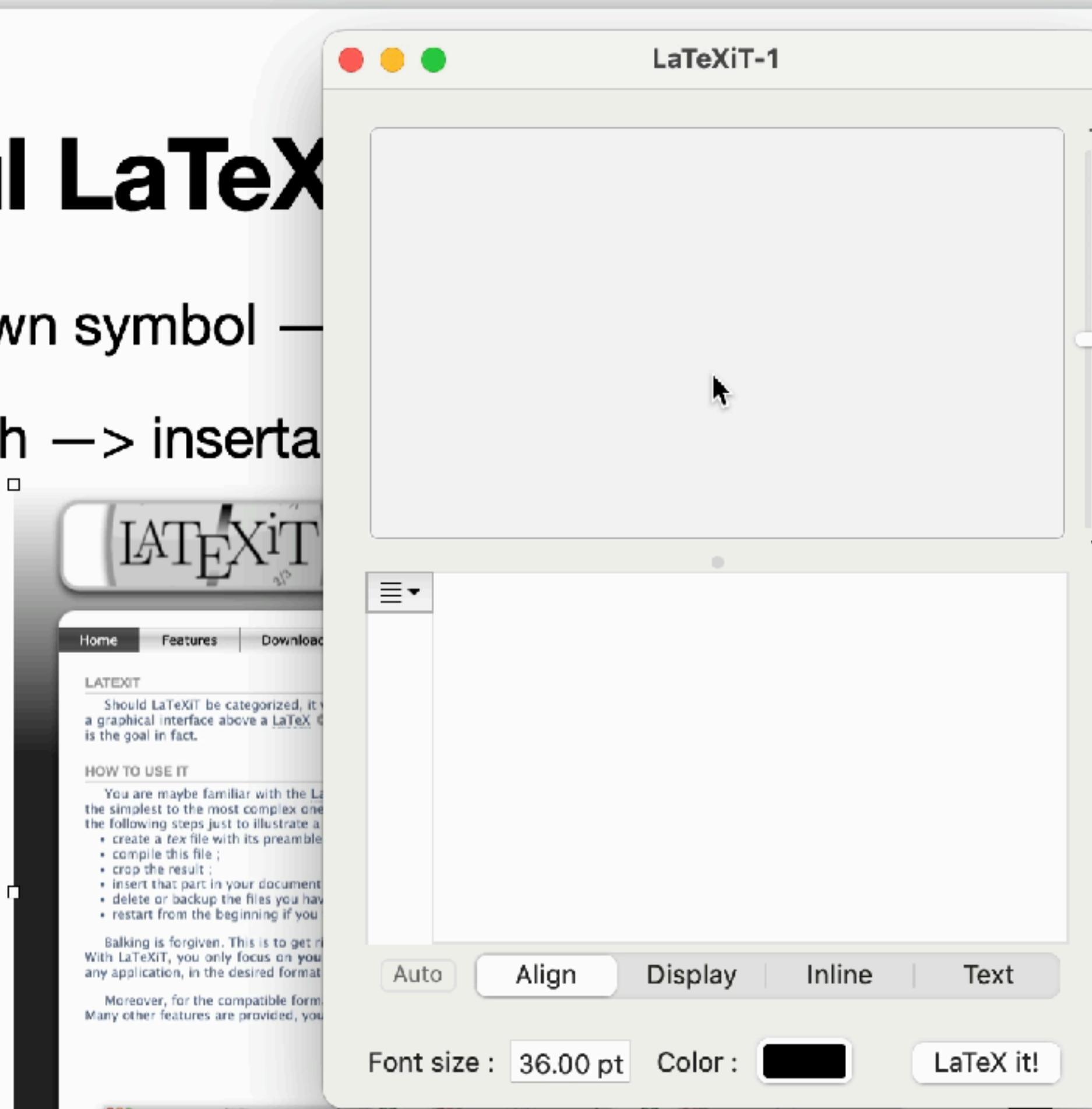
- Detexify: hand-drawn symbol → LaTeX
- LaTeXIt: LaTeX math → insertable figures





Some useful LaTeX

- [Detexify: hand-drawn symbol → LaTeX](#)
- [LaTeXiT: LaTeX math → insertion](#)



Some useful LaTeX tools

- Detexify: hand-drawn symbol → LaTeX
- LaTeXIt: LaTeX math → insertable figures
- AAS deluxetable: online tool from AAS: <https://authortools.aas.org/LATEX/make-latex.html>
- Astropy can also be useful in automatically generating tables

Bibliographies and bibtex

Bibliographies

- Many documents that you will produce will have a bibliography (or “References”)
- Consists of all papers, books, conference proceedings, miscellaneous items you cite in the text
- Different journals have different ways of formatting these
- Two ways to incorporate them into a LaTeX document:
 - Directly as entries in the LaTeX file’s bibliography:
`\bibitem[\protect\citeauthor{Bovy}{2015}]{2015ApJS..216...29B}` Bovy J., 2015, ApJS, 216, 29. doi:10.1088/0067-0049/216/2/29
 - Using a bibtex file

REFERENCES

- Abdurro’uf et al., 2022, [ApJS, 259, 35](#)
Allam Tarek J., McEwen J. D., 2021, [arXiv e-prints, p. arXiv:2105.06178](#)
Anderson L., Hogg D. W., Leistedt B., Price-Whelan A. M., Bovy J., 2018, [AJ, 156, 145](#)
Andrae R., Rix H.-W., Chandra V., 2023, [ApJS, 267, 8](#)
Bahdanau D., Cho K., Bengio Y., 2014, [arXiv e-prints, p. arXiv:1409.0473](#)
Barbary K., 2016, extinction v0.3.0, doi:10.5281/zenodo.804967, <https://doi.org/10.5281/zenodo.804967>
Bengio Y., Ducharme R., Vincent P., Janvin C., 2003, J. Mach. Learn. Res., 3, 1137–1155
Blanton M. R., et al., 2017, [AJ, 154, 28](#)
Bovy J., Rix H.-W., Green G. M., Schlafly E. F., Finkbeiner D. P., 2016, [ApJ, 818, 130](#)
Bubeck S., et al., 2023, [arXiv e-prints, p. arXiv:2303.12712](#)
Carrasco J. M., et al., 2021, [A&A, 652, A86](#)
Chase H., 2022, LangChain, <https://github.com/hwchase17/langchain>
Chopra S., Hadsell R., LeCun Y., 2005, in Proceedings - 2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, CVPR 2005. Proceedings - 2005 IEEE Computer Society Conference on Computer Vision and Pattern Recognition, CVPR 2005. IEEE Computer Society, pp 539–546, doi:10.1109/CVPR.2005.202

Bibtex

- Bibtex automatically takes care of most annoying aspects of building a bibliography for your document
- Bibtex use a bibliography file that looks like —>
- Processed as part of running latex to generate \bibitems in whatever format you want (all automatically)
- Can create one for each project or keep a master file
- Settle on a consistent labeling scheme

```
17951 @ARTICLE{Will08a,
17952   author = {{Will}, Clifford M.},
17953   title = "{Testing the General Relativistic ``No-Hair'' Theorems Using the Galactic Center Black Hol",
17954   journal = {\apjl},
17955   keywords = {black hole physics, Galaxy: center, relativity, Astrophysics, General Relativity and Quant
17956   | year = 2008,
17957   | month = feb,
17958   | volume = {674},
17959   | number = {1},
17960   | pages = {L25},
17961   | doi = {10.1086/528847},
17962   archivePrefix = {arXiv},
17963   | eprint = {0711.1677},
17964   primaryClass = {astro-ph},
17965   | adsurl = {https://ui.adsabs.harvard.edu/abs/2008ApJ...674L..25W},
17966   | adsnote = {Provided by the SAO/NASA Astrophysics Data System}
17967 }
17968
17969 @ARTICLE{Boehmer07a,
17970   author = {{B\{"o\}hmer}, C.\~G. and {Harko}, T.},
17971   title = "Can dark matter be a Bose Einstein condensate?",
17972   journal = {\jcap},
17973   keywords = {Astrophysics, General Relativity and Quantum Cosmology, High Energy Physics - Theory},
17974   | year = 2007,
17975   | month = jun,
17976   | volume = {2007},
17977   | number = {6},
17978   | eid = {025},
17979   | pages = {025},
17980   | doi = {10.1088/1475-7516/2007/06/025},
17981   archivePrefix = {arXiv},
17982   | eprint = {0705.4158},
17983   primaryClass = {astro-ph},
17984   | adsurl = {https://ui.adsabs.harvard.edu/abs/2007JCAP...06..025B},
17985   | adsnote = {Provided by the SAO/NASA Astrophysics Data System}
17986 }
```

Using ADS to get bibtex/bibitem entries

- To add a paper to your bibtex file / reference list, use ADS if the paper is on ADS (<https://ui.adsabs.harvard.edu/>)
- Find the paper:

The screenshot shows the ADS abstract page for the paper "Core condensation in heavy halos: a two-stage theory for galaxy formation and clustering" by White, S. D. M. and Rees, M. J. The page includes a sidebar with options like View, Abstract, Citations, References, Co-Reads, Similar Papers, Volume Content, Graphics, Metrics, and Export Citation (which is circled in red). The main content area displays the title, authors, abstract, and full text sources (ADS and Publisher).

VIEW

Abstract

Citations (3439)

References (25)

Co-Reads

Similar Papers

Volume Content

Graphics

Metrics

Export Citation

FEEDBACK

Core condensation in heavy halos: a two-stage theory for galaxy formation and clustering.

Show affiliations

White, S. D. M. ; Rees, M. J.

A model of galaxy formation is developed in which dissipation plays a role along with purely gravitational processes. The gist of the model is that the distribution of the dominant mass component on all scales arises from purely gravitational clustering, while the observed sizes and luminosity functions of galaxies are determined by gas-dynamical dissipative processes. The model accounts for the large amount of nongaseous 'dark matter', apparently making up about 80% or more of the virial mass in clusters such as Coma and which may constitute massive halos around large galaxies. At work is a process of self-similar gravitational clustering in an expanding universe. The clustering builds up in hierarchical fashion; the smaller-scale virialized systems merge into an amorphous whole when they are incorporated in a larger bound cluster. Residual gas in the resulting potential wells cools and acquires sufficient concentration to self-gravitate, forming luminous galaxies up to a limiting size. This limit agrees adequately with the masses, luminosities, and radii of large galaxies. On certain specific assumptions, a luminosity function is derived that agrees reasonably well with observation.

FULL TEXT SOURCES

ADS

Publisher

Using ADS to get bibtex/bibitem entries

- To add a paper to your bibtex file / reference list, use ADS if the paper is on ADS (<https://ui.adsabs.harvard.edu/>)
- Find the paper:
- Select the format you want:

The screenshot shows the ADS citation export interface. On the left, a sidebar lists various options: VIEW (Abstract, Citations (3439), References (25), Co-Reads, Similar Papers, Volume Content, Graphics, Metrics, Export Citation, FEEDBACK). The 'Export Citation' button is highlighted with a blue border. In the center, the main area displays 'Exporting record(s) 1 to 1 (total: 1)'. A 'Select Export Format' dropdown menu is open, showing 'BibTeX' as the selected option. Below it are two buttons: 'Download to File' and 'Copy to Clipboard'. A large text box contains the following BibTeX code:
```@ARTICLE{1978MNRAS.183..341W,  
author = {{White}, S.~D.~M. and {Rees}, M.~J.},  
title = "{Core condensation in heavy halos: a two-stage theory for galaxy formation and clustering.}",  
journal = {\mnras},  
keywords = {Astronomical Models, Galactic Clusters, Galactic Evolution, Galactic Nuclei, Gravitational Effects, Halos, Critical Mass, Dark Matter, Dynamic Models, Interstellar Gas, Luminosity, Many Body Problem, Red Shift, Astrophysics, Formation:Galaxies},  
year = 1978,  
month = may,  
volume = {183},  
pages = {341-358},  
doi = {10.1093/mnras/183.3.341},  
adsurl = {https://ui.adsabs.harvard.edu/abs/1978MNRAS.183..341W},  
}```  
On the right, a sidebar titled 'FULL TEXT SOURCES' offers links to 'ADS' and 'Publisher' with corresponding icons.

# Using ADS to get bibtex/bibitem entries

- To add a paper to your bibtex file / reference list, use ADS if the paper is on ADS (<https://ui.adsabs.harvard.edu/>)
- Find the paper:
- Select the format you want:

The screenshot shows the ADS citation export interface. On the left, a sidebar lists options like Abstract, Citations (3439), References (25), Co-Reads, Similar Papers, Volume Content, Graphics, Metrics, and Export Citation (which is highlighted in blue). The main area displays "Exporting record(s) 1 to 1 (total: 1)". It includes a "Select Export Format" dropdown set to "AASTeX", and buttons for "Download to File" and "Copy to Clipboard". Below this is a code snippet: 

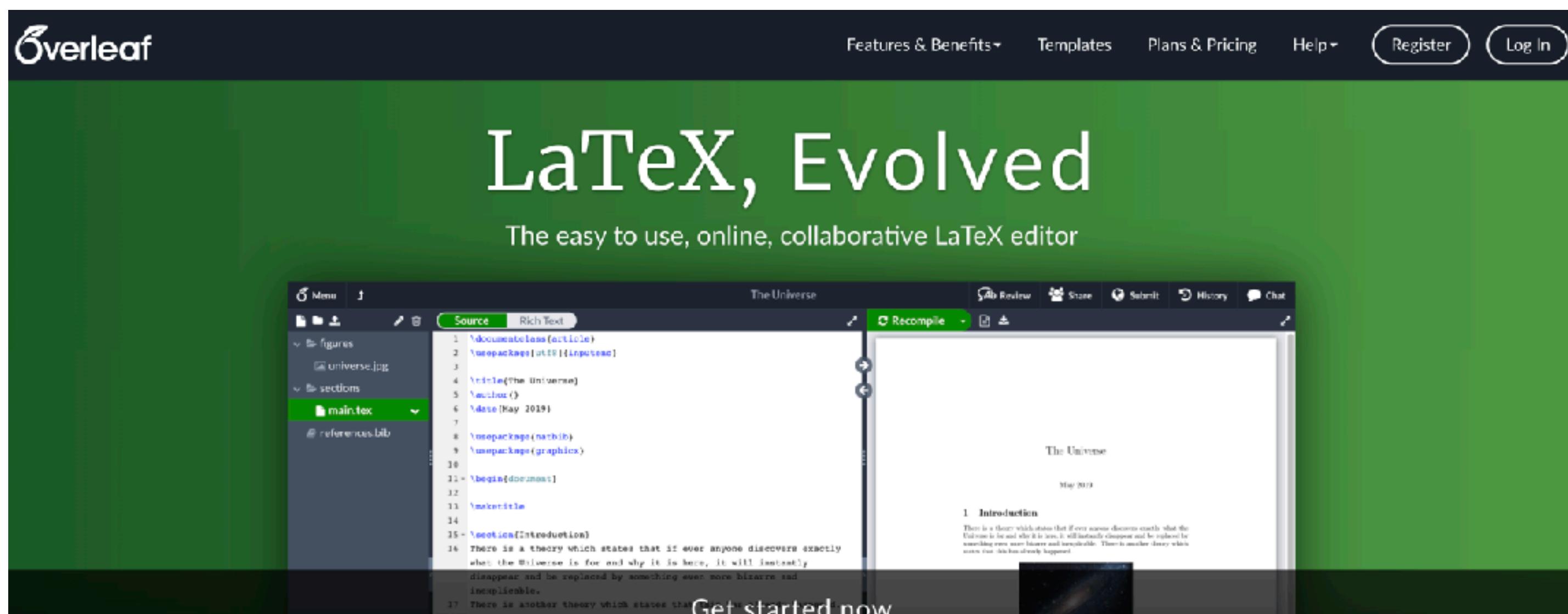
```
\bibitem[White \& Rees(1978)]{1978MNRAS.183..341W} White, S.~D.~M. \& Rees, M.~J. 1978, \mnras, 183, 341.
doi:10.1093/mnras/183.3.341
```

. On the right, a "FULL TEXT SOURCES" section shows links for ADS and Publisher.

# Overleaf

# Overleaf

- Most paper/proposal writing these days happens on [overleaf.com](https://overleaf.com)
- Advantages:
  - No need to install LaTeX and packages yourself
  - Straightforward real-time collaboration
  - Contains templates for many journals



Filters: All / Templates / Examples / Articles

# Templates

Start your projects with quality LaTeX templates for journals, CVs, resumes, papers, presentations, assignments, letters, project reports, and more. Search or browse below.

 Search

## Popular Tags



[Academic Journal](#)



[Bibliography](#)



[Book](#)



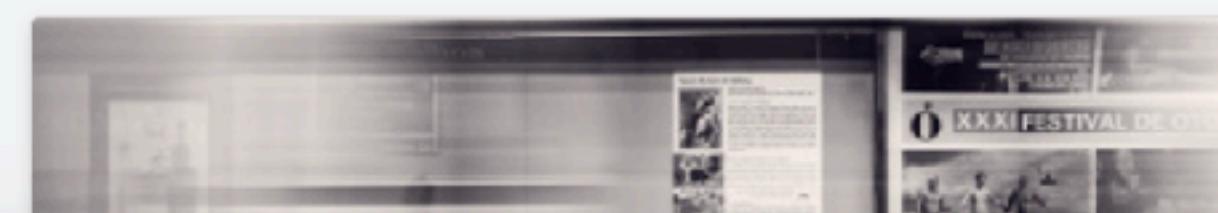
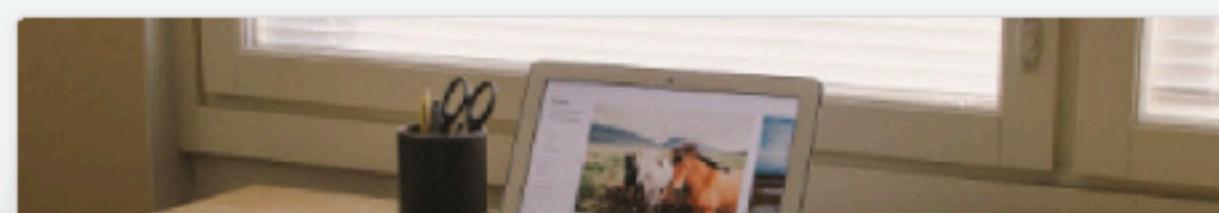
[Calendar](#)



[Résumé / CV](#)



[Formal Letter](#)



Filters: All / Templates / Examples / Articles

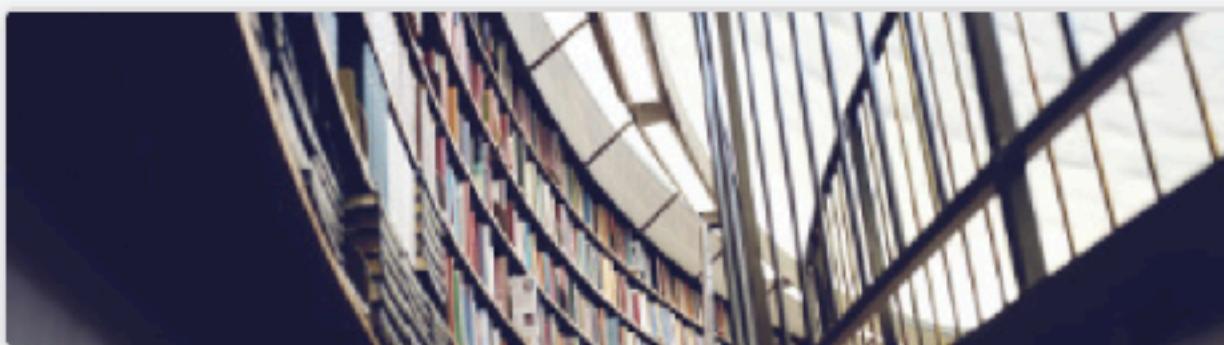
# Templates

Start your projects with quality LaTeX templates for journals, CVs, resumes, papers, presentations, assignments, letters, project reports, and more. Search or browse below.

AAS journals

Search

## Popular Tags



Academic Journal



Bibliography



Book



Calendar



Résumé / CV



Formal Letter



# Templates

Start your projects with quality LaTeX templates for journals, CVs, resumes, papers, presentations, assignments, letters, project reports, and more. Search or browse below.

Search

## AASTeX Template for submissions to AAS Journals (ApJ-AJ-ApJS-ApJL-PSJ-RNAAS) Official

The American Astronomical Society (AAS) has developed a markup package to assist authors in preparing manuscripts intended for submission to all the AAS-affiliated journals. The journals are the Astrophysical Journal (ApJ), the Astronomical Journal (AJ), ApJ Supplements (ApJS), Letters (ApJL), The Planetary Science Journal (PSJ), and Research Notes of the American Astronomical society (RNAAS). The latest LaTeX classfile is AASTeX v6.3.1 and it can be obtained here. The sample631.tex template uses this classfile to illustrate some ...

[Academic Journal](#)[American Astronomical Society](#)[Astronomy & Astrophysics](#)[American Astronomical Society - Official Templates](#)

## PASP (Publications of the Astronomical Society of the Pacific) AASTeX Template

This template contains details on how to prepare and submit your articles for publication in The Publications of the Astronomical Society of the Pacific. It is a modified version of the sample631.tex template from The American Astronomical Society (AAS) markup package. The latest LaTeX classfile is AASTeX v6.3.1 and it can be obtained here. The PASPsample631.tex template uses this classfile. Once your manuscript is complete, please visit this page to submit your manuscript: [https://mc04.manuscriptcentral...](https://mc04.manuscriptcentral.com)

[Academic Journal](#)[American Astronomical Society](#)

Menu AAS PUBLISHING Home AASTeX Template for submissions to AAS Journals (ApJ-AJ-ApJS-ApJL-PSJ-RNAAS) Review Share Submit to AAS History Layout Chat

Code Editor Visual Editor Recompile

aasjournal bst  
aastex631.cls  
orcid-ID.png  
sample631.bib  
**sample631.tex**  
samplefig.png

DRAFT VERSION SEPTEMBER 28, 2023  
Typeset using L<sup>A</sup>T<sub>E</sub>X default style in AASTeX631

Template AASTEXArticle with Examples: v6.3.1\*

GREG J. SCHWARZ<sup>1</sup>, AUGUST MUENCH,<sup>1</sup>  
(AAS JOURNALS DATA EDITORS)

F.X. TIMMERS,<sup>2,3</sup> AMY HENDRICKSON,<sup>4,†</sup> JULIE STEPHEN,<sup>5,†</sup>

<sup>1</sup>American Astronomical Society  
1667 K Street NW, Suite 800  
Washington, DC 20006, USA  
<sup>2</sup>Arizona State University  
<sup>3</sup>AAS Journals Associate Editor-in-Chief  
<sup>4</sup>TeXnology Inc.  
<sup>5</sup>AAS Director of Publishing

ABSTRACT

This example manuscript is intended to serve as a tutorial and template for authors to use when writing their own AAS Journal articles. The manuscript includes a history of AASTeX and includes figure and table examples to illustrate these features. Information on features not explicitly mentioned in the article can be viewed in the manuscript comments or more extensive online documentation. Authors are welcome replace the text, tables, figures, and bibliography with their own and submit the resulting manuscript to the AAS Journals peer review system. The first lesson in the tutorial is to remind authors that the AAS Journals, the Astrophysical Journal (ApJ), the Astrophysical Journal Letters (ApJL), the Astronomical Journal (AJ), and the Planetary Science Journal (PSJ) all have a 250 word limit for the abstract<sup>5</sup>. If you exceed this length the Editorial office will ask you to shorten it. This abstract has 161 words.

Keywords: Classical Novae (251) — Ultraviolet astronomy(1736) — History of astronomy(1868) — Interdisciplinary astronomy(804)

1. INTRODUCTION

L<sup>A</sup>T<sub>E</sub>X<sup>1</sup> is a document markup language that is particularly well suited for the publication of mathematical and scientific articles (Lamport 1994). L<sup>A</sup>T<sub>E</sub>X was written in 1985 by Leslie Lamport who based it on the T<sub>E</sub>X typesetting language which itself was created by Donald E. Knuth in 1978. In 1988 a suite of L<sup>A</sup>T<sub>E</sub>X macros were developed to investigate electronic submission and publication of AAS Journal articles (Hanisch & Biemesderfer 1989). Shortly afterwards, Chris Biemesderfer merged these macros and more into a L<sup>A</sup>T<sub>E</sub>X 2.08 style file called AASTeX. These early AASTeX versions introduced many common commands and practices that authors take for granted today. Substantial revisions were made by Lee Brotzman and Pierre Landau when the package was updated to v4.0. AASTeX v5.0, written in 1995 by Arthur Ogawa, upgraded to L<sup>A</sup>T<sub>E</sub>X 2e which uses the document class in lieu of a style file. Other improvements to version 5 included hypertext support, landscape deluxetables and improved figure support to facilitate electronic submission. AASTeX v5.2 was released in 2005 and introduced additional graphics support plus new mark up to identifier astronomical objects, datasets and facilities.

1 %% Beginning of file 'sample631.tex'  
2 %%  
3 %% Modified 2022 May  
4 %%  
5 %% This is a sample manuscript marked up using the  
6 %% AASTeX v6.31 L<sup>A</sup>T<sub>E</sub>X 2e macros.  
7 %%  
8 %% AASTeX is now based on Alexey Vikhlinin's emulateapj.cls  
9 %% (Copyright 2000–2015). See the classfile for details.  
10 %%  
11 %% AASTeX requires revtex4-1.cls and other external packages such as  
12 %% latexsym, graphicx, amssymb, longtable, and epsf. Note that as of  
13 %% Oct 2020, APS now uses revtex4.2e for its journals but remember that  
14 %% AASTeX v6+ still uses v4.1. All of these external packages should  
15 %% already be present in the modern TeX distributions but not always.  
16 %% For example, revtex4.1 seems to be missing in the linux version of  
17 %% TexLive 2020. One should be able to get all packages from www.ctan.org.  
18 %% In particular, revtex v4.1 can be found at  
19 %% <https://www.ctan.org/pkg/revtex4-1>.  
20 %%  
21 %% The first piece of markup in an AASTeX v6.x document is the \documentclass  
22 %% command. L<sup>A</sup>T<sub>E</sub>X will ignore any data that comes before this command. The  
23 %% documentclass can take an optional argument to modify the output style.  
24 %% The command below calls the preprint style which will produce a tightly  
25 %% typeset, one-column, single-spaced document. It is the default and thus  
26 %% does not need to be explicitly stated.  
27 %%  
28 %% using aastex version 6.3  
29 \documentclass[linenumber]{aastex631}  
30 %%  
31 %% The default is a single spaced, 10 point font, single spaced article.  
32 %% There are 5 other style options available via an optional argument. They  
33 %% can be invoked like this:  
34 %%  
35 %% \documentclass[arguments]{aastex631}  
36 %%

# Are you using the Overleaf submit to arXiv feature?

arXiv expects a zip submission that includes some of the generated files from your project. These files can be obtained directly (see: [View Generated Files](#)), but the **Submit to arXiv** option under the **Submit** button will provide you with a zip file with these included. This option is provided under the **online repositories** section of the Submit menu. If your project is using a dedicated journal template, the **Submit** button may not include options other than the journal for the template. To see all submit options, including arXiv, please make a copy of your project: the **Submit** button on the copy will include all options, not just the journal for the template.

Menu AAS PUBLISHING Home AASTeX Template for submissions to AAS Journals (ApJ-AJ-ApJS-ApJL-PSJ-RNAAS) Review Share Submit to AAS History Layout Chat

Code Editor Visual Editor Recompile 3

aasjournal.lst  
aastex631.cls  
orcid-ID.png  
sample631.bib  
**sample631.tex**  
samplefig.png

DRAFT VERSION SEPTEMBER 28, 2023  
Typeset using L<sup>A</sup>T<sub>E</sub>X default style in AASTeX631

Template AASTeXArticle with Examples: v6.3.1\*

GREG J. SCHWARZ,<sup>1</sup> AUGUST MUENCH,<sup>1</sup>  
(AAS JOURNALS DATA EDITORS)

F.X. TIMMES,<sup>2,3</sup> AMY HRNDRICKSON,<sup>4,1</sup> JULIE STREFFER,<sup>5,1</sup>

<sup>1</sup>American Astronomical Society  
1607 K Street NW, Suite 800  
Washington, DC 20006, USA  
<sup>2</sup>Arizona State University  
<sup>3</sup>AAS Journals Associate Editor-in-Chief  
<sup>4</sup>TeXnology Inc.  
<sup>5</sup>AAS Director of Publishing

ABSTRACT

This example manuscript is intended to serve as a tutorial and template for authors to use when writing their own AAS Journal articles. The manuscript includes a history of AASTeX and includes figure and table examples to illustrate these features. Information on features not explicitly mentioned in the article can be viewed in the manuscript comments or more extensive online documentation. Authors are welcome replace the text, tables, figures, and bibliography with their own and submit the resulting manuscript to the AAS Journals peer review system. The first lesson in the tutorial is to remind authors that the AAS Journals, the Astrophysical Journal (ApJ), the Astrophysical Journal Letters (ApJL), the Astronomical Journal (AJ), and the Planetary Science Journal (PSJ) all have a 250 word limit for the abstract<sup>a</sup>. If you exceed this length the Editorial office will ask you to shorten it. This abstract has 161 words.

Keywords: Classical Novae (251) — Ultraviolet astronomy(1736) — History of astronomy(1868) — Interdisciplinary astronomy(804)

1. INTRODUCTION

L<sup>A</sup>T<sub>E</sub>X<sup>1</sup> is a document markup language that is particularly well suited for the publication of mathematical and scientific articles (Lamport 1994). L<sup>A</sup>T<sub>E</sub>X was written in 1985 by Leslie Lamport who based it on the T<sub>E</sub>X typesetting language which itself was created by Donald E. Knuth in 1978. In 1988 a suite of L<sup>A</sup>T<sub>E</sub>X macros were developed to investigate electronic submission and publication of AAS Journal articles (Hanisch & Biemesderfer 1989). Shortly afterwards, Chris Biemesderfer merged these macros and more into a L<sup>A</sup>T<sub>E</sub>X 2.08 style file called AASTeX. These early AASTeX versions introduced many common commands and practices that authors take for granted today. Substantial revisions were made by Lee Brotzman and Pierre Landau when the package was updated to v4.0. AASTeX v5.0, written in 1995 by Arthur Ogawa, upgraded to L<sup>A</sup>T<sub>E</sub>X 2e which uses the document class in lieu of a style file. Other improvements to version 5 included hypertext support, landscape deluxtables and improved figure support to facilitate electronic submission. AASTeX v5.2 was released in 2006 and introduced additional graphics support plus new mark up to identifier astronomical objects, datasets and facilities.

1 %% Beginning of file 'sample631.tex'  
2 %%  
3 %% Modified 2022 May  
4 %%  
5 %% This is a sample manuscript marked up using the  
6 %% AASTeX v6.31 L<sup>A</sup>T<sub>E</sub>X 2e macros.  
7 %%  
8 %% AASTeX is now based on Alexey Vikhlinin's emulateapj.cls  
9 %% (Copyright 2000-2015). See the classfile for details.  
10 %%  
11 %% AASTeX requires revtex4-1.cls and other external packages such as  
12 %% latexsym, graphicx, amssymb, longtable, and epsf. Note that as of  
13 %% Oct 2020, APS now uses revtex4.2e for its journals but remember that  
14 %% AASTeX v6+ still uses v4.1. All of these external packages should  
15 %% already be present in the modern TeX distributions but not always.  
16 %% For example, revtex4.1 seems to be missing in the linux version of  
17 %% TexLive 2020. One should be able to get all packages from www.ctan.org.  
18 %% In particular, revtex v4.1 can be found at  
19 %% <https://www.ctan.org/pkg/revtex4-1>.  
20 %%  
21 %% The first piece of markup in an AASTeX v6.x document is the \documentclass  
22 %% command. L<sup>A</sup>T<sub>E</sub>X will ignore any data that comes before this command. The  
23 %% documentclass can take an optional argument to modify the output style.  
24 %% The command below calls the preprint style which will produce a tightly  
25 %% typeset, one-column, single-spaced document. It is the default and thus  
26 %% does not need to be explicitly stated.  
27 %%  
28 %% using aastex version 6.3  
29 \documentclass[linenumbers]{aastex631}  
30 %%  
31 %% The default is a single spaced, 10 point font, single spaced article.  
32 %% There are 5 other style options available via an optional argument. They  
33 %% can be invoked like this:  
34 %%  
35 %% \documentclass[arguments]{aastex631}  
36 %%

Download

Source PDF

Actions

**Copy Project**

Word Count

Sync

Dropbox

Git

GitHub

Settings

Compiler pdfLaTeX

TeX Live version 2023

Main document sample631.tex

Spell check English

Dictionary Edit

Auto-complete On

Auto-close Brackets On

Template for submissions to AAS Journals (ApJ-AJ-ApJS-ApJL-PSJ-RNAAS)

Editor | Normal text | B I |  $\Sigma$   $\Omega$  | ... | Q | Recompile | 3 | Download

of file 'sample631.tex'

2022 May

sample manuscript marked up using the v6.31 LaTeX 2e macros.

now based on Alexey Vikhlinin's emulateapj.cls (2000–2015). See the classfile for details.

quires revtex4-1.cls and other external packages such as graphicx, amssymb, longtable, and epsf. Note that as of APS now uses revtex4.2e for its journals but remember that + still uses v4.1. All of these external packages should be present in the modern TeX distributions but not always. le, revtex4.1 seems to be missing in the linux version of 0.20. One should be able to get all packages from www.ctan.org. ular, revtex v4.1 can be found at www.ctan.org/pkg/revtex4-1.

piece of markup in an AASTeX v6.x document is the \documentclass{aastex631}. LaTeX will ignore any data that comes before this command. The class can take an optional argument to modify the output style. nd below calls the preprint style which will produce a tightly one-column, single-spaced document. It is the default and thus need to be explicitly stated.

tex version 6.3

ss[linenumbers]{aastex631}

It is a single spaced, 10 point font, single spaced article. 5 other style options available via an optional argument. They invoked like this:

class[arguments]{aastex631}

DRAFT VERSION SEPTEMBER 28, 2023  
Typeset using L<sup>A</sup>T<sub>E</sub>X default style in AASTeX631

Template AASTeXArticle with Examples: v6.3.1\*

GREG J. SCHWARZ,<sup>1</sup> AUGUST MUENCH,<sup>1</sup>  
(AAS JOURNALS DATA EDITORS)

F.X. TIMMES,<sup>2,3</sup> AMY HENDRICKSON,<sup>4,1</sup> JULIE STEFFEN,<sup>5,1</sup>

<sup>1</sup> American Astronomical Society  
1667 K Street NW, Suite 800  
Washington, DC 20006, USA

<sup>2</sup> Arizona State University

<sup>3</sup> AAS Journals Associate Editor-in-Chief

<sup>4</sup> TeXnology Inc.

<sup>5</sup> AAS Director of Publishing

ABSTRACT

This example manuscript is intended to serve as a tutorial and template for authors to use when writing their own AAS Journal articles. The manuscript includes a history of AASTeX and includes figure and table examples to illustrate these features. Information on features not explicitly mentioned in the article can be viewed in the manuscript comments or more extensive online documentation. Authors are welcome replace the text, tables, figures, and bibliography with their own and submit the resulting manuscript to the AAS Journals peer review system. The first lesson in the tutorial is to remind authors that the AAS Journals, the Astrophysical Journal (ApJ), the Astrophysical Journal Letters (ApJL), the Astronomical Journal (AJ), and the Planetary Science Journal (PSJ) all have a 250 word limit for the abstract<sup>a</sup>. If you exceed this length the Editorial office will ask you to shorten it. This abstract has 161 words.

Keywords: Classical Novae (251) — Ultraviolet astronomy(1736) — History of astronomy(1868) — Interdisciplinary astronomy(804)

1. INTRODUCTION

LaTeX<sup>b</sup> is a document markup language that is particularly well suited for the publication of mathematical and scientific articles (Lamport 1994). LaTeX was written in 1985 by Leslie Lamport who based it on the TeX typesetting language which itself was created by Donald E. Knuth in 1978. In 1988 a suite of LaTeX macros were developed to investigate electronic submission and publication of AAS Journal articles (Hanisch & Biemesderfer 1989). Shortly afterwards, Chris Biemesderfer merged these macros and more into a LaTeX 2.08 style file called AASTeX. These early AASTeX versions introduced many common commands and practices that authors take for granted today. Substantial revisions were made by Lee Brotzman and Pierre Landau when the package was updated to v4.0. AASTeX v5.0, written in 1995 by Arthur Ogawa, upgraded to LaTeX 2e which uses the document class in lieu of a style file. Other improvements to version 5 included hypertext support, landscape deluxtables and improved figure support to facilitate electronic submission. AASTeX v5.2 was released in 2005 and introduced additional graphics support plus new mark up to identifier astronomical objects, datasets and facilities.

Menu Home AASTeX Template for submissions to AAS Journals (ApJ-AJ-ApJS-ApJL-PSJ-RNAAS) (Copy) Review Share Submit History Layout Chat

Code Editor Visual Editor Normal text B I  $\Sigma$   $\Omega$  Recompile

aasjournal bst  
aastex631.cls  
orcid-ID.png  
sample631.bib  
**sample631.tex**  
samplefig.png

DRAFT VERSION SEPTEMBER 28, 2023  
Typeset using L<sup>A</sup>T<sub>E</sub>X default style in AASTeX631

Template AASTEXArticle with Examples: v6.3.1\*

GREG J. SCHWARZ,<sup>1</sup> AUGUST MUENCH,<sup>1</sup>  
(AAS JOURNALS DATA EDITORS)

F.X. TIMMES,<sup>2,3</sup> AMY HENDRICKSON,<sup>4,†</sup> JULIE STEFFEN,<sup>5,1</sup>

<sup>1</sup>American Astronomical Society  
1667 K Street NW, Suite 300  
Washington, DC 20006, USA  
<sup>2</sup>Arizona State University  
<sup>3</sup>AAS Journals Associate Editor-in-Chief  
<sup>4</sup>TechXology Inc.  
<sup>5</sup>AAS Director of Publishing

ABSTRACT

This example manuscript is intended to serve as a tutorial and template for authors to use when writing their own AAS Journal articles. The manuscript includes a history of AASTeX and includes figure and table examples to illustrate these features. Information on features not explicitly mentioned in the article can be viewed in the manuscript comments or more extensive online documentation. Authors are welcome replace the text, tables, figures, and bibliography with their own and submit the resulting manuscript to the AAS Journals peer review system. The first lesson in the tutorial is to remind authors that the AAS Journals, the Astrophysical Journal (ApJ), the Astrophysical Journal Letters (ApJL), the Astronomical Journal (AJ), and the Planetary Science Journal (PSJ) all have a 250 word limit for the abstract<sup>a)</sup>. If you exceed this length the Editorial office will ask you to shorten it. This abstract has 161 words.

Keywords: Classical Novae (251) — Ultraviolet astronomy(1736) — History of astronomy(1868) — Interdisciplinary astronomy(804)

1. INTRODUCTION

L<sup>A</sup>T<sub>E</sub>X<sup>1</sup> is a document markup language that is particularly well suited for the publication of mathematical and scientific articles (Lamport 1994). L<sup>A</sup>T<sub>E</sub>X was written in 1985 by Leslie Lamport who based it on the T<sub>E</sub>X typesetting language which itself was created by Donald E. Knuth in 1978. In 1988 a suite of L<sup>A</sup>T<sub>E</sub>X macros were developed to investigate electronic submission and publication of AAS Journal articles (Hanisch & Biemesderfer 1989). Shortly afterwards, Chris Biemesderfer merged these macros and more into a L<sup>A</sup>T<sub>E</sub>X 2.08 style file called AASTeX. These early AASTeX versions introduced many common commands and practices that authors take for granted today. Substantial revisions were made by Lee Brotzman and Pierre Landau when the package was updated to v4.0. AASTeX v5.0, written in 1995 by Arthur Ogawa, upgraded to L<sup>A</sup>T<sub>E</sub>X 2<sup>c</sup> which uses the document class in lieu of a style file. Other improvements to version 5 included hypertext support, landscape deluxetables and improved figure support to facilitate electronic submission. AASTeX v5.2 was released in 2005 and introduced additional graphics support plus new mark

1 Beginning of file 'sample631.tex'  
2  
3 Modified 2022 May  
4  
5 This is a sample manuscript marked up using the  
6 AASTeX v6.31 L<sup>A</sup>T<sub>E</sub>X 2<sup>c</sup> macros.  
7  
8 AASTeX is now based on Alexey Vikhlinin's emulateapj.cls  
9 (Copyright 2000–2015). See the classfile for details.  
10  
11 AASTeX requires revtex4-1.cls and other external packages such as  
12 latexsym, graphicx, amssymb, longtable, and epsf. Note that as of  
13 Oct 2020, APS now uses revtex4.2e for its journals but remember that  
14 AASTeX v6+ still uses v4.1. All of these external packages should  
15 already be present in the modern TeX distributions but not always.  
16 For example, revtex4.1 seems to be missing in the linux version of  
17 TexLive 2020. One should be able to get all packages from www.ctan.org.  
18 In particular, revtex v4.1 can be found at  
19 <https://www.ctan.org/pkg/revtex4-1>.  
20  
21 The first piece of markup in an AASTeX v6.x document is the \documentclass  
22 command. L<sup>A</sup>T<sub>E</sub>X will ignore any data that comes before this command. The  
23 documentclass can take an optional argument to modify the output style.  
24 The command below calls the preprint style which will produce a tightly  
25 typeset, one-column, single-spaced document. It is the default and thus  
26 does not need to be explicitly stated.  
27  
28 using aastex version 6.3  
29 \documentclass[linenumbers]{aastex631}  
30  
31 The default is a single spaced, 10 point font, single spaced article.  
32 There are 5 other style options available via an optional argument. They  
33 can be invoked like this:  
34  
35 \documentclass[arguments]{aastex631}

Menu Home AASTeX Template for submissions to AAS Journals (ApJ-AJ-ApJS-ApJL-PSJ-RNAAS) (Copy) Review Share Submit History Layout Chat

Code Editor View

aasjournal bst  
aastex631.cls  
orcid-ID.png  
sample631.bib  
sample631.tex  
samplefig.png

File outline

- Introduction
- Manuscript styles
- Floats
- Tables
  - Splitting a table
  - Figures
  - Enhanced graphics
- Software and third party tools
- Appendix information
- Gold Open Access
- Author publication metrics
- Rotating tables
- Using Chinese characters

Submit

Featured

Overleaf Gallery

Overleaf Gallery

Share your document publicly as a LaTeX template to be reused by others right here on Overleaf.

Submit as a template

F1000Research

F1000 Research

The Open Science publishing platform for life scientists with immediate publication and transparent refereeing.

Submit to F1000Research

Search

Academic Journals, Online Repositories, Author Services or Conference Proceedings

Academic Journals

F1000Research

F1000 Research

The Open Science publishing platform for life scientists with immediate publication and transparent refereeing.

PeerJ Journal

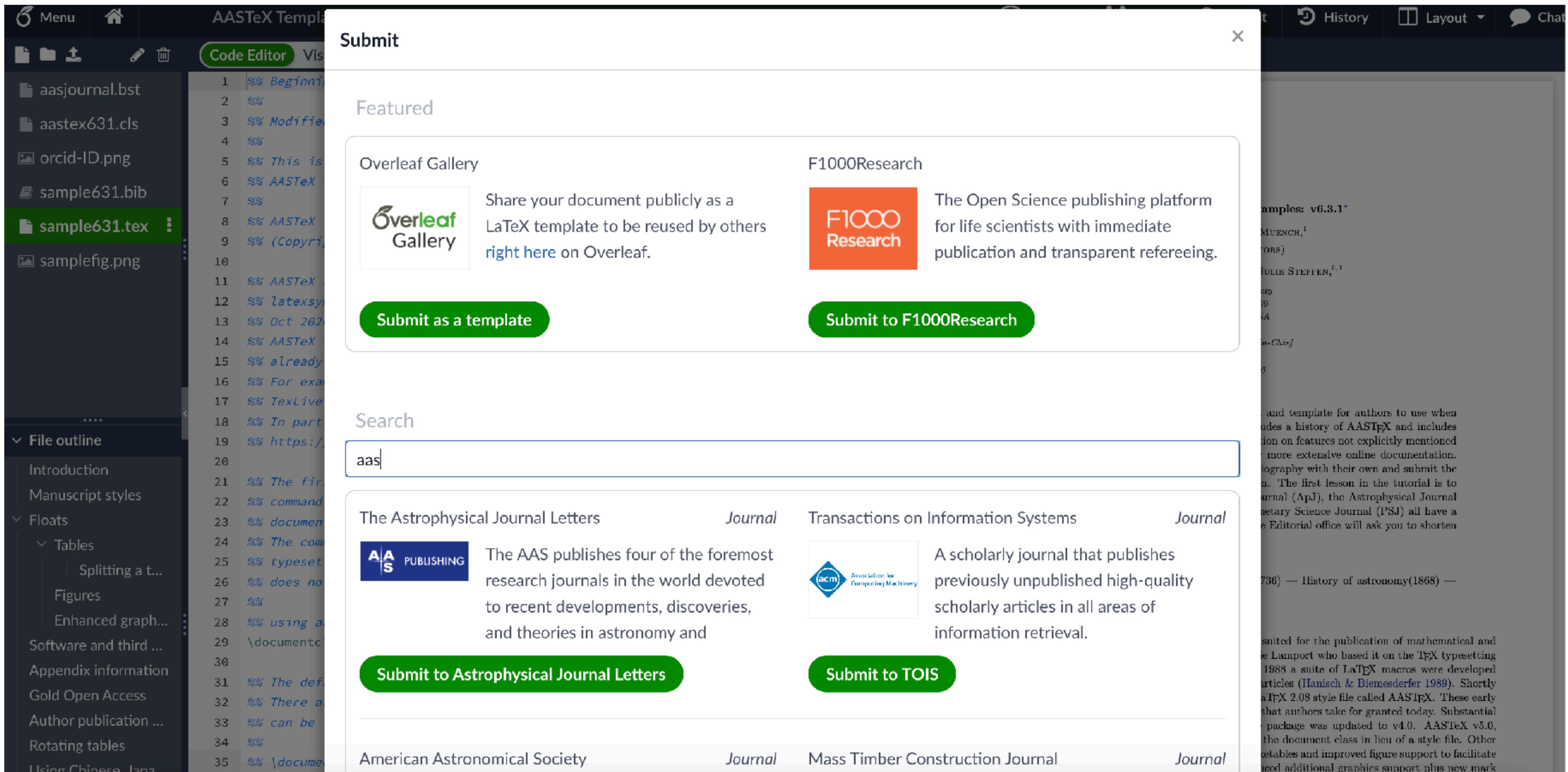
PeerJ

PeerJ is an Open Access publisher of scholarly articles, serving the Biological and Medical sciences.

samples: v6.3.1\*  
MUENCH,<sup>1</sup>  
(ORS)  
CLIE STEPPEN,<sup>1</sup>  
ety  
10  
TA  
n-Chief  
9

and template for authors to use when includes a history of AASTeX and includes on features not explicitly mentioned more extensive online documentation. biography with their own and submit the n. The first lesson in the tutorial is to journal (ApJ), the Astrophysical Journaletary Science Journal (PSJ) all have a e Editorial office will ask you to shorten  
736) — History of astronomy(1868) —

suit for the publication of mathematical and e Lamport who based it on the TeX typesetting 1988 a suite of LaTEX macros were developed articles (Hanisch & Biemesderfer 1989). Shortly aTeX 2.08 style file called AASTeX. These early that authors take for granted today. Substantial package was updated to v4.0. AASTeX v5.0, the document class in lieu of a style file. Other tables and improved figure support to facilitate additional graphics support plus new mark



Menu Home AASTeX Template

Submit

Featured

Overleaf Gallery

Share your document publicly as a LaTeX template to be reused by others right here on Overleaf.

Overleaf Gallery

Submit as a template

F1000Research

The Open Science publishing platform for life scientists with immediate publication and transparent refereeing.

F1000 Research

Submit to F1000Research

Search

arxiv

arXiv

arXiv is an open repository of scientific preprints in fields such as mathematics, physics, astronomy, computer science.

arXiv.org

INArxiv

INArxiv is a multidisciplinary preprint service built and managed by the Indonesian open science community.

INArxiv

Submit your paper to the arXiv

Submit to the INArxiv

MarXiv

SocArXiv

Repository Repository

and template for authors to use when does a history of AASTeX and includes ion features not explicitly mentioned more extensive online documentation. ography with their own and submit the n. The first lesson in the tutorial is to urnal (ApJ), the Astrophysical Journal etary Science Journal (PSJ) all have a Editorial office will ask you to shorten

736) — History of astronomy(1868) —

sued for the publication of mathematical and le Lamport who based it on the TeX typesetting 1988 a suite of LaTEX macros were developed articles (Hanisch & Biemesderfer 1989). Shortly aTeX 2.08 style file called AASTeX. These early that authors take for granted today. Substantial package was updated to v4.0. AASTeX v5.0, the document class in lieu of a style file. Other tables and improved figure support to facilitate ced additional graphics support plus new mark

File outline

- Introduction
- Manuscript styles
- Floats
  - Tables
    - Splitting a t...
  - Figures
  - Enhanced graph...
- Software and third ...
- Appendix information
- Gold Open Access
- Author publication ...
- Rotating tables
- Using Chinese, Japa...

1 %% Beginnings  
2 %%  
3 %% Modified  
4 %%  
5 %% This is  
6 %% AASTeX  
7 %%  
8 %% AASTeX  
9 %% (Copyrig  
10 %% AASTeX  
11 %% latexsyn  
12 %% Oct 202  
13 %% AASTeX  
14 %% already  
15 %% For exa  
16 %% TexLive  
17 %% In part  
18 %% https://  
19 %% The fir  
20 %% command  
21 %% documen  
22 %% The com  
23 %% typeset  
24 %% does no  
25 %%  
26 %% using a  
27 %%\documentc  
28 %% The de  
29 %% There a  
30 %% can be  
31 %%\doucume  
32 %% The de  
33 %% There a  
34 %% can be  
35 %%\douceme

Menu Home AASTeX Template for submissions to AAS Journals (ApJ-AJ-ApJS-ApJL-PSJ-RNAAS) (Copy) Review Share Submit History Layout Chat

**Code Editor** View

aasjournal bst  
aastex631.cls  
orcid-ID.png  
sample631.bib  
**sample631.tex**  
samplefig.png

**Submit**

Back to Journals and Services

The arXiv accepts submissions only from registered authors. To begin the submission of a new manuscript, please log in to the arXiv using your email and arXiv password.

Please note that some projects that compile without errors on Overleaf may encounter unexpected compilation errors when submitted to the arXiv service. This [help page](#) outlines some common reasons, and how to solve them.

**Step 1: Download files**

**Download project ZIP with submission files (e.g. .bbl)**

**Download PDF file of your article**

**Step 2: Submit your manuscript**

**Submit to arXiv**

File outline

- Introduction
- Manuscript styles
- Floats
  - Tables
    - Splitting a t...
  - Figures
  - Enhanced graph...
- Software and third ...
- Appendix information
- Gold Open Access
- Author publication ...
- Rotating tables
- Using Chinese, Japa...

Keywords: Classical Novae (251) — Ultraviolet astronomy(1736) — History of astronomy(1868) — Interdisciplinary astronomy(804)

1. INTRODUCTION

LaTeX<sup>1</sup> is a document markup language that is particularly well suited for the publication of mathematical and scientific articles (Lamport 1994). LaTeX was written in 1985 by Leslie Lamport who based it on the TeX typesetting language which itself was created by Donald E. Knuth in 1978. In 1988 a suite of LaTeX macros were developed to investigate electronic submission and publication of AAS Journal articles (Hanisch & Biemesderfer 1989). Shortly afterwards, Chris Biemesderfer merged these macros and more into a LaTeX 2.08 style file called AASTeX. These early AASTeX versions introduced many common commands and practices that authors take for granted today. Substantial revisions were made by Lee Brotzman and Pierre Landau when the package was updated to v4.0. AASTeX v5.0, written in 1995 by Arthur Ogawa, upgraded to LaTeX 2e which uses the document class in lieu of a style file. Other improvements to version 5 included hypertext support, landscape deluxetables and improved figure support to facilitate electronic submission. AASTeX v5.2 was released in 2005 and introduced additional graphics support plus new mark

```
1 %% Beginning of file
2 %%
3 %% Modified by aastex631.cls
4 %%
5 %% This is
6 %% AASTeX
7 %%
8 %% AASTeX
9 %% (Copyright)
10 %%
11 %% AASTeX
12 %% Latexsy
13 %% Oct 202
14 %% AASTeX
15 %% already
16 %% For exa
17 %% TexLive
18 %% In part
19 %% https://
20 %%
21 %% The fir
22 %% command
23 %% documen
24 %% The com
25 %% typeset, one-column, single-spaced document. It is the default and thus
26 %% does not need to be explicitly stated.
27 %%
28 %% using aastex version 6.3
29 \documentclass[linenumber]{aastex631}
30 %%
31 %% The default is a single spaced, 10 point font, single spaced article.
32 %% There are 5 other style options available via an optional argument. They
33 %% can be invoked like this:
34 %%
35 %% \documentclass[arguments]{aastex631}
```