

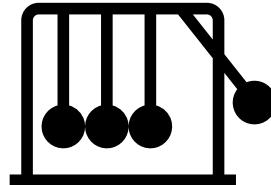


# Week 1: Scratching the Surface

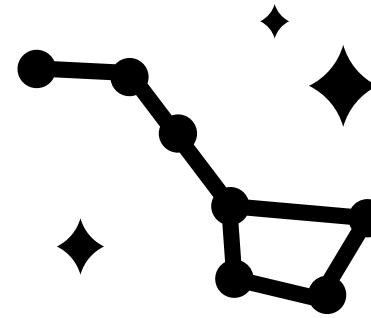
STARFISH SCHOOL 2020

**Who are we and why are we  
doing this?**

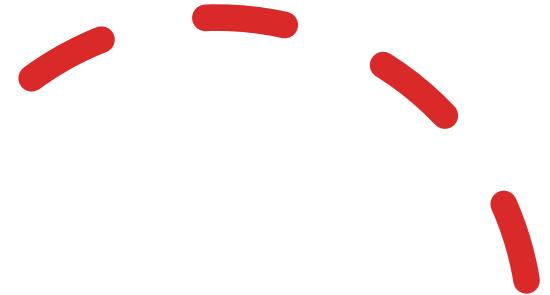
# Astronomy is more than just the Physics



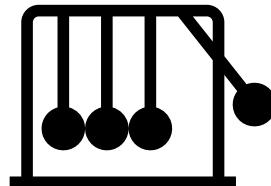
Physics



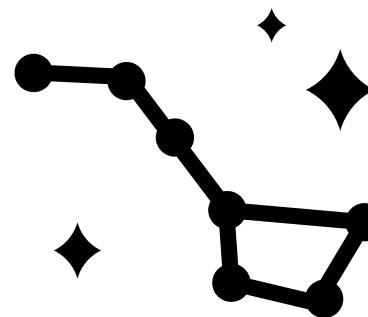
Astronomy



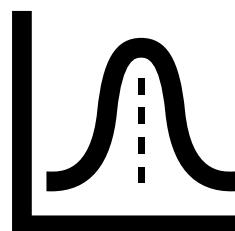
# Astronomy is more than just the Physics



Physics



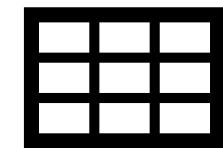
Astronomy



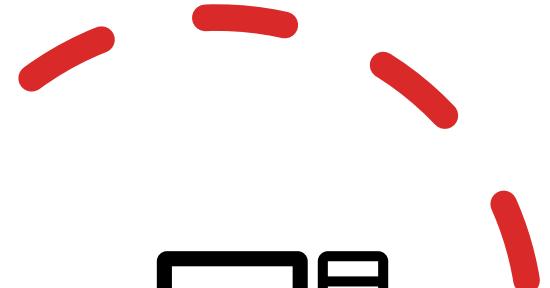
Statistics



Computing



Data Analysis



# Expectations

This bootcamp is about helping you become the best Astro grad student/researcher you can be!

This is not about grading or becoming expert in any of these concepts. It's about knowing that these tools and techniques exist, letting you get your hands dirty with them, and knowing where to search for help.

Our expectations for you are:

- Try things
- Ask questions to us and your peers throughout the bootcamp
- Do your best to complete the exercises as a group
- Help each other



# Expectations

This bootcamp is about helping the student/researcher you come to be.

This is not about grading concepts. It's about knowing how to get your hands dirty with them, and knowing where to search for help.

Our expectations for you are:

- Try things
- Ask questions to us and your peers throughout the bootcamp
- Do your best to complete the exercises as a group
- Help each other

## HOT TIP

Sometimes, we'll have tips that will help make your life/research easier. We'll throw them into these Hot Tip boxes. Look out for the pepper!



# Expectations

This bootcamp is about helping you become the best Astro grad student/researcher you can be!

This is not about grading or becoming expert in any of these concepts. It's about knowing that these tools and techniques exist, letting you get your hands dirty with them, and knowing where to search for help.

Our expectations for you are:

- Try things
- Ask questions
- Do your best
- Help each other

## COOL CATCH

Sometimes, there'll be something we want to point out that we want to warn you about, or make you aware of before it causes a problem. That'll be in these cool catch boxes. Look for the snowflake.



# Rough Schedule

Times	Session	What are you doing?
1 PM – 2:30 PM	<b>Demos and Lectures</b>	We'll take lead, and we encourage you to follow along and run things at the same time we are. Any code we want you to type, we'll share with you through the slack channel.
2:30 – 4:30 PM	<b>Exercises</b>	Work together in breakout rooms on each of the exercises. Feel free to ask each other or us for help. If you have any tech issues at this point as well, please feel free to post in the slack channel
4:30 – 5 PM	<b>Recap Session</b>	We'll come back together to talk through the exercises and talk about the "muddiest points"

# Time and Project Management

# Allow your future self to thank your past self

- Our idea of academia...
- The reality of academia...



# Tips to a less stressed work life

- Deadlines really matter, and don't matter at all



# Tips to a less stressed work life

- Deadlines really matter, and don't matter at all
- Eat the frog



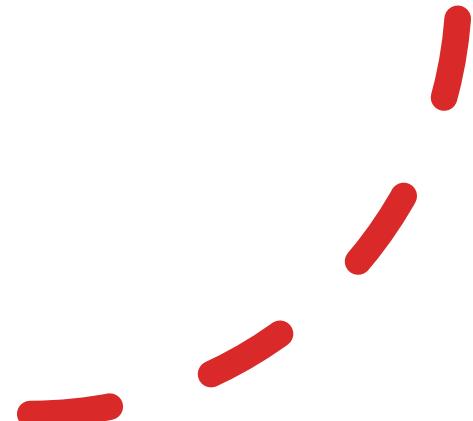
# Tips to a less stressed work life

- Deadlines really matter, and don't matter at all
- Eat the frog
- Don't confuse being 'busy' for being effective (NYT article, postdoc article)



# Tips to a less stressed work life

- Deadlines really matter, and don't matter at all
- Eat the frog
- Don't confuse being 'busy' for being effective
- 80/20 rule



# Tips to a less stressed work life

- Deadlines really matter, and don't matter at all
- Eat the frog
- Don't confuse being 'busy' for being effective
- 80/20 rule
- Parkinson's rule



# Tips to a less stressed work life

- Make a (work) budget – transition to work

# Tips to a less stressed work life

- Make a (work) budget
- No, really.
- Forgive yourself.

# Tips to a less stressed work life

- Make a (work) budget
- No, really.
- Forgive yourself.
- Don't hide.

# Tips to a less stressed work life

- Make a (work) budget
- No, really.

The screenshot shows the TIMEULAR homepage. At the top, there's a grey bar with the text "Subscribe to our monthly newsletter". Below it is the TIMEULAR logo and a navigation bar with links: Tracker, App, Teams, Talk to Sales, Why?, Pricing, Login, and a shopping cart icon. To the right of the cart is a blue "Buy Now" button. The main headline "Take control of your time" is displayed in large, bold, dark text. Below it is a subtitle "Effortless time tracking to help you lead a more productive life." and a small image showing two people working at desks. A blue link "https://timeular.com/" is overlaid on the bottom left of the screenshot.

- Keep track of how long things *actually* take.
- Get better at estimating, keep iterating. Build in contingency.

The screenshot shows the TomatoTimer website. The header features the "TomatoTimer" logo and a navigation bar with links: Log, FAQ, Settings, and Tweet about us!. Below the header is a large digital timer displaying "25:00". Underneath the timer are three buttons: "Pomodoro" (green), "Short Break" (light blue), and "Long Break" (light blue). The main content area has three sections: "Keyboard Shortcuts" (listing SPACE, ALT + P, ALT + S, ALT + L, and ALT + R), "Notifications" (describing how audio tone and volume can be changed via Settings), and "Settings" (describing how custom times can be set via Settings). A blue "Enable Desktop Alerts" button is located at the bottom right of the main content area. A blue link "https://tomato-timer.com/" is overlaid on the bottom left of the screenshot.

# Tips to a less stressed work life

- Make a (work) budget
- No, really.

The screenshot shows the homepage of Timeular. At the top, there's a grey bar with the text "Subscribe to our monthly newsletter". Below it is the Timeular logo and a navigation bar with links: Tracker, App, Teams, Talk to Sales, Why?, Pricing, Login, and a shopping cart icon. A prominent blue button labeled "Buy Now" is positioned next to the shopping cart. The main heading "Take control of your time" is displayed in a large, bold, dark font. Below it, a subtitle reads "Effortless time tracking to help you lead a more productive life." There's also a small video thumbnail showing two people working at a desk.

<https://timeular.com/>

- Keep track of how long things *actually* take.
- Get better at estimating, keep iterating. Build in contingency.

## HOT TIP

Try out different tools/software until you find something that 'sticks'. There is no wrong answer if it works for you!



The screenshot shows the TomatoTimer website. At the top, the title "TomatoTimer" is centered. To its right are links for Log, FAQ, Settings, and Tweet about us!. Below the title is a large digital timer displaying "25:00". Underneath the timer are three buttons: "Pomodoro" (dark teal), "Short Break" (light blue), and "Long Break" (light blue). The main area features three boxes: "Keyboard Shortcuts" (listing SPACE, ALT + P, ALT + S, ALT + L, and ALT + R), "Notifications" (describing audio tone and volume via Settings), and "Settings" (describing custom times via Settings). At the bottom, there's a blue button labeled "Enable Desktop Alerts".

<https://tomato-timer.com/>

# Project Management

- Treat your research like a job, not a 'calling'

Trello lets you work more collaboratively and get more done.

Trello's boards, lists, and cards enable you to organize and prioritize your projects in a fun, flexible, and rewarding way.



Sign Up – It's free!

A screenshot of a Trello board titled "Collecting Data". It contains four cards:

- Invited article
- Gaslighting book
- Archive article
- Chapter 4: Imperative
  - Created Apr 30, 2019
  - 1 comment
  - 1/5 completed

A second column titled "Analyze Data" is visible on the right, showing one card: "Chapter 5: Conclusion". A large red circular graphic is overlaid on the top right corner of the screenshot.

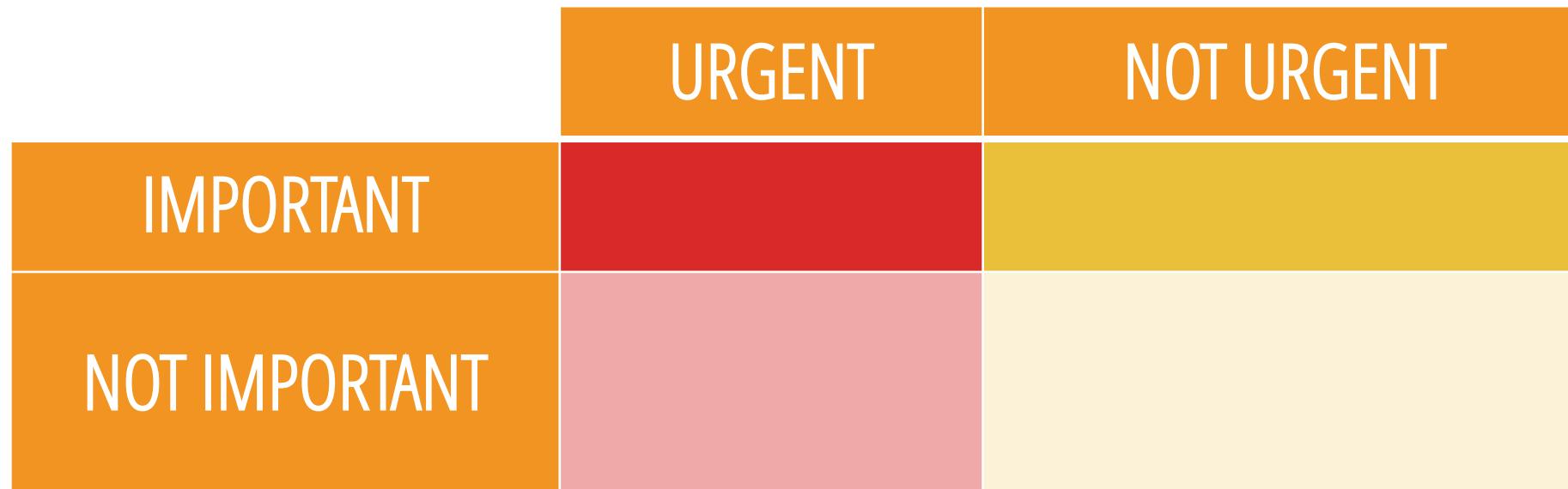
# Time management is not optional

- Learning how you work/what works for you takes a while, but be intentional about it. Watch this talk.



- <https://www.youtube.com/watch?v=oTugjssqOT0>

# Covey Quadrants

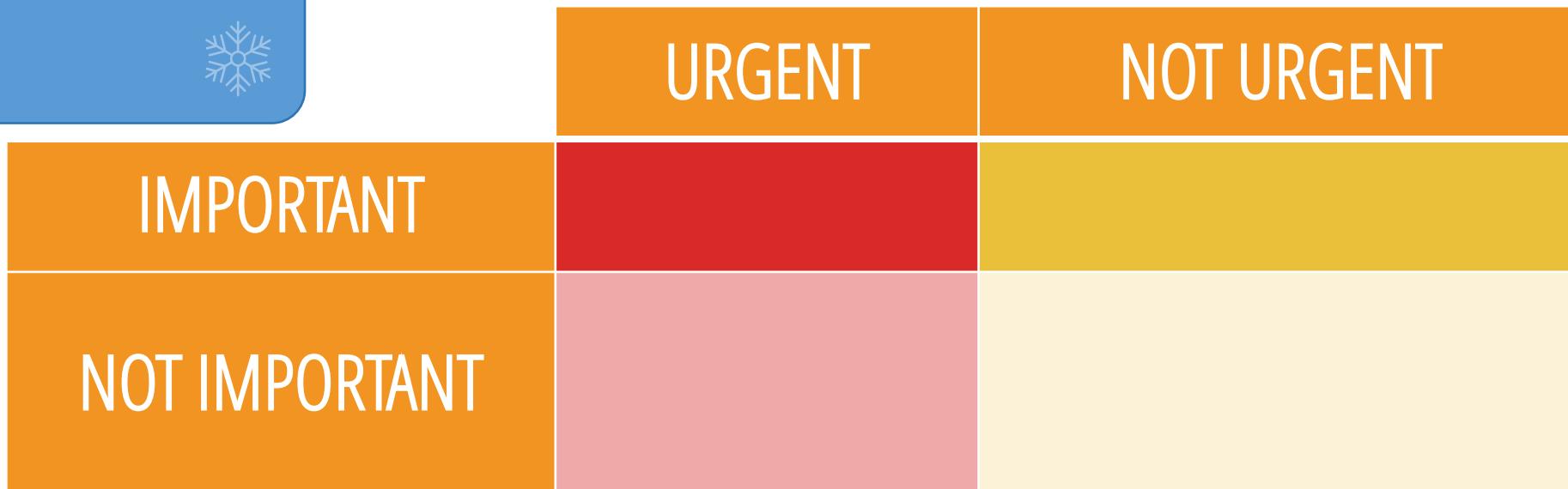


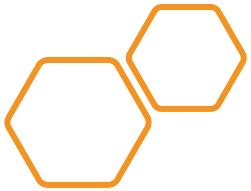
## COOL CATCH

Your advisor will almost always put things in the URGENT quadrant – that's the hardest to separate



# Covey Quadrants

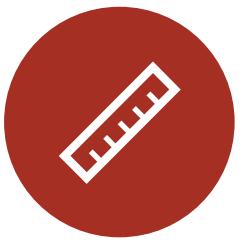




# SMART goals



SPECIFIC



MEASUREABLE



ATTAINABLE

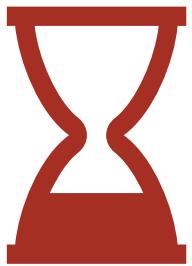


RELEVANT

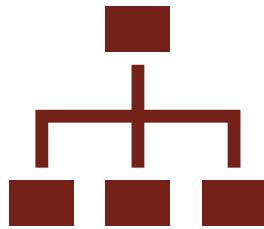


TIME-BASED

# Productive Procrastination



When waiting for code to compile... check the ArXiv

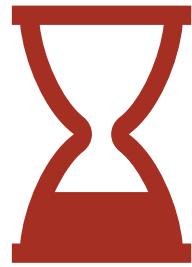


Make sure to get the big things (that you need to wait on other people for) out of the way first, then do plots/fun/email

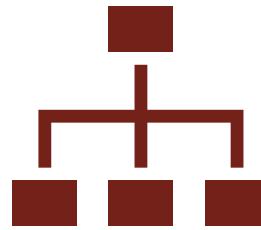


Take account of your time

# Productive Procrastination



When waiting for code to compile... check the ArXiv



Make sure to get the big things (that you need to wait on other people for) out of the way first, then do plots/fun/email



Take account of your time

## COOL CATCH

This does **not** mean working while watching TV! Down time is really important.



# (Try not to) let your email/inbox overwhelm you

The screenshot shows the Toodledo web interface. On the left, a sidebar lists categories like 'My Tasks', 'All Tasks' (which is selected), 'Starred', 'Hotlist', 'RECENT' (including 'Recently Added', 'Recently Completed', and 'Recently Modified'), and a search bar. The main area displays a table of tasks with columns for 'Task', 'Folder', 'Due Date ↑', 'Repeat', and 'Priority'. The tasks are grouped by due date: 'Due Tomorrow' and 'Due in the next 7 days'. Examples of tasks include 'SRD PR', 'SO CC stuff', 'Check DC2 pull requests', and 'book review'. A 'Quick Add Task' input field is at the top right of the table.

See Github too

The advertisement for Get It Done features a large central image of a computer monitor displaying the task manager's interface. Below the monitor are a tablet and a smartphone, both also showing the app. A play button icon is overlaid on the monitor image. To the right of the devices, the text 'Accomplish More with *Get It Done!*' is displayed in blue. Further down, the text 'From Home, Work, or Anywhere In Between' is shown in green. At the bottom right, a yellow button says 'Get started for free!'. The top right corner of the ad includes links for 'Features | Support | Sign Up | Login'.

# Intentionality

01

Be online when it  
matters

02

Communicate your  
style and talk about it  
with your advisor

03

Have a buddy system

04

Challenge each other

05

Take *real* breaks

# LaTeX and Overleaf

# LaTeX intro

- LaTeX is a markup language (think: html), which means you type certain commands around your text/input which control the look and feel of that input.
- If you want to change certain style elements of the document, using pre-existing commands means that all those elements change together.
- It can be clunky at first, but believe me *it will change your life*



# LaTeX syntax

- All documents start with some preamble to define document types/formatting

```
\usepackage{lineno}
\linenumbers
\setjournal{\apj}
\documentclass[iop,revtex4-1]{\color{red}hackemulateapj}

\usepackage{epsfig}
\usepackage{epstopdf}
\usepackage{graphicx}
```

# LaTeX syntax

- All documents start with some preamble to define document types/formatting

```
\usepackage{lineno}  
\linenumbers  
\setjournal{\apj}  
\documentclass[iop,revtex4-1]{\color{red}hackemulateapj}
```

```
\usepackage{epsfig}  
\usepackage{epstopdf}  
\usepackage{graphicx}
```

Pre-defined packages that do specific things, like  
help me include figures (graphics) or add line  
numbers to my document (lineno)

# LaTeX syntax

- All documents start with some preamble to define document types/formatting

define my document class (which is set to something for the Institute of Physics or IOP) and define its style (something I've called `hackemulateapj`, because I hacked a previous style file called `emulateapj` which emulates the ApJ style file)

```
\usepackage{lineno}
\linenumbers
\setjournal{\apj}
\documentclass[iop,revtex4-1]{hackemulateapj}

\usepackage{epsfig}
\usepackage{epstopdf}
\usepackage{graphicx}
```

# LaTeX syntax

- I then start writing my text, putting various things in special environments (e.g. figure captions, sections, the abstract)

```
\begin{document}  
  \title{A copy of an actual paper I'm working on}  
  \input{Starfish_folder/authors}  
  \input{./PLASTICC_sims_newcommand.tex}
```

```
\begin{abstract}
```

Next-generation surveys like the Legacy Survey of Space and Time (LSST) on the Vera C. Rubin Observatory will generate orders of magnitude more discoveries of transients and variable stars than previous surveys. To prepare for this data deluge, we developed \texttt{PLASTICC} (\texttt{acro}), a competition and associated simulated data set to challenge the community. \texttt{acro} took place between \texttt{DATESTART} and \texttt{DATESTOP}, with 1094 teams participating in the challenge which was hosted by the data-science platform [Kaggle](#). The aim of \texttt{acro} was to develop novel solutions to the problem of transient classification in a large, non-representative photometric data set.

# LaTeX syntax

- I then start writing my text, putting various things in special environments (e.g. figure captions, sections, the abstract)

Kicks things off

```
\begin{document}  
  \title{A copy of an actual paper I'm working on}  
  \input{Starfish_folder/authors}  
  \input{./PLASTICC_sims_newcommand.tex}
```

This means I have another file with lots of pre-defined symbols/commands in it

This generates the title and abstract

```
\begin{abstract}
```

Next-generation surveys like the Legacy Survey of Space and Time (LSST) on the Vera C. Rubin Observatory will generate orders of magnitude more discoveries of transients and variable stars than previous surveys. To prepare for this data deluge, we developed \texttt{PLASTICC} (\texttt{acro}), a competition and associated simulated data set to challenge the community. \texttt{acro} took place between \texttt{DATESTART} and \texttt{DATESTOP}, with 1094 teams participating in the challenge which was hosted by the data-science platform [Kaggle](#). The aim of \texttt{acro} was to develop novel solutions to the problem of transient classification in a large non-representative photometric data set.

# What it generates...

DRAFT VERSION SEPTEMBER 10, 2020  
Preprint typeset using L<sup>A</sup>T<sub>E</sub>X style emulateapj v. 01/23/15

## A COPY OF AN ACTUAL PAPER I'M WORKING ON

R. HLOŽEK<sup>1,2</sup>

(A COLLABORATION)

<sup>1</sup> Department of Astronomy and Astrophysics, University of Toronto, 50 St. George St., Toronto, ON M5S 3H4, Canada

<sup>2</sup> Dunlap Institute for Astronomy and Astrophysics, University of Toronto, 50 St. George St., Toronto, ON M5S 3H4, Canada

*Draft version September 10, 2020*

## ABSTRACT

Next-generation surveys like the Legacy Survey of Space and Time (LSST) on the Vera C. Rubin Observatory will generate orders of magnitude more discoveries of transients and variable stars than previous surveys. To prepare for this data deluge, we developed Photometric LSST Astronomical Time Series Classification Challenge (PLAsTiCC), a competition and associated simulated data set to challenge the community. PLAsTiCC took place between 2018 Sep 28 and 2018 Dec 17, with 1094 teams participating in the challenge which was hosted by the data-science platform Kaggle. The aim of PLAsTiCC was to develop novel solutions to the problem of transient classification in a large, non-representative photometric data set. Three winners were announced in February 2019, and a range of classification solutions were produced by the participants. This is a comment I want to insert (Renee) The machine learning techniques utilized by the community included hybrid combinations and ensemble averages of a range of approaches, including boosted decision trees, neural networks and multi-layer perceptrons (MLPs). We summarize the challenge entries and classes of solutions, highlight the performance of the winning solutions, and discuss how combining different approaches leads to further improvement in the performance of the classifiers.

### 1. INTRODUCTION

The Legacy Survey of Space and Time (LSST, [LSST Science Collaboration et al. 2009](#)) of the Vera C. Rubin

SuperNova ANalysis (SNANA) simulation code. We list the validations performed on the simulations below. **Confusing artifacts** – When processing light curves and metadata (additional information on the objects

# LaTeX is great for mathematics

- Using pre-defined symbols takes you from this

---

```
The \acro-metric was a weighted log-loss
\begin{eqnarray}
\label{eq:logloss}
L &\equiv& -\sum_{m=1}^N w_m \sum_{n=1}^M \tau_{n,m} \ln[p(m \mid d_n)],
\end{eqnarray}
where
\begin{eqnarray}
\label{eq:indicator}
\tau_{n,m} &\equiv&
\begin{cases}
0 & m_n \neq m \\
1 & m_n = m
\end{cases}
\end{eqnarray}
```

# LaTeX is great for mathematics

- Using pre-defined symbols takes you from this

```
The \acro-metric was a weighted log-loss
\begin{eqnarray}
\label{eq:logloss}
L &\equiv& -\sum_{m=1}^N w_m \sum_{n=1}^M \tau_{n,m} \ln[p(m \mid d_n)],
\end{eqnarray}
where
\begin{eqnarray}
\label{eq:indicator}
\tau_{n,m} &\equiv&
\begin{cases}
0 & m_n \neq m \\
1 & m_n = m
\end{cases}
\end{eqnarray}
```

## HOT TIP

These mathematical symbols/notation will come about in handy later when we use matplotlib



# LaTeX is great for mathematics

- To this

The PLAsTiCC metric was a weighted log-loss

$$L \equiv - \sum_{m=1}^N w_m \sum_{n=1}^M \tau_{n,m} \ln[p(m \mid d_n)], \quad (1)$$

where

$$\tau_{n,m} \equiv \begin{cases} 0 & m_n \neq m \\ 1 & m_n = m \end{cases} \quad (2)$$

If you move this equation around in the text, LaTeX will keep track of its location/numbering

# Figures and tables exist in environments

- you \begin and \end the environments to start/end a table.

```
\begin{table*}
```

the \* will mean it takes up the full  
page (as opposed to a column)

```
\begin{center}
```

```
\begin{tabular}{cccccccccc}
```

```
\hline
```

```
\hline
```

```
Name & \multicolumn{3}{c}{Boosted Decision Trees} & &
```

```
\multicolumn{4}{c}{Neural Nets} \\
```

```
\cline{2-4}
```

```
\cline{6-9}
```

```
& LightGBM & CatBoost & XGBoost & & NN & CNN & RNN &
```

```
MLP \\
```

```
\hline
```

```
\topplace & \cmark & \xmark & \xmark & & \xmark &
```

```
\xmark & \xmark & \xmark \\
```

```
\secondplace & \cmark & \xmark & \xmark & & \xmark &
```

# Figures and tables exist in environments

- you \begin{ and \end{ the environments to start/end a table.

Name	Boosted Decision Trees			Neural Nets			
	LightGBM	CatBoost	XGBoost	NN	CNN	RNN	MLP
Kyle Boone (avocado)	✓	✗	✗	✗	✗	✗	✗
Mike & Silogram	✓	✗	✗	✗	✗	✓	✗
Major Tom, mamas & nyapn	✓	✓	✗	✗	✓	✗	✗
Ahmet Erdem	✓	✗	✗	✓	✗	✗	✗
SKZ Lost in Translation	✓	✗	✗	✗	✗	✓	✓
Stefan Stefanov	✗	✗	✗	✓	✗	✗	✗
rapids.ai	✓	✗	✗	✗	✗	✓	✓
Three Muskateers	✓	✓	✓	✗	✓	✗	✗
Simon Chen	✓	✗	✗	✗	✗	✗	✗

# References are defined in a bibliography file

```
@ARTICLE{biswas/opsim,
    author = {{Biswas}, Rahul and {Daniel}, Scott F. and {Hlo\v{z}ek},
              R. and
              {Kim}, A.-G. and {Yoachim}, Peter and
              {LSST Dark Energy Science Collaboration}},
    title = "{Enabling Catalog Simulations of Transient and Variable
              Sources Based on LSST Cadence Strategies}",
    journal = {\apjs},
    keywords = {Astrophysics - Instrumentation and Methods for
               Astrophysics, Astrophysics - Cosmology and Nongalactic Astrophysics},
    year = 2020,
    month = apr,
    volume = {247},
    number = {2},
    eid = {60},
    pages = {60},
    doi = {10.3847/1538-4365/ab72f2},
archivePrefix = {arXiv},
    eprint = {1905.02887},
primaryClass = {astro-ph.IM},
    adsurl = {https://ui.adsabs.harvard.edu/abs/2020ApJS..247...60B},
    adsnote = {Provided by the SAO/NASA Astrophysics Data System}
}
```

This is how the citation defined in a .bib file

This is how the citation is referenced in the main text

Once the 'pure' source model is obtained, it is combined with a noise model specific to the observational conditions of LSST `\cite{biswas/opsim}`, including the cadence information, zero points, sky noise, and point spread function (PSF) `\cite{snana}`. The objects have to

# References are defined in a bibliography file

```
% Include both collaboration papers and external  
citations:  
\bibliographystyle{apsrev}  
\bibliography{results,metric}
```

Once the ‘pure’ source model is obtained, it is combined with a noise model specific to the observational conditions of LSST [Biswas et al. \(2020\)](#), including the cadence information, zero points, sky noise, and point

You define your bibliography style and then also tell LaTeX where to look (here in files results.bib and metric.bib)

This is how the reference appears in the text (for this particular referencing style)

R. Biswas, S. F. Daniel, R. Hložek, A. G. Kim, P. Yoachim, and LSST Dark Energy Science Collaboration, *ApJS* **247**, 60 (2020), 1905.02887.

This is what the reference looks like at the end of the file

# References are defined in a bibliography file

```
% Include both collaboration papers and external  
citations:  
\bibliographystyle{plain}  
\bibliography{results,metric}
```

If you change the bibliography style file

Once the ‘pure’ source model is obtained, it is combined with a noise model specific to the observational conditions of LSST (4), including the cadence information, zero points, sky noise, and point spread function (PSF) (16). The objects have to be ‘detected’ in order

This is how the reference appears in the text  
(for this particular referencing style)

[4]Rahul Biswas, Scott F. Daniel, R. Hložek, A. G. Kim, Peter Yoachim, and LSST Dark Energy Science Collaboration. Enabling Catalog Simulations of Transient and Variable Sources Based on LSST Cadence Strategies. *ApJS*, 247(2):60, April 2020.

This is what the reference looks like at the end of the file

# References are defined in a bibliography file

```
% Include both collaboration papers and external  
citations:  
\bibliographystyle{plain}  
\bibliography{results,metric}
```

If you change the bibliography style file

Once the ‘pure’ source model is obtained, it is combined with a noise model specific to the observational conditions of LSST (4), including the cadence information, zero points, sky noise, and point spread function (PSF) (16). The objects have to be ‘detected’ in order

This is how the reference appears in the text  
(for this particular referencing style)

[4]Rahul Biswas, Scott F. Daniel, R. Hložek, A. G. Kim, Peter Yoachim, and LSST Dark Energy Science Collaboration. Enabling Catalog Simulations of Transient and Variable Sources Based on LSST Cadence Strategies. *ApJS*, 247(2):60, April 2020.

## COOL CATCH



LaTeX is great about re-ordering references, but it really doesn't like if you define something twice – so keep that .bib file clean.

This is what the reference looks like at the end of the file

# References are defined in a bibliography file

```
% Include both collaboration papers and external  
citations:  
\bibliographystyle{plain}  
\bibliography{results,metric}
```

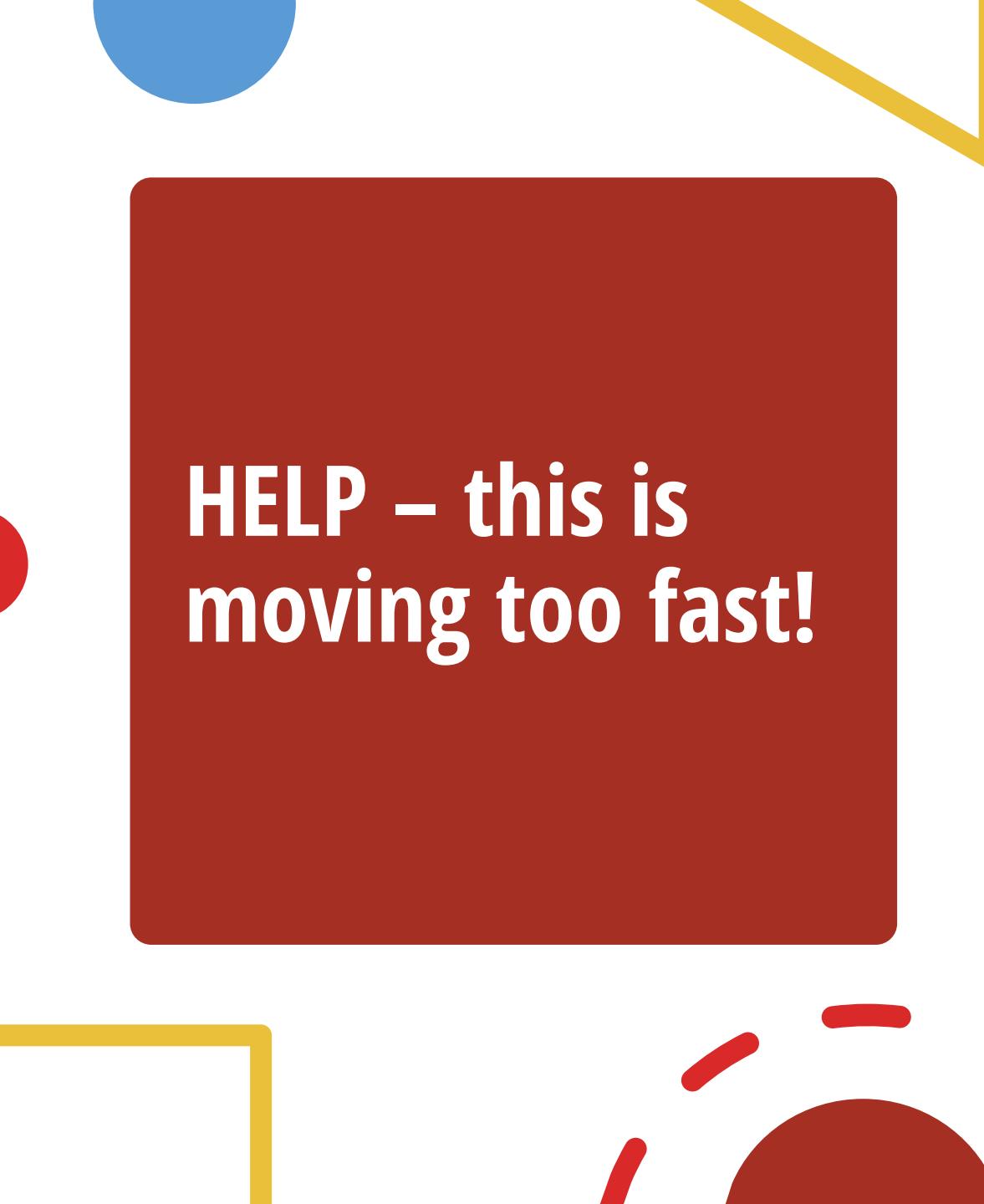
If you change the bibliography style file

Once the ‘pure’ source model is obtained, it is combined with a noise model specific to the observational conditions of LSST (4), including the cadence information, zero points, sky noise, and point spread function (PSF) (16). The objects have to be ‘detected’ in order

This is how the reference appears in the text  
(for this particular referencing style)

[4]Rahul Biswas, Scott F. Daniel, R. Hložek, A. G. Kim, Peter Yoachim, and LSST Dark Energy Science Collaboration. Enabling Catalog Simulations of Transient and Variable Sources Based on LSST Cadence Strategies. *ApJS*, 247(2):60, April 2020.

This is what the reference looks like at the end of the file



# **HELP – this is moving too fast!**

- Don't worry – the internet is your friend.
- Google the thing you want to do and there is almost certainly an answer. Also, ask your colleagues/students/mentors for advice.
- Everyone loves teaching people their LaTeX tricks

# Overleaf/styles/templates

- Overleaf is online LaTeX editing software that you can use to compile LaTeX and collaborate with others.
- LOTS of templates for articles/reports etc. -- check out the AAS template

The screenshot shows the Overleaf web interface. On the left, there's a sidebar with navigation links: 'New Project' (highlighted in green), 'All Projects', 'Your Projects' (highlighted in blue), 'Shared with you', 'Archived Projects' (with an 'i' icon), 'Trashed Projects' (with an 'i' icon), 'TAGS/FOLDERS', and '+ New Folder'. The main area has a search bar labeled 'Search projects...'. Below it is a table listing projects:

<input type="checkbox"/> Title	Owner	Last Modified
PLAsTiCC_results	You	35 minutes ago
SO_Governance	You	14 days ago by '
The Atacama Cosmology Telescope: Constraining the primordial power spectrum with ACTPol 98 and 150 GHz data	You	15 days ago by '
Canadian LSST contributions	You	10 months ago
litebird-sms-documents2	You	10 months ago

# Overleaf/styles/templates



Demo Time!  
Overleaf

- Overleaf is online LaTeX editing software that you can use to compile LaTeX and collaborate with others.
- LOTS of templates for articles/reports etc.

The screenshot shows the Overleaf web interface. On the left, there's a sidebar with a 'New Project' button and links for 'Blank Project', 'Example Project', 'Upload Project', 'Import from GitHub', 'Templates', 'Academic Journal', 'Book', 'Formal Letter', and 'Homework Assignment'. The main area has a search bar labeled 'Search projects...'. Below it is a table listing several projects:

Title	Owner	Last Modified
PLAsTiCC_results	You	35 minutes ago
SO_Governance	You	14 days ago by '
The Atacama Cosmology Telescope: Constraining the primordial power spectrum with ACTPol 98 and 150 GHz data	You	15 days ago by '
Canadian LSST contributions	You	10 months ago
litebird-sms-documents2	You	10 months ago
LSST CFI Preproposal		

# Overleaf/styles/templates



Demo Time!  
Overleaf

<https://www.overleaf.com/read/tntwghqvcxzh>

Overleaf

New Project

Blank Project

Example Project

Upload Project

Import from GitHub

Templates

Academic Journal

Book

Formal Letter

Homework Assignment

Search projects...

Title	Owner	Last Modified
PLAsTiCC_results	You	35 minutes ago
SO_Governance	You	14 days ago by '
The Atacama Cosmology Telescope: Constraining the primordial power spectrum with ACTPol 98 and 150 GHz data	You	15 days ago by '
Canadian LSST contributions	You	10 months ago
litebird-sms-documents2	You	10 months ago
LSST CFI Preproposal		

# Keeping tidy/sync often

- Backup early and often! UofT gives us all 1TB of OneDrive space
- Overleaf can sync to Dropbox & Github - so you can work offline
- Try keeping the main .tex file bare, keep definitions in their own .input files



# Looking at the Literature through ADS

# Literature & Research

- Don't expect yourself to understand everything immediately
  - Reading scientific papers is a skill you will develop
- You will read papers, and re-read them, and re-read them...
  - And you'll retain something new each time!
- You will search the literature, then search it again, and again...
  - After all, we are doing **re**search! :)

# (Re)searching the literature



Limit query to:  Astronomy  Physics  General

Search

Author  AND  OR

Object  AND  OR

Publication date between

 /  and  / 

Title

AND  OR  BOOLEAN

Abstract/Keywords

AND  OR  BOOLEAN

Refereed only  Articles only

Publication(s)

Press Return Key To Add Publication

Sort

 Date ▾

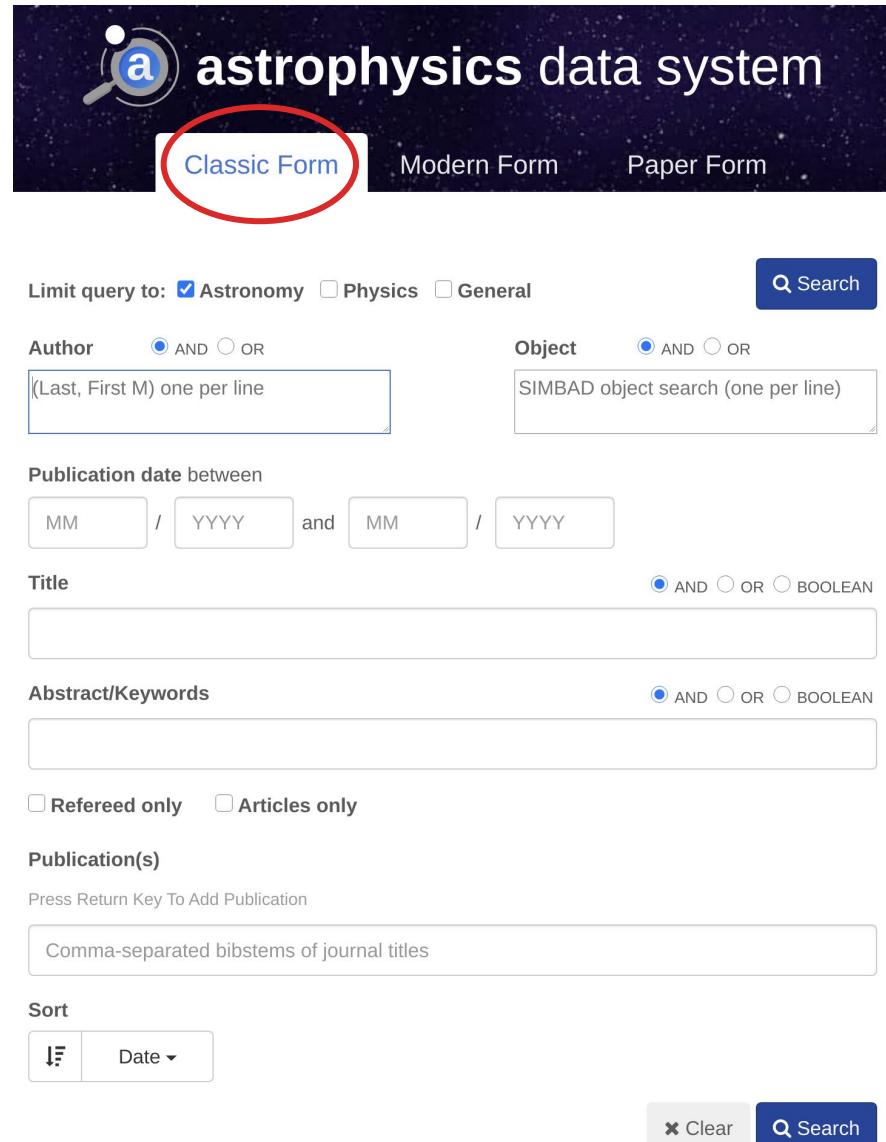
Clear

Search

ADS: astrophysics data system (bookmark!)

<https://ui.adsabs.harvard.edu/classic-form>

# (Re)searching the literature



The screenshot shows the ADS search interface. At the top, there's a logo with a magnifying glass icon and the text "astrophysics data system". Below it, three search modes are listed: "Classic Form" (highlighted with a red circle), "Modern Form", and "Paper Form".

Below the search mode buttons, there are search fields and filters:

- Limit query to:**  Astronomy  Physics  General
- Author:**  AND  OR  
Input field: (Last, First M) one per line
- Object:**  AND  OR  
Input field: SIMBAD object search (one per line)
- Publication date between:**  MM /  YYYY and  MM /  YYYY
- Title:**  AND  OR  BOOLEAN  
Input field
- Abstract/Keywords:**  AND  OR  BOOLEAN  
Input field
- Refereed only  Articles only
- Publication(s):** Press Return Key To Add Publication  
Input field: Comma-separated bibstems of journal titles
- Sort:**
- Buttons:**

ADS: astrophysics data system (bookmark!)  
<https://ui.adsabs.harvard.edu/classic-form>

# (Re)searching the literature

The screenshot shows the ADS Classic Form search interface. At the top, there's a logo with a magnifying glass over an 'a' and the text "astrophysics data system". Below the logo, there are three navigation options: "Classic Form" (highlighted with a red oval), "Modern Form", and "Paper Form".  
  
The search form includes:

- A "Limit query to:" section with checkboxes for "Astronomy" (checked), "Physics", and "General".
- "Author" and "Object" search fields, each with "AND" and "OR" radio buttons and input boxes for "(Last, First M) one per line" and "SIMBAD object search (one per line)".
- "Publication date between" fields for selecting start and end dates.
- "Title" and "Abstract/Keywords" search fields, each with "AND", "OR", and "BOOLEAN" radio buttons.
- Checkboxes for "Refereed only" and "Articles only".
- A "Publication(s)" section with a note to "Press Return Key To Add Publication" and a field for "Comma-separated bibstems of journal titles".
- A "Sort" dropdown menu with "Date" selected.
- Buttons for "Clear" and "Search".

ADS: astrophysics data system (bookmark!)  
<https://ui.adsabs.harvard.edu/classic-form>

The screenshot shows the ADS Modern Form search interface. At the top, there's a logo with a magnifying glass over an 'a' and the text "astrophysics data system". Below the logo, there are three navigation options: "Classic Form", "Modern Form" (highlighted with a red oval), and "Paper Form".  
  
The search form includes:

- A "QUICK FIELD" dropdown menu with options: Author, First Author, Abstract, Year, Fulltext, and All Search Terms (selected).
- A search bar with a placeholder "I" and a search button.
- A list of search terms and their corresponding queries:

author	author:"huchra, john"	citations	citations(author:"huchra, j")
first author	author:"^huchra, john"	references	references(author:"huchra, j")
abstract + title	abs:"dark energy"	reviews	reviews("gamma-ray bursts")
year	year:2000	refereed	property:refereed
year range	year:2000-2005	astronomy	collection:astronomy
full text	full:"gravity waves"	OR	abs:(planet OR star)
publication	bibstem:ApJ		



Use a classic ADS-style form



Learn more about searching  
the ADS



Access ADS data with our  
API

# (Re)searching the literature

The screenshot shows the ADS search interface in 'Classic Form'. At the top, there's a logo with a magnifying glass over an 'a' and the text 'astrophysics data system'. Below it are three navigation links: 'Classic Form' (which is circled in red), 'Modern Form', and 'Paper Form'. Underneath these are search filters: 'Limit query to' with checkboxes for 'Astronomy' (checked), 'Physics', and 'General'; 'Author' search fields for '(Last, First M) one per line' and 'Object' search fields for 'SIMBAD object search (one per line)'; and date range fields for 'Publication date between' (MM / YYYY and MM / YYYY). There are also fields for 'Title', 'Abstract/Keywords', and publication types ('Refereed only', 'Articles only'). A 'Publication(s)' section allows adding journal titles via a text input field. At the bottom, there's a 'Sort' dropdown (set to 'Date'), a 'Clear' button, and a large blue 'Search' button.

ADS: astrophysics data system (bookmark!)  
<https://ui.adsabs.harvard.edu/classic-form>

The screenshot shows the ADS search interface in 'Modern Form'. The layout is similar to the classic form but with some changes. The 'Modern Form' link is circled in red at the top. Below the search bar, there's a 'QUICK FIELD' dropdown menu with options: Author, First Author, Abstract, Year, Fulltext, and All Search Terms (which is selected). The search bar itself has a placeholder 'I' and a blue search icon. To the right of the search bar, there's a list of search terms with their corresponding syntax: 'author: "huchra, john"', 'citations: citations(author:"huchra, j")', 'first author: "huchra, john"', 'references: references(author:"huchra, j")', 'abstract + title: "dark energy"', 'reviews: reviews("gamma-ray bursts")', 'year: 2000', 'refereed: property:refereed', 'year range: 2000-2005', 'astronomy: collection:astronomy', 'full text: "gravity waves"', 'OR: abs:(planet OR star)', and 'publication: bibstem:ApJ'. Orange arrows point from the search terms to their respective syntax elements.



Use a classic ADS-style form



Learn more about searching  
the ADS



Access ADS data with our  
API

# Simple search for papers by Rubin

[Feedback](#)[ORCID](#)[About](#)[Sign Up](#)[Log In](#)

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

[Start New Search](#)

author:(“Rubin”)



Your search returned 2,083 results

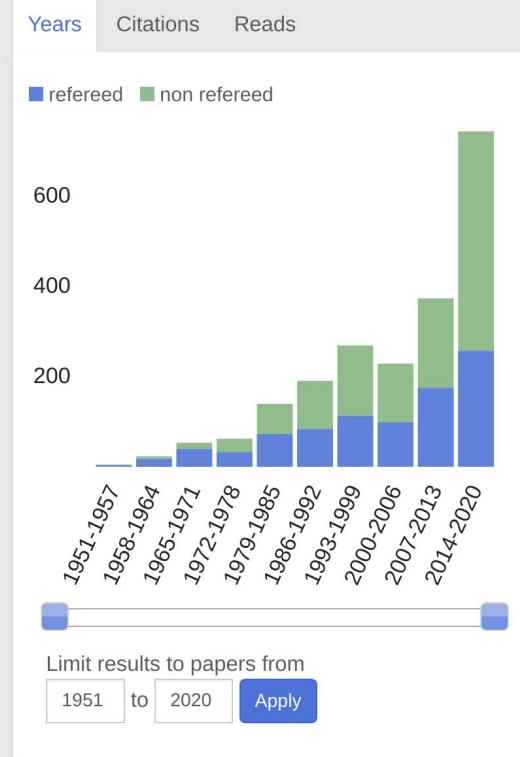
Collection  
+astronomy

Date ▾

[Export](#)[Explore](#)

- ▼ AUTHORS
  - Rubin, A 614
  - Rubin, M 384
  - Rubin, D 271
  - Rubin, V 255
  - Rubin, R 227
- [more](#)

- Show highlights  Show abstracts  Hide Sidebars [Go To Bottom](#)
- 1  2020Icar..34713771W 2020/09   
Trace element and textural evidence favoring lunar, not terrestrial, origin of the mini-granite in Apollo sample 14321  
Warren, Paul H.; Rubin, Alan E.
- 2  2020P&SS..18704924M 2020/08   
Electron dynamics near diamagnetic regions of comet 67P/Churyumov- Gerasimenko  
Madanian, H.; Burch, J. L.; Eriksson, A. I. [and 8 more](#)
- 3  2020arXiv200808430B 2020/08   
ROSINA ion zoo at Comet 67P  
Beth, A.; Altwegg, K.; Balsiger, H. [and 9 more](#)
- 4  2020arXiv200805988S 2020/08   
The Palomar Transient Factory Core-Collapse Supernova Host-Galaxy Sample. I. Host-Galaxy Distribution Functions and Environment-Dependence of CCSNe  
Schulze, Steve; Yaron, Ofer; Sollerman, Jesper [and 51 more](#)
- 5  2020arXiv200803576H 2020/08   
First in-situ detection of the CN radical in comets and evidence for a distributed source  
Hänni, Nora; Altwegg, Kathrin; Pestoni, Boris [and 4 more](#)
- 6  2020A&A...640C...3W 2020/08   
Solar wind charge exchange in cometary atmospheres. III. Results from the Rosetta mission



# Simple search for papers by Rubin

[Feedback ▾](#)[ORCID ▾](#)[About ▾](#)[Sign Up](#)[Log In](#)

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms ▾

[Start New Search](#)

author:"Rubin")



Your search returned 2,083 results

Collection  
+astronomy[Date ▾](#)[Export ▾](#)[Explore ▾](#)

AUTHORS	
➤	<input type="checkbox"/> Rubin, A 614
➤	<input type="checkbox"/> Rubin, M 384
➤	<input type="checkbox"/> Rubin, D 271
➤	<input type="checkbox"/> Rubin, V 255
➤	<input type="checkbox"/> Rubin, R 227
<a href="#">more</a>	

COLLECTIONS	
<input type="checkbox"/> astronomy	2k
<input type="checkbox"/> physics	377
<input type="checkbox"/> general	52
REFERRED	
<input type="checkbox"/> non-refereed	1.1k
<input type="checkbox"/> refereed	886
AFFILIATIONS	
KEYWORDS	
PUBLICATIONS	
BIB GROUPS	

 Show highlights  Show abstracts  Hide Sidebars[Go To Bottom](#)

- 1  2020Icar..34713771W 2020/09   
Trace element and textural evidence favoring lunar, not terrestrial, origin of the mini-granite in Apollo sample 14321

Warren, Paul H.; Rubin, Alan E.

- 2  2020P&SS..18704924M 2020/08   
Electron dynamics near diamagnetic regions of comet 67P/Churyumov- Gerasimenko

Madanian, H.; Burch, J. L.; Eriksson, A. I. [and 8 more](#)

- 3  2020arXiv20080430B 2020/08   
ROSINA ion zoo at Comet 67P

Beth, A.; Altwegg, K.; Balsiger, H. [and 9 more](#)

- 4  2020arXiv200805988S 2020/08   
The Palomar Transient Factory Core-Collapse Supernova Host-Galaxy Sample. I. Host-Galaxy Distribution Functions and Environment-Dependence of CCSNe

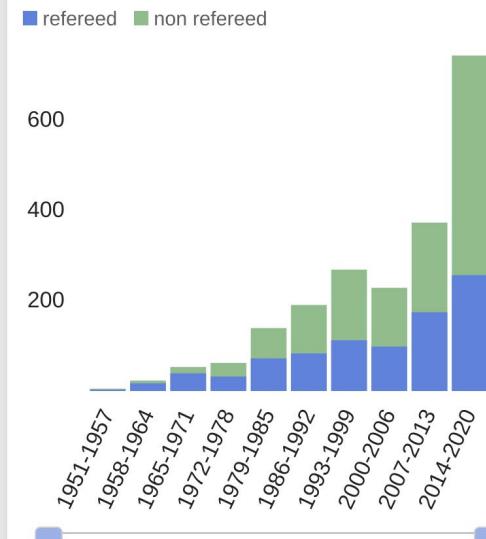
Schulze, Steve; Yaron, Ofer; Sollerman, Jesper [and 51 more](#)

- 5  2020arXiv200803576H 2020/08   
First in-situ detection of the CN radical in comets and evidence for a distributed source

Hänni, Nora; Altwegg, Kathrin; Pestoni, Boris [and 4 more](#)

- 6  2020A&A...640C...3W 2020/08   
Solar wind charge exchange in cometary atmospheres. III. Results from the Rosetta mission

Years Citations Reads



Limit results to papers from

1951 to 2020

Apply

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:(“Rubin”)



Your search returned 2,083 results

Collection  
+astronomy

Date ▾



Export ▾



Explore ▾

## AUTHORS

 Rubin, A Rubin, M Rubin, D Rubin, V Rubin, V C Rubin, Vera C Rubin, Vera Rubin, V Rubin, V GAuthors  
1 selected[Show highlights](#) [Show abstracts](#) [Hide Sidebars](#)[Go To Bottom](#)

2020car..34713771W

2020/09



Trace element and textural evidence favoring lunar, not terrestrial, origin of the mini-granite in Apollo sample 14321

Warren, Paul H.; Rubin, Alan E.

2020P&amp;SS.18704924M

2020/08



Electron dynamics near diamagnetic regions of comet 67P/Churyumov- Gerasimenko

Madanian, H.; Burch, J. L.; Eriksson, A. I. [and 8 more](#)

2020arXiv20080430B

2020/08



ROSINA ion zoo at Comet 67P

Beth, A.; Altweig, K.; Balsiger, H. [and 9 more](#)

2020arXiv200805988S

2020/08



The Palomar Transient Factory Core-Collapse Supernova Host-Galaxy Sample. I. Host-Galaxy Distribution Functions and Environment-Dependence of CCSNe

Schulze, Steve; Yaron, Ofer; Sollerman, Jesper [and 51 more](#)

2020arXiv200803576H

2020/08



First in-situ detection of the CN radical in comets and evidence for a distributed source

Hänni, Nora; Altweig, Kathrin; Pestoni, Boris [and 4 more](#)

2020A&amp;A...640C...3W

2020/08



Solar wind charge exchange in cometary atmospheres. III. Results from the Rosetta mission

Years

Citations

Reads

refereed non refereed

600

400

200

100

0

Limit results to papers from

1951

to

2020

Apply

1951-1957

1958-1964

1965-1971

1972-1978

1979-1985

1986-1992

1993-1999

2000-2006

2007-2013

2014-2020



QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

← Start New Search

author:"Rubin"



Your search returned 2,083 results

Collection +astronomy

## AUTHORS

 Rubin, A Rubin, M Rubin, D Rubin, V Rubin, V C Rubin, Vera C Rubin, Vera Rubin, V Rubin, V GAuthors  
1 selectedlimit to  
exclude

Show highlights Show abstracts Hide Sidebars



Date ▾



Export ▾



Explore ▾

2020car..34713771W

2020/09

Go To Bottom

Trace element and textural evidence favoring lunar, not terrestrial, origin of the mini-granite in Apollo sample 14321

Warren, Paul H.; Rubin, Alan E.

2020P&amp;SS.18704924M

2020/08

Electron dynamics near diamagnetic regions of comet 67P/Churyumov- Gerasimenko

Madanian, H.; Burch, J. L.; Eriksson,

2020arXiv200808430B

2020

ROSINA ion zoo at Comet 67P?

Beth, A.; Altweig, K.; Balsiger, H. et al.

2020arXiv200805988S

2020/08

The Palomar Transient Factory Catalog of Galaxy Distribution Functions and

Schulze, Steve; Yaron, Ofer; Sollerman,

2020arXiv200803576H

2020/08

First in-situ detection of the CN radical

Hänni, Nora; Altweig, Kathrin; Pestel,

2020A&amp;A...640C...3W

2020/08

Solar wind charge exchange in co



ads

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:"Rubin")

Feedback ▾ ORCID ▾ About ▾ Sign Up Log In

Your search returned 255 results

## COLLECTIONS

 astronomy

2k

 physics

377

 general

52

## REFERRED

 non-refered

1.1k

Collection +astronomy

Author +Rubin, V

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:"Rubin")

Feedback ▾ ORCID ▾ About ▾ Sign Up Log In

Your search returned 255 results

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:"Rubin")

Feedback ▾ ORCID ▾ About ▾ Sign Up Log In

## AUTHORS

 Rubin, V

255

 Ford, W

77

 Thonnard, N

26

 Hunter, D

16

 Peterson, C

14

more

## COLLECTIONS

 astronomy

255

 general

10

 physics

7

## REFERRED

 non-refered

132

 refereed

123

## AFFILIATIONS

## KEYWORDS

## PUBLICATIONS

## BIB GROUPS

## SIMBAD OBJECTS

## NED OBJECTS

## DATA

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:"Rubin")

Feedback ▾ ORCID ▾ About ▾ Sign Up Log In

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:"Rubin")

Feedback ▾ ORCID ▾ About ▾ Sign Up Log In

Star Formation in Two Luminous Spiral Galaxies

Hunter, Deidre A.; Elmegreen, Bruce G.; Rubin, Vera C. and 4 more

2013AJ....146...92H

2013/10 cited: 13

Star Formation in the Extreme Outer Disks of Giant Spiral Galaxies

Ashburn, Allison; Hunter, D. A.; Rubin, V. C.

2013AAS...22114605A

2013/01

Obituary: Martin F. McCarthy (1923-2010)

Coyne, George; Rubin, Vera

2011BAAS...43..019C

2011/12

An Interesting Voyage

Rubin, Vera C.

2011noao.prop..116J

2011/02

The Stellar Kinematics of Dwarf Irregular Galaxy DDO 125: Is this a galaxy without dark matter?

Jackson, Megan; Hunter, Deidre; Rubin, Vera and 1 more

2011AAS...21725832W

2011/01

Star Formation in the Outer Disks of Spiral Galaxies

Wright, Teresa; Hunter, D.; Rubin, V.

2010JAHH...13..145R

2010/07 cited: 1

Charlotte Moore Sitterly

Go To Bottom

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

Start New Search

author:"Rubin"



Your search returned 2,083 results

Collection +astronomy

## AUTHORS

 Rubin, A Rubin, M Rubin, D Rubin, V Rubin, V C Rubin, Vera C Rubin, Vera Rubin, V Rubin, V GAuthors  
1 selectedlimit to  
exclude[Show highlights](#)[Show abstracts](#)[Hide Sidebars](#)

Date ▾



Export ▾



Explore ▾

2020car..34713771W

2020/09

Trace element and textural evidence favoring lunar, not terrestrial, origin of the mini-granite in Apollo sample 14321

Warren, Paul H.; Rubin, Alan E.

2020P&amp;SS.18704924M

2020/08

Electron dynamics near diamagnetic regions of comet 67P/Churyumov- Gerasimenko

Madanian, H.; Burch, J. L.; Eriksson,

2020arXiv200808430B

2020

ROSINA ion zoo at Comet 67P?

Beth, A.; Altweig, K.; Balsiger, H. et al.

2020arXiv200805988S

2020/08

The Palomar Transient Factory Catalog

Galaxy Distribution Functions and

Schulze, Steve; Yaron, Ofer; Sollerman,

2020arXiv200803576H

2020/08

First in-situ detection of the CN ra

Hänni, Nora; Altweig, Kathrin; Pest

2020A&amp;A...640C...3W

2020/08

Solar wind charge exchange in co



QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:"Rubin"



Your search returned 255 results

## COLLECTIONS

 astronomy physics general

## REFERRED

 non-refered

1.1k

Collection +astronomy

Author +Rubin, V

Go To Bottom

Years Citations Reads

refereed non refereed

600

400

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:"Rubin"



Your search returned 255 results

Go To Bottom

Years Citations Reads

refereed non refereed

50

40

30

20

10

0

1951-1956

1957-1962

1963-1968

1969-1974

1975-1980

1981-1986

1987-1992

1993-1998

1999-2004

2005-2010

2011-2013

Limit results to papers from

1951 to 2013

Apply



## AUTHORS

 Rubin, V

255

 Ford, W

77

 Thonnard, N

26

 Hunter, D

16

 Peterson, C

14

more

## COLLECTIONS

 astronomy

255

 general

10

 physics

7

## REFERRED

 non-refereed

132

 refereed

123

 AFFILIATIONS KEYWORDS PUBLICATIONS BIB GROUPS SIMBAD OBJECTS NED OBJECTS DATA Show highlights Show abstracts Hide Sidebars Go To Bottom Years Citations Reads refereed non refereed 2013AJ....146...92H

2013/10 cited: 13

Star Formation in Two Luminous Spiral Galaxies

Hunter, Deidre A.; Elmegreen, Bruce G.; Rubin, Vera C. and 4 more

 2013AAS...22114605A

2013/01

Star Formation in the Extreme Outer Disks of Giant Spiral Galaxies

Ashburn, Allison; Hunter, D. A.; Rubin, V. C.

 2011BAAS...43..019C

2011/12

Obituary: Martin F. McCarthy (1923-2010)

Coyne, George; Rubin, Vera

 2011ARA&A..49...1R

2011/09 cited: 1

An Interesting Voyage

Rubin, Vera C.

 2011noao.prop..116J

2011/02

The Stellar Kinematics of Dwarf Irregular Galaxy DDO 125: Is this a galaxy without dark matter?

Jackson, Megan; Hunter, Deidre; Rubin, Vera and 1 more

 2011AAS...21725832W

2011/01

Star Formation in the Outer Disks of Spiral Galaxies

Wright, Teresa; Hunter, D.; Rubin, V.

 2010JAH...13...145R

2010/07 cited: 1

Charlotte Moore Sitterly



ads

[Feedback](#) [ORCID](#) [About](#) [Sign Up](#) [Log In](#)

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

[Start New Search](#)

author:(“Rubin”)



Your search returned 255 results

[Collection](#) [Author](#)

+astronomy

+Rubin, V

AUTHORS

> [Rubin, V](#) 255> [Ford, W](#) 77> [Thonnard, N](#) 26> [Hunter, D](#) 16> [Peterson, C](#) 14[more](#)

COLLECTIONS

< [astronomy](#) 255< [general](#) 10< [physics](#) 7

REFERRED

< [non-refereed](#) 132< [refereed](#) 123

AFFILIATIONS

&gt; KEYWORDS

&gt; PUBLICATIONS

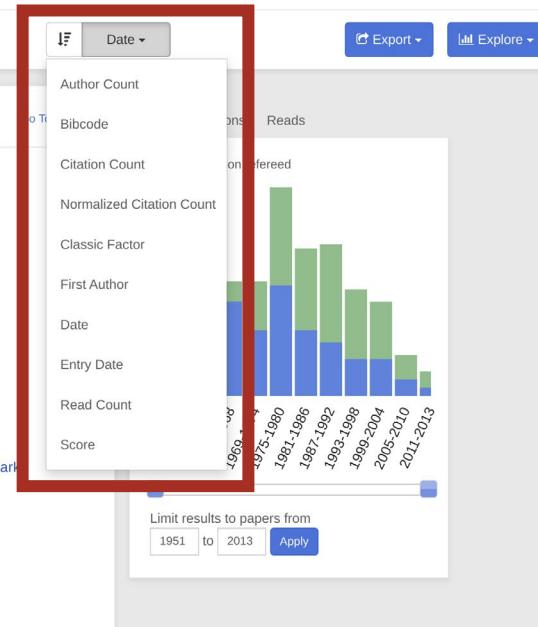
&gt; BIB GROUPS

&gt; SIMBAD OBJECTS

&gt; NED OBJECTS

&gt; ...

- Show highlights Show abstracts Hide Sidebars
- 1 [2013AJ...146..92H](#) 2013/10 cited: 13  
Star Formation in Two Luminous Spiral Galaxies  
Hunter, Deidre A.; Elmegreen, Bruce G.; Rubin, Vera C. [and 4 more](#)
  - 2 [2013AA...22114605A](#) 2013/01  
Star Formation in the Extreme Outer Disks of Giant Spiral Galaxies  
Ashburn, Allison; Hunter, D. A.; Rubin, V. C.
  - 3 [2011BAAS...43..019C](#) 2011/12  
Obituary: Martin F. McCarthy (1923-2010)  
Coyne, George; Rubin, Vera
  - 4 [2011ARA&A..49....1R](#) 2011/09 cited: 1  
An Interesting Voyage  
Rubin, Vera C.
  - 5 [2011noao.prop..116J](#) 2011/02  
The Stellar Kinematics of Dwarf Irregular Galaxy DDO 125: Is this a galaxy without dark matter?  
Jackson, Megan; Hunter, Deidre; Rubin, Vera [and 1 more](#)
  - 6 [2011AA...21725832W](#) 2011/01  
Star Formation in the Outer Disks of Spiral Galaxies  
Wright, Teresa; Hunter, D.; Rubin, V.
  - 7 [2010JAH...13..145R](#) 2010/07 cited: 1  
Charlotte Moore Sitterly





Feedback ▾ ORCID ▾ About ▾ Sign Up Log In

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms ▾

◀ Start New Search

author:(“Rubin”)



Your search returned 255 results

Collection +astronomy Author +Rubin, V

✓ AUTHORS

- >  Rubin, V 255
  - >  Ford, W 77
  - >  Thonnard, N 26
  - >  Hunter, D 16
  - >  Peterson, C 14
- [more](#)

✓ COLLECTIONS

- astronomy 255
- general 10
- physics 7

✓ REFEREED

- non-refereed 132
- refereed 123

✓ AFFILIATIONS

✓ KEYWORDS

✓ PUBLICATIONS

✓ BIB GROUPS

✓ SIMBAD OBJECTS

✓ NED OBJECTS

Show highlights  Show abstracts  Hide Sidebars

- 1  2013AJ...146..92H 2013/10 cited: 13 [Star Formation in Two Luminous Spiral Galaxies](#)  
Hunter, Deidre A.; Elmegreen, Bruce G.; Rubin, Vera C. [and 4 more](#)
- 2  2013AAS...22114605A 2013/01 [Star Formation in the Extreme Outer Disks of Giant Spiral Galaxies](#)  
Ashburn, Allison; Hunter, D. A.; Rubin, V. C.
- 3  2011BAAS...43..019C 2011/12 [Obituary: Martin F. McCarthy \(1923-2010\)](#)  
Coyne, George; Rubin, Vera
- 4  2011ARA&A..49....1R 2011/09 cited: 1 [An Interesting Voyage](#)  
Rubin, Vera C.
- 5  2011noao.prop..116J 2011/02 [The Stellar Kinematics of Dwarf Irregular Galaxy DDO 125: Is this matter?](#)  
Jackson, Megan; Hunter, Deidre; Rubin, Vera [and 1 more](#)
- 6  2011AAS...21725832W 2011/01 [Star Formation in the Outer Disks of Spiral Galaxies](#)  
Wright, Teresa; Hunter, D.; Rubin, V.
- 7  2010JAH...13..145R 2010/07 cited: 1 [Charlotte Moore Sitterly](#)

Date ▾

Export ▾

Explore ▾

Author Count

Bibcode

Citation Count

Normalized Citation Count

Classic Factor

First Author

Date

Entry Date

Reads



QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms ▾

◀ Start New Search

author:(“Rubin”)

Feedback ▾ ORCID ▾ About ▾ Sign Up Log In

Your search returned 255 results with 9,397 total citations

Collection +astronomy Author +Rubin, V

✓ AUTHORS

- >  Rubin, V 255
  - >  Ford, W 77
  - >  Thonnard, N 26
  - >  Hunter, D 16
  - >  Peterson, C 14
- [more](#)

✓ COLLECTIONS

- astronomy 255
- general 10
- physics 7

✓ REFEREED

- non-refereed 132
- refereed 123

✓ AFFILIATIONS

✓ KEYWORDS

✓ PUBLICATIONS

✓ BIB GROUPS

✓ SIMBAD OBJECTS

✓ NED OBJECTS

Show highlights  Show abstracts  Hide Sidebars

Go To Bottom

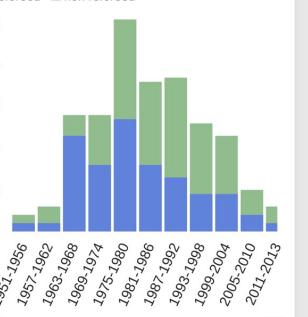
- 1  1980ApJ...238..471R 1980/06 cited: 992 [Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 \(R=4kpc\) to UGC 2885 \(R=122kpc\).](#)  
Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.
- 2  1970ApJ...159..379R 1970/02 cited: 801 [Rotation of the Andromeda Nebula from a Spectroscopic Survey of Emission Regions](#)  
Rubin, Vera C.; Ford, W. Kent, Jr.
- 3  1985ApJ...289...81R 1985/02 cited: 648 [Rotation velocities of 16 SA galaxies and a comparison of Sa, SB and SC rotation properties.](#)  
Rubin, V. C.; Burstein, D.; Ford, W. K., Jr. [and 1 more](#)
- 4  2001ARA&A..39..137S 2001 cited: 599 [Rotation Curves of Spiral Galaxies](#)  
Sofue, Yoshiaki; Rubin, Vera
- 5  2001ApJ...552L..23D 2001/05 cited: 431 [Mass Density Profiles of Low Surface Brightness Galaxies](#)  
de Blok, W. J. G.; McGaugh, Stacy S.; Bosma, Albert [and 1 more](#)
- 6  1978ApJ...225L.107R 1978/11 cited: 423 [Extended rotation curves of high-luminosity spiral galaxies. IV. Systematic dynamical properties, Sa -> Sc.](#)  
Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.

Citation Count ▾

Export ▾ Explore ▾

Years Citations Reads

refereed non refereed



Limit results to papers from

1951 to 2013

Apply



Feedback ▾ ORCID ▾ About ▾ Sign Up Log In

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

◀ Start New Search

author:(“Rubin”)

X Q

Your search returned 255 results

Collection +astronomy  
Author +Rubin, V

✓ AUTHORS

- >  Rubin, V 255
  - >  Ford, W 77
  - >  Thonnard, N 26
  - >  Hunter, D 16
  - >  Peterson, C 14
- [more](#)

✓ COLLECTIONS

- astronomy 255
- general 10
- physics 7

✓ REFEREED

- non-refereed 132
- refereed 123

✓ AFFILIATIONS

✓ KEYWORDS

✓ PUBLICATIONS

✓ BIB GROUPS

✓ SIMBAD OBJECTS

✓ NED OBJECTS

Show highlights  Show abstracts  Hide Sidebars

- 1  2013AJ...146..92H 2013/10 cited: 13  
**Star Formation in Two Luminous Spiral Galaxies**  
Hunter, Deidre A.; Elmegreen, Bruce G.; Rubin, Vera C. [and 4 more](#)
- 2  2013AAS...22114605A 2013/01  
**Star Formation in the Extreme Outer Disks of Giant Spiral Galaxies**  
Ashburn, Allison; Hunter, D. A.; Rubin, V. C.
- 3  2011BAAS...43..019C 2011/12  
**Obituary: Martin F. McCarthy (1923-2010)**  
Coyne, George; Rubin, Vera
- 4  2011ARA&A..49....1R 2011/09 cited: 1  
**An Interesting Voyage**  
Rubin, Vera C.
- 5  2011noao.prop..116J 2011/02  
**The Stellar Kinematics of Dwarf Irregular Galaxy DDO 125: Is this matter?**  
Jackson, Megan; Hunter, Deidre; Rubin, Vera [and 1 more](#)
- 6  2011AAS...21725832W 2011/01  
**Star Formation in the Outer Disks of Spiral Galaxies**  
Wright, Teresa; Hunter, D.; Rubin, V.
- 7  2010JAH...13..145R 2010/07 cited: 1  
**Charlotte Moore Sitterly**

Date ▾

Author Count  
Bibcode  
Citation Count  
Normalized Citation Count  
Classic Factor  
First Author  
Date  
Entry Date

Export ▾  Explore ▾



QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

◀ Start New Search

author:(“Rubin”)

Feedback ▾ ORCID ▾ About ▾ Sign Up Log In

Your search returned 255 results with 9,397 total citations

Collection +astronomy  
Author +Rubin, V

✓ AUTHORS

- >  Rubin, V 255
  - >  Ford, W 77
  - >  Thonnard, N 26
  - >  Hunter, D 16
  - >  Peterson, C 14
- [more](#)

✓ COLLECTIONS

- astronomy 255
- general 10
- physics 7

✓ REFEREED

- non-refereed 132
- refereed 123

✓ AFFILIATIONS

✓ KEYWORDS

✓ PUBLICATIONS

✓ BIB GROUPS

✓ SIMBAD OBJECTS

✓ NED OBJECTS

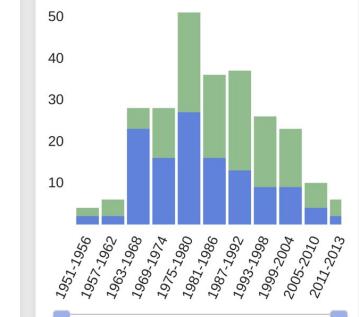
Show highlights  Show abstracts  Hide Sidebars

Go To Bottom

- 1  1980ApJ...238..471R 1980/06 cited: 992  
**Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc).**  
Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.
- 2  1970ApJ...159..379R 1970/02 cited: 801  
**Rotation of the Andromeda Nebula from a Spectroscopic Survey of Emission Regions**  
Rubin, Vera C.; Ford, W. Kent, Jr.
- 3  1985ApJ...289...81R 1985/02 cited: 648  
**Rotation velocities of 16 SA galaxies and a comparison of Sa, SB and SC rotation properties.**  
Rubin, V. C.; Burstein, D.; Ford, W. K., Jr. [and 1 more](#)
- 4  2001ARA&A..39..137S 2001 cited: 599  
**Rotation Curves of Spiral Galaxies**  
Sofue, Yoshiaki; Rubin, Vera
- 5  2001ApJ...552L..23D 2001/05 cited: 431  
**Mass Density Profiles of Low Surface Brightness Galaxies**  
de Blok, W. J. G.; McGaugh, Stacy S.; Bosma, Albert [and 1 more](#)
- 6  1978ApJ...225L.107R 1978/11 cited: 423  
**Extended rotation curves of high-luminosity spiral galaxies. IV. Systematic dynamical properties, Sa -> Sc.**  
Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.

Years Citations Reads

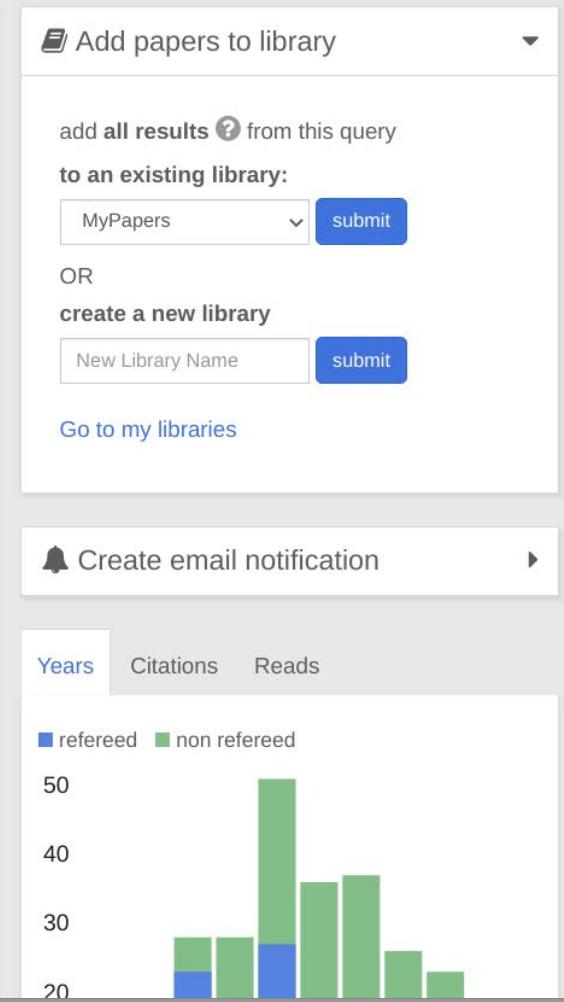
refereed  non refereed



Limit results to papers from  
1951 to 2013

AUTHORS	
> <input type="checkbox"/> Rubin, V	255
> <input type="checkbox"/> Ford, W	77
> <input type="checkbox"/> Thonnard, N	26
> <input type="checkbox"/> Hunter, D	16
> <input type="checkbox"/> Peterson, C	14
<a href="#">more</a>	
COLLECTIONS	
<input type="checkbox"/> astronomy	255
<input type="checkbox"/> general	10
<input type="checkbox"/> physics	7
REFERRED	
<input type="checkbox"/> non-refereed	132
<input type="checkbox"/> refereed	123
AFFILIATIONS	
KEYWORDS	
PUBLICATIONS	
BIB GROUPS	
SIMBAD OBJECTS	
NED OBJECTS	
DATA	
VIZIER TABLES	

- [Show highlights](#) [Hide abstracts](#) [Hide Sidebars](#) [Go To Bottom](#)
- 1  1980ApJ...238..471R 1980/06 cited: 993     
Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc).  
Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.
- Abstract**  
For 21 Sc galaxies whose properties encompass a wide range of radii, masses, and luminosities, we have obtained major axis spectra extending to the faint outer regions, and have deduced rotation curves. The galaxies are of high inclination, so uncertainties in the angle of inclination to the line ... [more](#)
- 2  1970ApJ...159..379R 1970/02 cited: 803     
Rotation of the Andromeda Nebula from a Spectroscopic Survey of Emission Regions  
Rubin, Vera C.; Ford, W. Kent, Jr.
- Abstract**  
Spectra of sixty-seven H I regions from 3 to 24 kpc from the nucleus of M31 have been obtained with the DTM image-tube spectrograph at a dispersion of 135 Å/mm'. Radial velocities, principally from Hα, have been determined with an accuracy of 10 km sec' for most regions. Rotational velocities ... [more](#)
- 3  1985ApJ...289...81R 1985/02 cited: 648     
Rotation velocities of 16 SA galaxies and a comparison of Sa, SB and SC rotation properties.  
Rubin, V. C.; Burstein, D.; Ford, W. K., Jr. [and 1 more](#)
- Abstract**  
Rotational velocities over most of the optical extent of 54 Sa, Sb, and Sc galaxies have been determined. The Sa curves exhibit a similar progression with luminosity as do the Sh



# So many options!

The screenshot shows the Astrophysics Data System (ADS) search interface. At the top, there's a navigation bar with links for Feedback, ORCID, About, and Account. Below the navigation is a search bar with the query "author:'Rubin'". To the left of the main content area is a sidebar titled "VIEW" containing links for Abstract, Citations (993), References (33), Co-Reads, Similar Papers, Volume Content, Graphics, Metrics, and Export Citation. The main content area displays a single search result for "Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc)." The result includes the abstract, authors (Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.), and a detailed description of the study. On the right side, there are sections for "FULL TEXT SOURCES" (ADS, NED 23, SIMBAD 21) and "DATA PRODUCTS". A button for "Add paper to library" is also present.

# So many options!



ads

Feedback ORCID About Account

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:"Rubin"

Back to results

VIEW

Abstract

Citations (993)

References (33)

Co-Reads

Similar Papers

Volume Content

Graphics

Metrics

Export Citation

Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc).

Show affiliations

Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.

For 21 Sc galaxies whose properties encompass a wide range of radii, masses, and luminosities, we have obtained major axis spectra extending to the faint outer regions, and have deduced rotation curves. The galaxies are of high inclination, so uncertainties in the angle of inclination to the line of sight and in the position angle of the major axis are minimized. Their radii range from 4 to 122 kpc ( $H = 50 \text{ km s}^{-1} \text{ Mpc}^{-1}$ ); in general, the rotation curves extend to 83% or  $R_{25}^{1.5}$ . When plotted on a linear scale with no scaling, the rotation curves for the smallest galaxies fall upon the initial parts of the rotation curves for the larger galaxies. All curves show a fairly rapid velocity rise to  $V \sim 125 \text{ km s}^{-1}$  at  $R \sim 5 \text{ kpc}$ , and a slower rise thereafter. Most rotation curves are rising slowly even at the farthest measured point. Neither high nor low

FULL TEXT SOURCES

ADS

DATA PRODUCTS

NED (23) SIMBAD (21)

Add paper to library

# So many options!

The screenshot shows the Astrophysics Data System (ADS) search results page for the query "author:Rubin".

**Header:** ads, Feedback, ORCID, About, Account.

**Search Bar:** QUICK FIELD: Author, First Author, Abstract, Year, Fulltext, All Search Terms. The search term "author:Rubin" is entered.

**Left Sidebar (Abstract View):**

- VIEW
- Abstract** (selected)
- Citations (993)
- References (33)
- Co-Reads
- Similar Papers
- Volume Content
- Graphics
- Metrics
- Export Citation

**Central Content:**

Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc).

Show affiliations  
Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.

For 21 Sc galaxies whose properties encompass a wide range of radii, masses, and luminosities, we have obtained major axis spectra extending to the faint outer regions, and have deduced rotation curves. The galaxies are of high inclination, so uncertainties in the angle of inclination to the line of sight and in the position angle of the major axis are minimized. Their radii range from 4 to 122 kpc ( $H = 50 \text{ km s}^{-1} \text{ Mpc}^{-1}$ ); in general, the rotation curves extend to 83% or  $R_{25}^{1.5}$ . When plotted on a linear scale with no scaling, the rotation curves for the smallest galaxies fall upon the initial parts of the rotation curves for the larger galaxies. All curves show a fairly rapid velocity rise to  $V \sim 125 \text{ km s}^{-1}$  at  $R \sim 5 \text{ kpc}$ , and a slower rise thereafter. Most rotation curves are rising slowly even at the farthest measured point. Neither high nor low

**Right Sidebar:**

FULL TEXT SOURCES: ADS, NED (23), SIMBAD (21). DATA PRODUCTS: I, II, III.

Add paper to library ▾

Large orange arrows point to the "Abstract" button in the sidebar and the "Add paper to library" button in the sidebar.

# So many options!

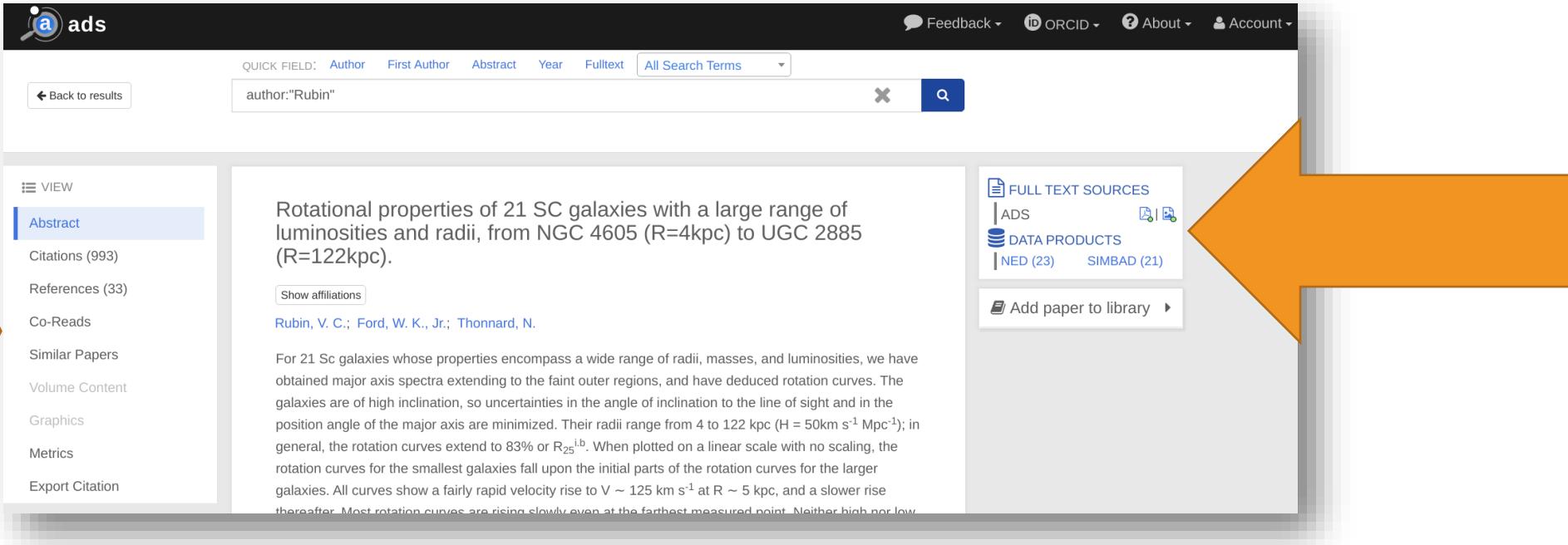
The screenshot shows the Astrophysics Data System (ADS) search interface. At the top, there's a navigation bar with links for Feedback, ORCID, About, and Account. Below it is a search bar with the query "author:Rubin". To the right of the search bar is a large orange arrow pointing right. On the left, there's a sidebar with a "VIEW" section containing links for Abstract, Citations (993), References (33), Co-Reads, Similar Papers, Volume Content, Graphics, Metrics, and Export Citation. The main content area displays a paper abstract for "Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc)." It lists authors Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N. and provides a detailed description of the research. To the right of the abstract is another sidebar titled "FULL TEXT SOURCES" with links for ADS, DATA PRODUCTS, NED (23), and SIMBAD (21). There's also a link to "Add paper to library".

## COOL CATCH

There can be multiple versions of a paper on ADS and arxiv. Always look at the most up-to-date version. Things can change between pre-print and publication!



# So many options!



The screenshot shows the Astrophysics Data System (ADS) search results page for the author "Rubin". The search bar at the top contains "author:Rubin". The main content area displays a single result: "Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc)". The "Abstract" tab is selected in the sidebar. To the right of the abstract, there is a "FULL TEXT SOURCES" section listing ADS, NED (23), and SIMBAD (21). A large orange arrow points from the left towards the right side of the screen, highlighting the full-text sources and citation options.

"This paper is awesome!  
How can I cite it?"

# So many options!

The screenshot shows the Astrophysics Data System (ADS) search results page for the query "author:Rubin". A large orange arrow points from the left towards the "Metrics" and "Export Citation" buttons in the sidebar. Another large orange arrow points from the right towards the "Add paper to library" button in the sidebar.

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author: "Rubin"

VIEW  
Abstract  
Citations (993)  
References (33)  
Co-Reads  
Similar Papers  
Volume Content  
Graphics  
Metrics  
Export Citation

Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc).

Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.

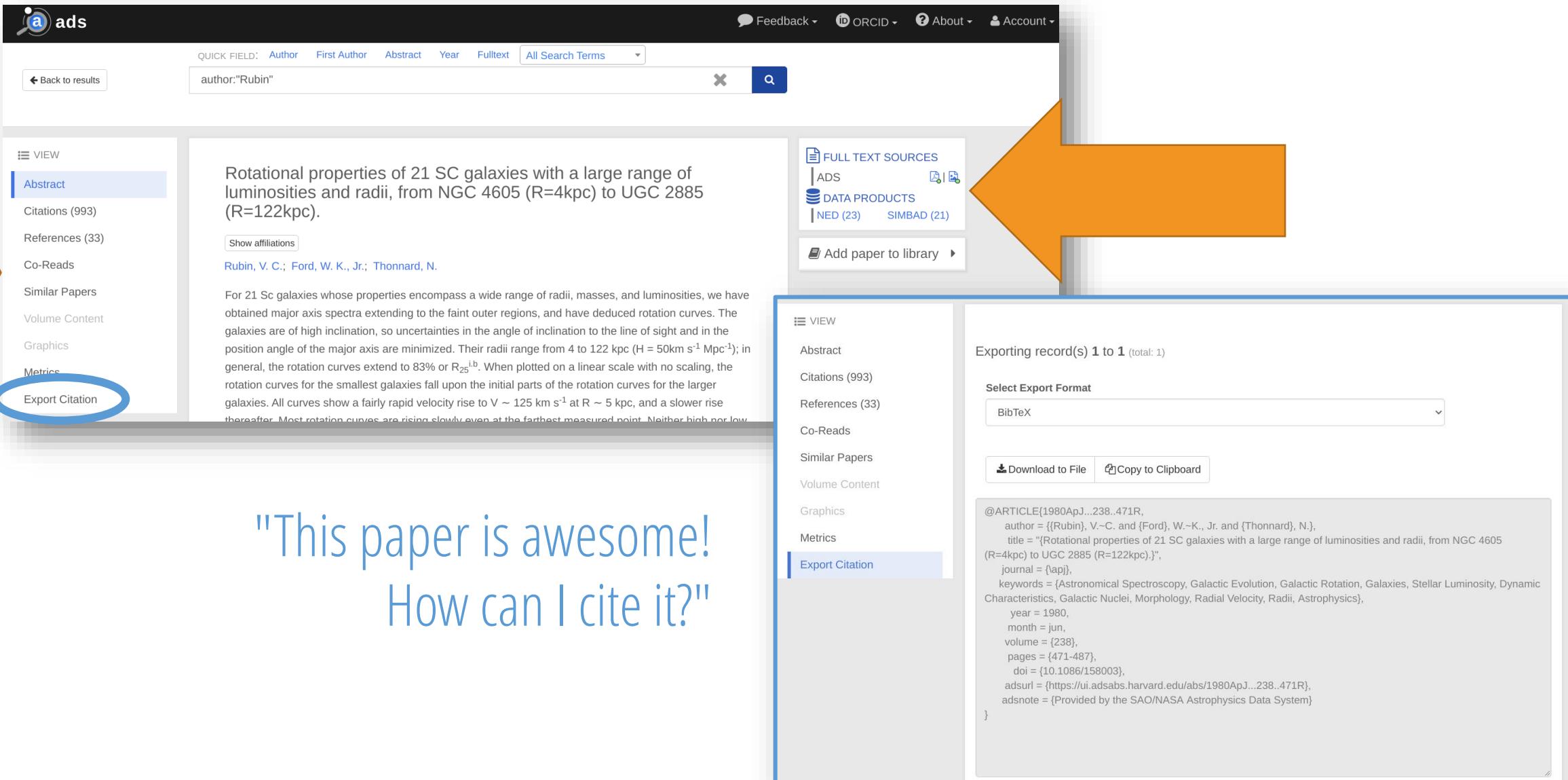
For 21 Sc galaxies whose properties encompass a wide range of radii, masses, and luminosities, we have obtained major axis spectra extending to the faint outer regions, and have deduced rotation curves. The galaxies are of high inclination, so uncertainties in the angle of inclination to the line of sight and in the position angle of the major axis are minimized. Their radii range from 4 to 122 kpc ( $H = 50 \text{ km s}^{-1} \text{ Mpc}^{-1}$ ); in general, the rotation curves extend to 83% or  $R_{25}^{1.5}$ . When plotted on a linear scale with no scaling, the rotation curves for the smallest galaxies fall upon the initial parts of the rotation curves for the larger galaxies. All curves show a fairly rapid velocity rise to  $V \sim 125 \text{ km s}^{-1}$  at  $R \sim 5 \text{ kpc}$ , and a slower rise thereafter. Most rotation curves are rising slowly even at the farthest measured point. Neither high nor low

FULL TEXT SOURCES  
ADS  
DATA PRODUCTS  
NED (23) SIMBAD (21)

Add paper to library

"This paper is awesome!  
How can I cite it?"

# So many options!



The screenshot shows the ADS (Astrophysics Data System) search interface. A search for "author:Rubin" has been performed. On the left, the paper details are shown, including the abstract, author list (Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.), and a detailed description of the study of 21 Sc galaxies. The "Export Citation" link in the sidebar is highlighted with a blue circle. On the right, a large orange arrow points from the main search results towards a detailed citation export view. This view shows the "Select Export Format" dropdown set to "BibTeX", and the resulting BibTeX code for the paper:

```
@ARTICLE{1980ApJ...238..471R,  
    author = {{(Rubin)}, V.-C. and {Ford}, W.-K., Jr. and {Thonnard}, N.},  
    title = "Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc).",  
    journal = {ApJ},  
    keywords = {Astronomical Spectroscopy, Galactic Evolution, Galactic Rotation, Galaxies, Stellar Luminosity, Dynamic Characteristics, Galactic Nuclei, Morphology, Radial Velocity, Radii, Astrophysics},  
    year = 1980,  
    month = jun,  
    volume = {238},  
    pages = {471-487},  
    doi = {10.1086/158003},  
    adsurl = {https://ui.adsabs.harvard.edu/abs/1980ApJ...238..471R},  
    adsnote = {Provided by the SAO/NASA Astrophysics Data System}
```

# So many options!



Demo Time!  
Explore ADS

QUICK FIELD: Author First Author Abstract Year Fulltext All Search Terms

author:"Rubin"

VIEW  
Abstract  
Citations (993)  
References (33)  
Co-Reads  
Similar Papers  
Volume Content  
Graphics  
Metrics  
Export Citation

Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc).

Rubin, V. C.; Ford, W. K., Jr.; Thonnard, N.

For 21 Sc galaxies whose properties encompass a wide range of radii, masses, and luminosities, we have obtained major axis spectra extending to the faint outer regions, and have deduced rotation curves. The galaxies are of high inclination, so uncertainties in the angle of inclination to the line of sight and in the position angle of the major axis are minimized. Their radii range from 4 to 122 kpc ( $H = 50 \text{ km s}^{-1} \text{ Mpc}^{-1}$ ); in general, the rotation curves extend to 83% or  $R_{25}^{1.5}$ . When plotted on a linear scale with no scaling, the rotation curves for the smallest galaxies fall upon the initial parts of the rotation curves for the larger galaxies. All curves show a fairly rapid velocity rise to  $V \sim 125 \text{ km s}^{-1}$  at  $R \sim 5 \text{ kpc}$ , and a slower rise thereafter. Most rotation curves are rising slowly even at the farthest measured point. Neither high nor low

FULL TEXT SOURCES  
ADS  
DATA PRODUCTS  
NED (23) SIMBAD (21)

Add paper to library

VIEW  
Abstract  
Citations (993)  
References (33)  
Co-Reads  
Similar Papers  
Volume Content  
Graphics  
Metrics  
Export Citation

Exporting record(s) 1 to 1 (total: 1)

Select Export Format  
BibTeX

Download to File Copy to Clipboard

```
@ARTICLE{1980ApJ...238..471R,
    author = {{Rubin}, V.-C. and {Ford}, W.-K., Jr. and {Thonnard}, N.},
    title = "Rotational properties of 21 SC galaxies with a large range of luminosities and radii, from NGC 4605 (R=4kpc) to UGC 2885 (R=122kpc).",
    journal = {ApJ},
    keywords = {Astronomical Spectroscopy, Galactic Evolution, Galactic Rotation, Galaxies, Stellar Luminosity, Dynamic Characteristics, Galactic Nuclei, Morphology, Radial Velocity, Radii, Astrophysics},
    year = 1980,
    month = jun,
    volume = {238},
    pages = {471-487},
    doi = {10.1086/158003},
    adsurl = {https://ui.adsabs.harvard.edu/abs/1980ApJ...238..471R},
    adsnote = {Provided by the SAO/NASA Astrophysics Data System}
```

# Why sign up for an ADS account?

- Keep track of papers you read (and write!)
- Organize papers into libraries and share
- Receive email reminders on topics you care about
- easy bibtex output for overleaf and latex
- It's free!



# Why sign up for an ADS account?

- Keep track of papers you read (and write!)
- Organize papers into libraries and share
- Receive email reminders on topics you care about
- easy bibtex output for overleaf and latex
- It's free!

## HOT TIP

Go to [ui.adsabs.harvard.edu](http://ui.adsabs.harvard.edu) to set up an account. You can link your account to an ORCID account too!



# Why sign up for an ADS account?

- Keep track of papers you read (and write!)
- Organize papers into libraries and share
- Receive email reminders on topics you care about
- easy bibtex output for overleaf and latex
- It's free!



Demo Time!  
ADS Libraries

## HOT TIP

Go to [ui.adsabs.harvard.edu](http://ui.adsabs.harvard.edu) to set up an account. You can link your account to an ORCID account too!



# Hot off the press at arXiv

<https://arxiv.org/list/astro-ph/new>

The screenshot shows the arXiv.org homepage for the Astrophysics category. At the top, there's a black header with the Cornell University logo and a link to the Simons Foundation. Below it is a red navigation bar with links for "arXiv.org > astro-ph", a search bar, and options for "All fields" and "Search". The main content area has a white background. It starts with a section titled "Astrophysics" and "New submissions". A note says "Submissions received from Tue 8 Sep 20 to Wed 9 Sep 20, announced Thu, 10 Sep 20". Below this is a list of three new submissions:

- [1] [arXiv:2009.03888 \[pdf, other\]](https://arxiv.org/abs/2009.03888)  
**Simulating gamma-ray production from cosmic rays interacting with the solar atmosphere in the presence of coronal magnetic fields**  
Zhe Li, Kenny C. Y. Ng, Songzhan Chen, Yuncheng Nan, Huihai He  
Subjects: High Energy Astrophysical Phenomena (astro-ph.HE); Solar and Stellar Astrophysics (astro-ph.SR)  

Cosmic rays can interact with the solar atmosphere and produce a slew of secondary messengers, making the Sun a bright gamma-ray source in the sky. Detailed observations with Fermi-LAT have shown that these interactions must be strongly affected by solar magnetic fields in order to produce the wide range of observational features, such as high flux and hard spectrum. However, the detailed mechanisms behind these features are still a mystery. In this work, we tackle this problem by performing particle-interaction simulations in the solar atmosphere in the presence of coronal magnetic fields modeled using the potential field source surface (PFSS) model. We find that the low-energy ( $\sim$ GeV) gamma-ray production is significantly enhanced by the coronal magnetic fields, but the enhancement decreases rapidly with energy. The enhancement is directly correlated with the production of gamma rays with large deviation angles relative to the input cosmic-ray direction. We conclude that coronal magnetic fields are essential for correctly modeling solar disk gamma rays below 10GeV, but above that the effect of coronal magnetic fields diminishes. Other magnetic field structures are needed to explain the high-energy disk emission.
- [2] [arXiv:2009.03895 \[pdf, other\]](https://arxiv.org/abs/2009.03895)  
**Viscous evolution of a massive disk surrounding stellar-mass black holes in full general relativity**  
Sho Fujibayashi, Masaru Shibata, Shinya Wanajo, Kenta Kiuchi, Koutarou Kyutoku, Yuichiro Sekiguchi  
Comments: 25 pages, 17 figures  
Subjects: High Energy Astrophysical Phenomena (astro-ph.HE)

# Hot off the press at arXiv

<https://arxiv.org/list/astro-ph/new>

Cornell University We gratefully acknowledge support from the Simons Foundation and member institutions.

arXiv.org > astro-ph Search... All fields Search Help | Advanced Search

## Astrophysics

### New submissions

Submissions received from Tue 8 Sep 20 to Wed 9 Sep 20, announced Thu, 10 Sep 20

- New submissions
- Cross-lists
- Replacements

[ total of 114 entries: 1-114 ]  
[ showing up to 2000 entries per page: [fewer](#) | [more](#) ]

#### New submissions for Thu, 10 Sep 20

[1] [arXiv:2009.03888 \[pdf, other\]](#)  
**Simulating gamma-ray production from cosmic rays interacting with the solar atmosphere in the presence of coronal magnetic fields**  
Zhe Li, Kenny C. Y. Ng, Songzhan Chen, Yuncheng Nan, Huihai He  
Subjects: High Energy Astrophysical Phenomena (astro-ph.HE); Solar and Stellar Astrophysics (astro-ph.SR)  
  
Cosmic rays can interact with the solar atmosphere and produce a slew of secondary messengers, making the Sun a bright gamma-ray source in the sky. Detailed observations with Fermi-LAT have shown that these interactions must be strongly affected by solar magnetic fields in order to produce the wide range of observational features, such as high flux and hard spectrum. However, the detailed mechanisms behind these features are still a mystery. In this work, we tackle this problem by performing particle-interaction simulations in the solar atmosphere in the presence of coronal magnetic fields modeled using the potential field source surface (PFSS) model. We find that the low-energy ( $\sim$ GeV) gamma-ray production is significantly enhanced by the coronal magnetic fields, but the enhancement decreases rapidly with energy. The enhancement is directly correlated with the production of gamma rays with large deviation angles relative to the input cosmic-ray direction. We conclude that coronal magnetic fields are essential for correctly modeling solar disk gamma rays below 10GeV, but above that the effect of coronal magnetic fields diminishes. Other magnetic field structures are needed to explain the high-energy disk emission.

[2] [arXiv:2009.03895 \[pdf, other\]](#)  
**Viscous evolution of a massive disk surrounding stellar-mass black holes in full general relativity**  
Sho Fujibayashi, Masaru Shibata, Shinya Wanajo, Kenta Kiuchi, Koutarou Kyutoku, Yuichiro Sekiguchi  
Comments: 25 pages, 17 figures  
Subjects: High Energy Astrophysical Phenomena (astro-ph.HE)

## HOT TIP

There is an arXiv *mini-course* offered in the DADDAA!



## COOL CATCH

Twitter account @astro-ph-leaks scrapes comments in .tex files uploaded to arXiv ... If you upload a manuscript, then don't leave any comments in it that you don't want broadcast to the world ;)



# Phone Apps (e.g. libarxiv)

The image shows two side-by-side screenshots of the libarxiv mobile application on an iPhone. The left screenshot displays the main navigation menu with categories like Physics, Mathematics, and Computer Science. The right screenshot shows a detailed view of a specific research paper from the 'Cosmology and Nongalactic Astrophysics' category.

**Left Screenshot (All Categories):**

- Physics
  - Astrophysics (astro-ph)
  - Physics(Condensed Matter) (cond-mat)
  - General Relativity and Quantum Cosmology (gr-qc)
  - High Energy Physics (hep)
  - Mathematical Physics (math-ph)
  - Nonlinear Sciences (nlin)
  - Nuclear Experiment (nucl-ex)
  - Nuclear Theory (nucl-th)
  - Physics (physics)
  - Quantum Physics (quant-ph)
- Mathematics
- Computer Science
- Quantitative Biology

All Recent Bookmarks Others

**Right Screenshot (Cosmology and Nongalactic Astrophysics):**

2020/9/9

**Stellar cooling, inelastic dark matter, and XENON**  
Wai-Yee Keung, Danny Marfatia, Po-Yan Tseng

**Newtonian-like gravity with variable \$G\$**  
úlio C. Fabris, Tales Gomes, únior D. Toniato, Hermano Velten

**Multi-messenger parameter estimation of GW170817: from jet structure to the Hubble constant**  
Hao Wang, Dimitrios Giannios

**Palatini Higgs and Coleman-Weinberg inflation with non-minimal coupling**  
Nilay Boston

**Minimum variance estimation of statistical anisotropy via galaxy survey**  
Maresuke Shiraishi, Teppei Okumura, Kazuyuki Akitsu

**The patch like model of galaxies formation: the virial paradox, core-cusp and missing satellite problems**  
ínski, A. Doroshkevich

**A model-independent constraint on the Hubble constant with gravitational waves from the Einstein Telescope**  
Sixuan Zhang, Shuo Cao, Jia Zhang, Tonghua Liu, Yuting Liu, Shuaibo Geng, Yujie Lian

**On cosmography in the cosmic dark ages: are we still in the dark?**  
Aritra Banerjee, Ó Colgáin, Misao Sasaki, Mohammad M. Sheikh-Jabbari, Tao Yang

**The XXL survey: XLII. Detection and characterization of the galaxy population of distant galaxy clusters in the XXL-N/VIDEO field: A tale of variety**  
A. Trudeau, C. Garrel, J. Willis, M. Pierre, F. Gastaldello, L. Chiappetti, S. Ettori, K. Umetsu, C. Adami, N. Adams, R. A. A. Bowler, L. Faccioli,

All Recent Bookmarks Others

# Accessing Library Services



# Accessing Library Services

- Gernstein Science Library
  - Building closed, but help still available!
  - [ask.gerstein@utoronto.ca](mailto:ask.gerstein@utoronto.ca)
  - [Curbside pick-up at Robart's Library](#)
- Accessing U of T Library off-campus
  - <https://onesearch.library.utoronto.ca/>
- Google Scholar account
  - Add U of T in Settings > Library Links

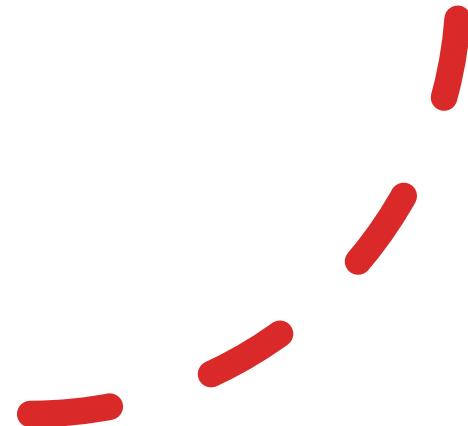


# Accessing Library Services

- Gernstein Science Library
  - Building closed, but help still available!
  - [ask.gerstein@utoronto.ca](mailto:ask.gerstein@utoronto.ca)
  - [Curbside pick-up at Robart's Library](#)
- Accessing U of T Library off-campus
  - <https://onesearch.library.utoronto.ca/>
- Google Scholar account
  - Add U of T in Settings > Library Links

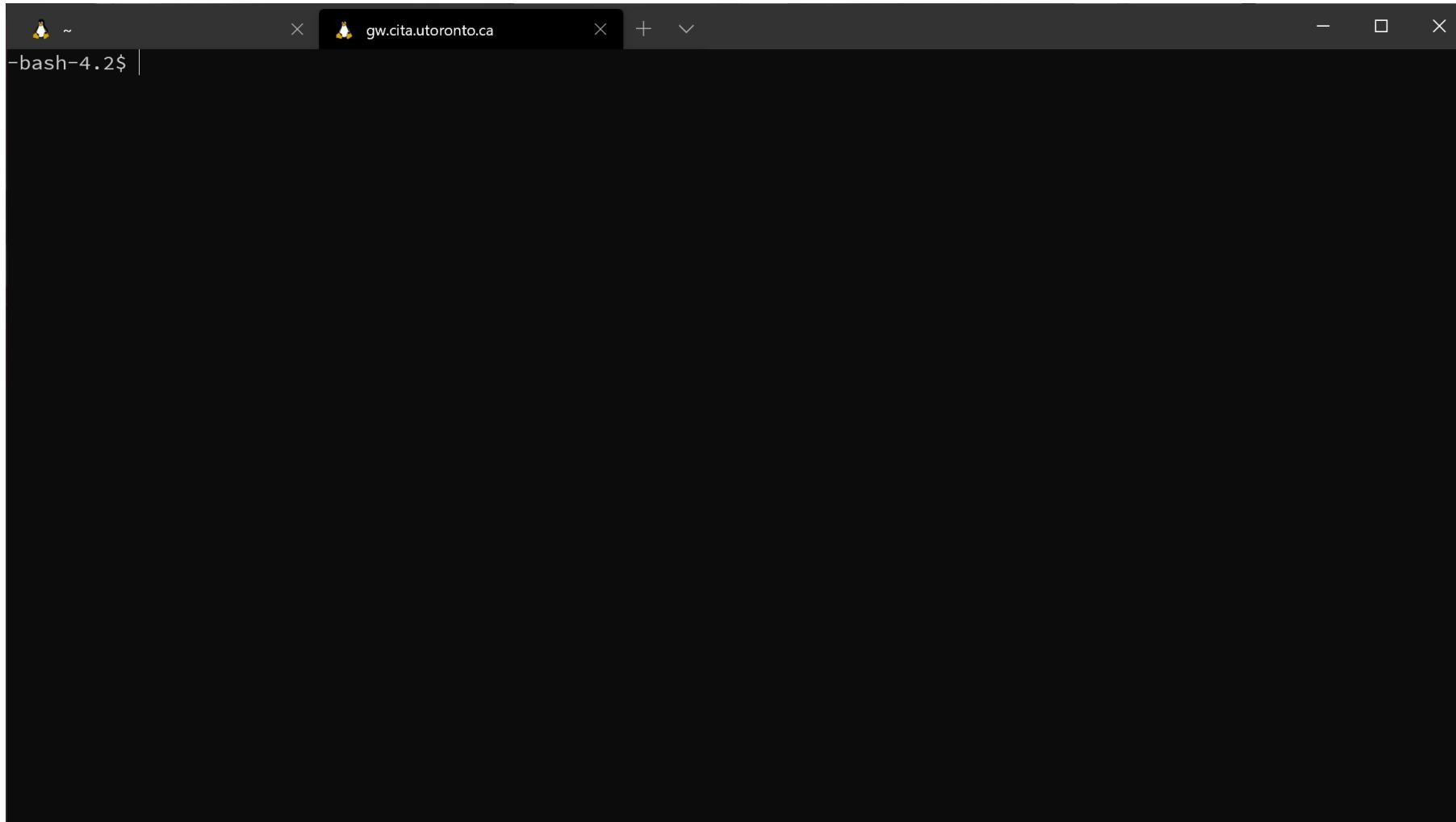


Demo Time!  
Google Scholar

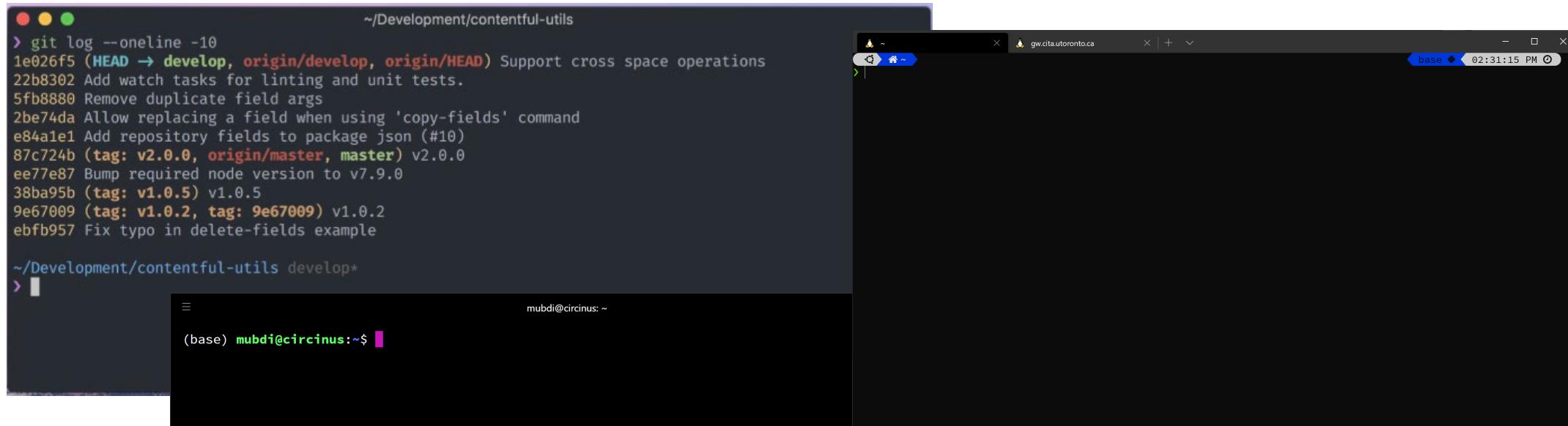


Your friend, the Terminal

# This is your terminal. You will come to love this little box!



# They come in all sorts of shapes and sizes



The image displays three separate terminal windows, each with a distinct window shape and size, illustrating the variety of terminal interfaces available.

- Top Left Terminal:** A standard rectangular terminal window with rounded corners. It shows a command-line interface with a dark background and light-colored text. The command `git log --oneline -10` is run, displaying ten recent commits. The window title is `~/Development/contentful-utils`.
- Top Right Terminal:** A terminal window with a rounded rectangular shape and a dark background. It shows a command-line interface with a dark background and light-colored text. The window title is `gw.cita.utoronto.ca` and the status bar indicates the time as `02:31:15 PM`.
- Bottom Center Terminal:** A rounded rectangular terminal window with a dark background and light-colored text. The window title is `howto geek@ubuntu: ~` and the status bar indicates the user as `howto geek@ubuntu:~$`.

# What is a Terminal?

A Terminal Program (sometimes also called a “console”) is a way of interacting directly with your computer using text commands. This is an alternative way of interacting with your computer to a mouse, and often, more powerful.

Not all terminals are built the same, and we have the following recommendations for terminal programs:

- **For Windows:** Windows Terminal (available on the Windows Store)
- **For MacOS:** iTerm2 (available on its website: <https://iterm2.com>)
- **For Linux/or Crossplatform:** Hyper (available on its website: <https://hyper.is/>)

# What is a Terminal?

A Terminal Program (sometimes also called a “console”) is a way of interacting directly with your computer using text commands. This is an alternative way of interacting with your computer to a mouse, and often, more powerful.

Not all terminals are built the same, and we recommend the following terminal programs:

- **For Windows:** Windows Terminal (available on its website)
- **For MacOS:** iTerm2 (available on its website)
- **For Linux/or Crossplatform:** Hyper (available on its website. <https://hyper.is/>)

## HOT TIP

The terminal programs we’re recommending all have the ability to open multiple tabs and panes, and hot keys to switch between them. This makes it easy to compare two things side-by-side.



# Some terminal basics...

```
> cd <directory name> # change your current directory to <directory name>  
  
> cd ~ # change your current directory to your home directory  
  
> ls # list all the files in the current directory  
  
> ls -ahl # the same, but show me all the files in a list  
  
> ls <directory name> # list all the files in <directory name>  
  
> mkdir <directory name> # make a directory called <directory name>  
  
> rmdir <directory name> # remove the directory called <directory name>  
(only works if it's empty)  
  
> pwd # list what directory you're in
```

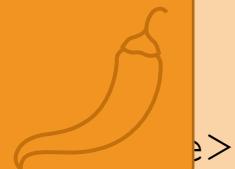


# Some terminal basics...

```
> cd <directory name> # change your current directory to <directory name>  
  
> cd ~ # change your current directory to your home directory  
  
> ls # list all the files in the cu  
  
> ls -ahl # the same, but show me a  
  
> ls <directory name> # list all th  
  
> mkdir <directory name> # make a d  
  
> rmdir <directory name> # remove t  
(only works if it's empty)  
  
> pwd # list what directory you're in
```

## HOT TIP

This is just a very basic list to give you a flavour, and everyone has their own versions/options of these commands that they love. Use what makes the most sense!



# Some terminal basics...

```
> cd <directory name> # change your current directory to <directory name>  
  
> cd ~ # change your current directory to your home directory  
  
> ls # list all the files in the current directory  
  
> ls -ahl # the same, but show me all the files in a list  
  
> ls <directory name> # list all the files in <directory name>  
  
> mkdir <directory name> # make a directory  
  
> rmdir <directory name> # remove the directory  
(only works if it's empty)  
  
pwd # list what directory you're in
```

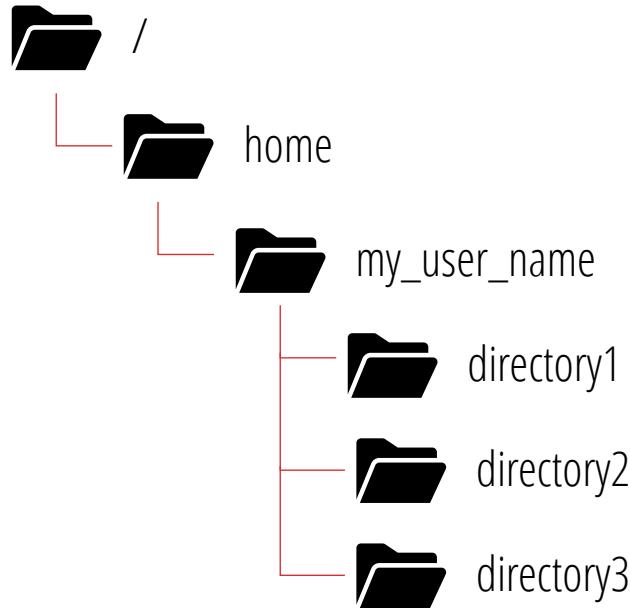
## HOT TIP

You can type in “man <command name>” to get the **man**ual page of the command, which shows you all of the options for that command and how to use it.



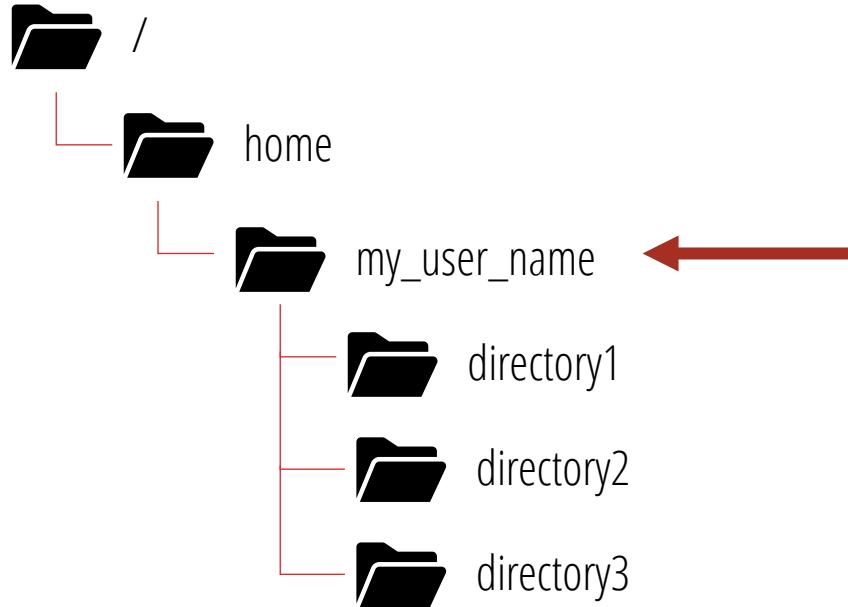
# Navigating your directories

Typically, on your computer, there's a tree of directories:



# Navigating your directories

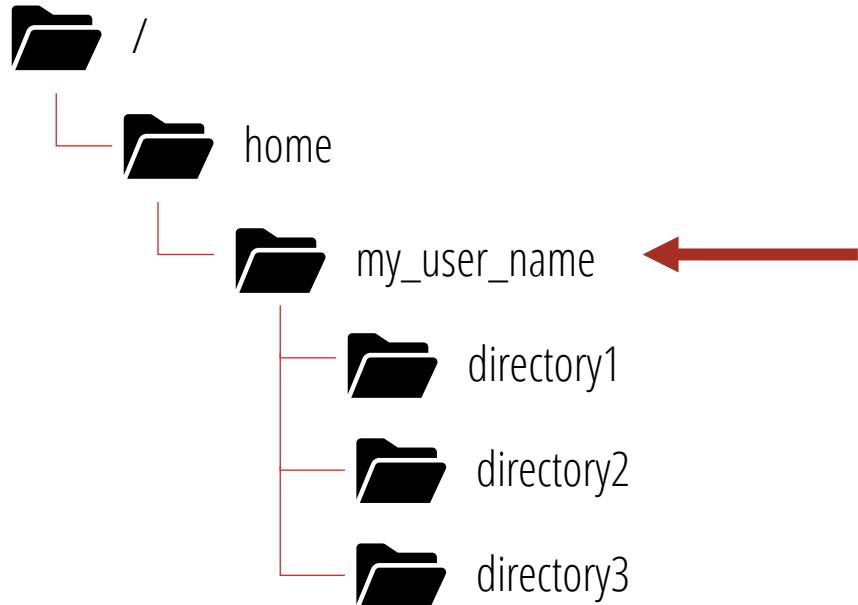
Typically, on your computer, there's a tree of directories:



**When you log in, this is where you are.  
It's also often referred to as “~”**

# Navigating your directories

Typically, on your computer, there's a tree of directories:



**When you log in, this is where you are.  
It's**

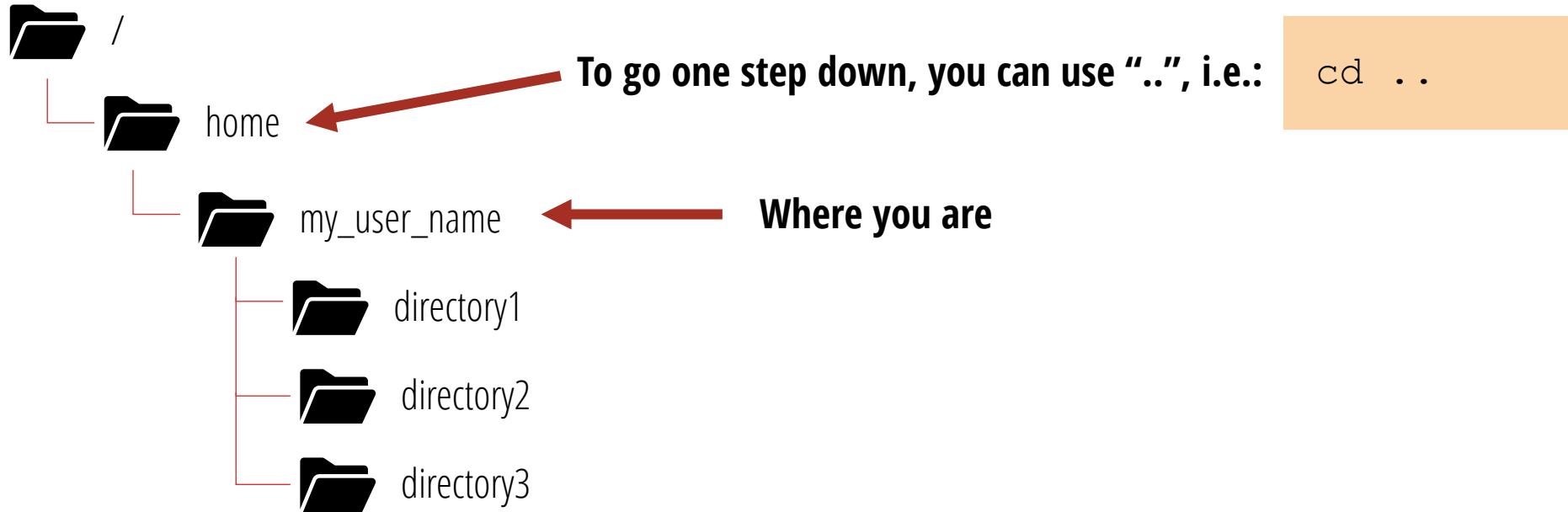
## COOL CATCH

In Windows (not using WSL), this location is usually in your User directory. For instance, for me, it is located in "C:\Users\mubdi"



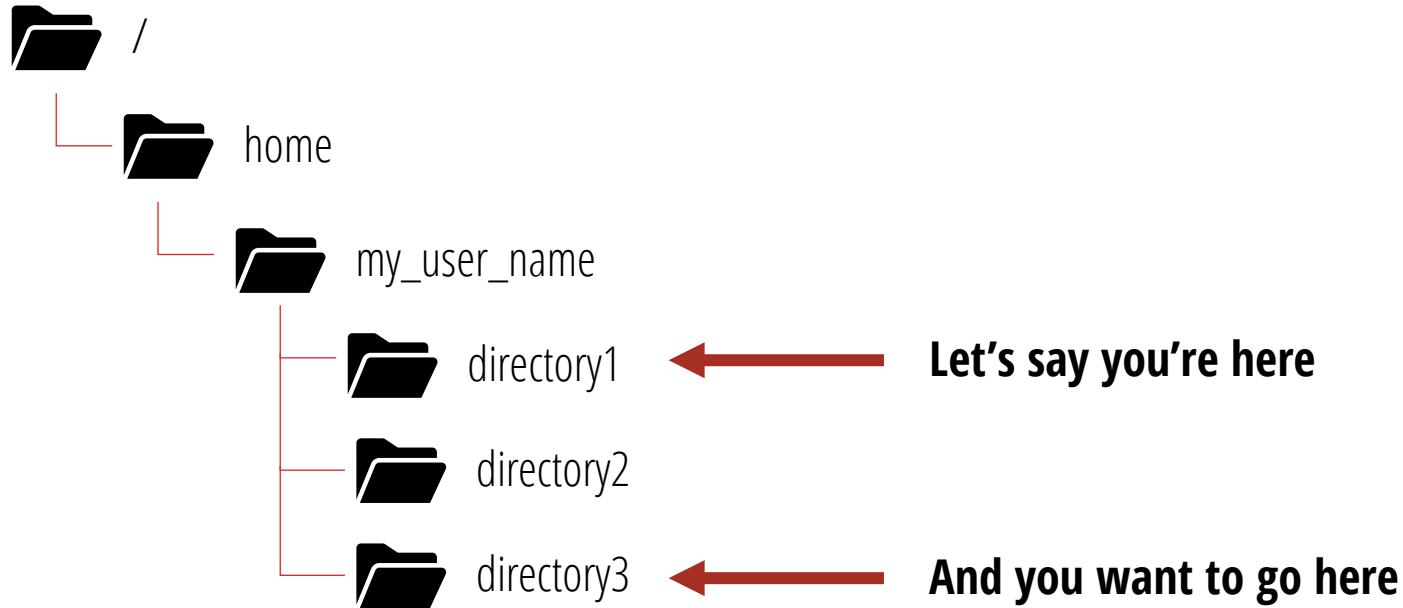
# Navigating your directories

Typically, on your computer, there's a tree of directories:



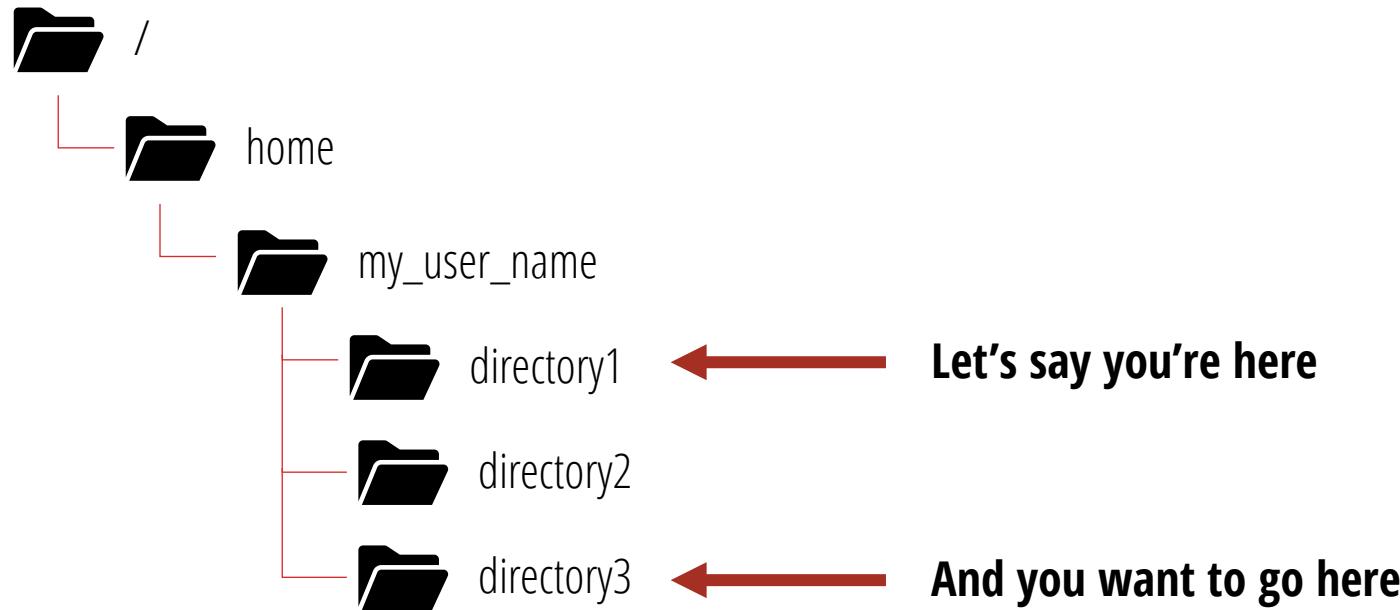
# Navigating your directories

Typically, on your computer, there's a tree of directories:



# Navigating your directories

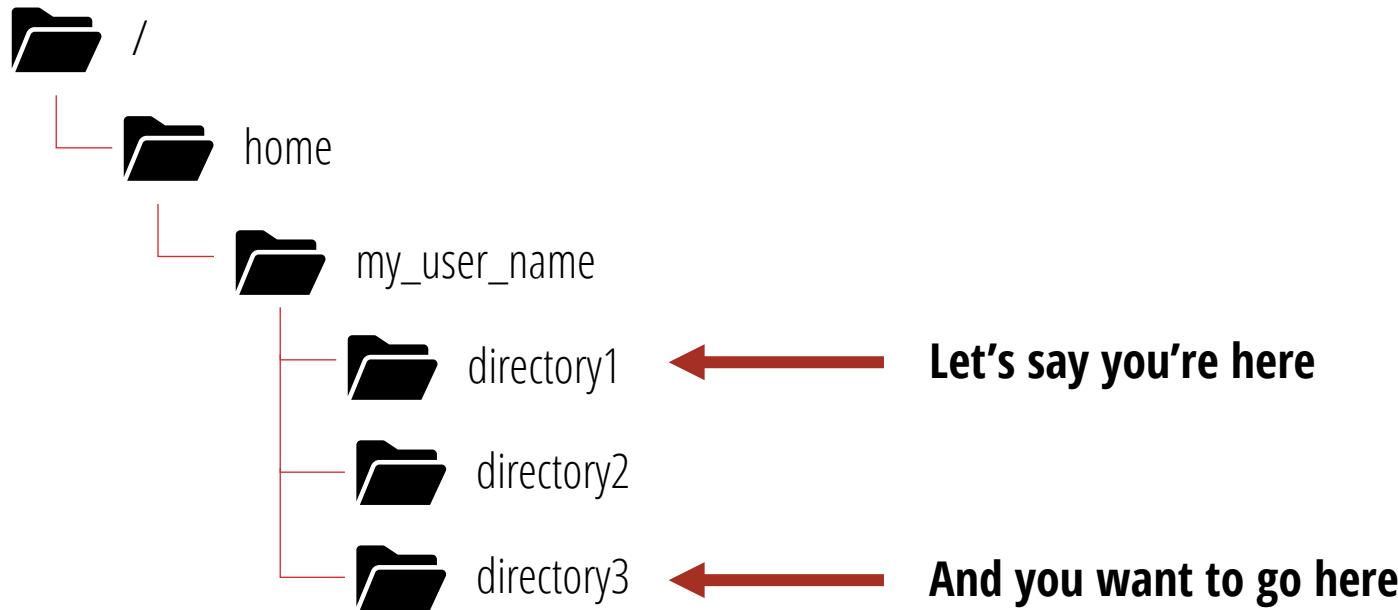
Typically, on your computer, there's a tree of directories:



```
cd ../directory3
```

# Navigating your directories

Typically, on your computer, there's a tree of directories:

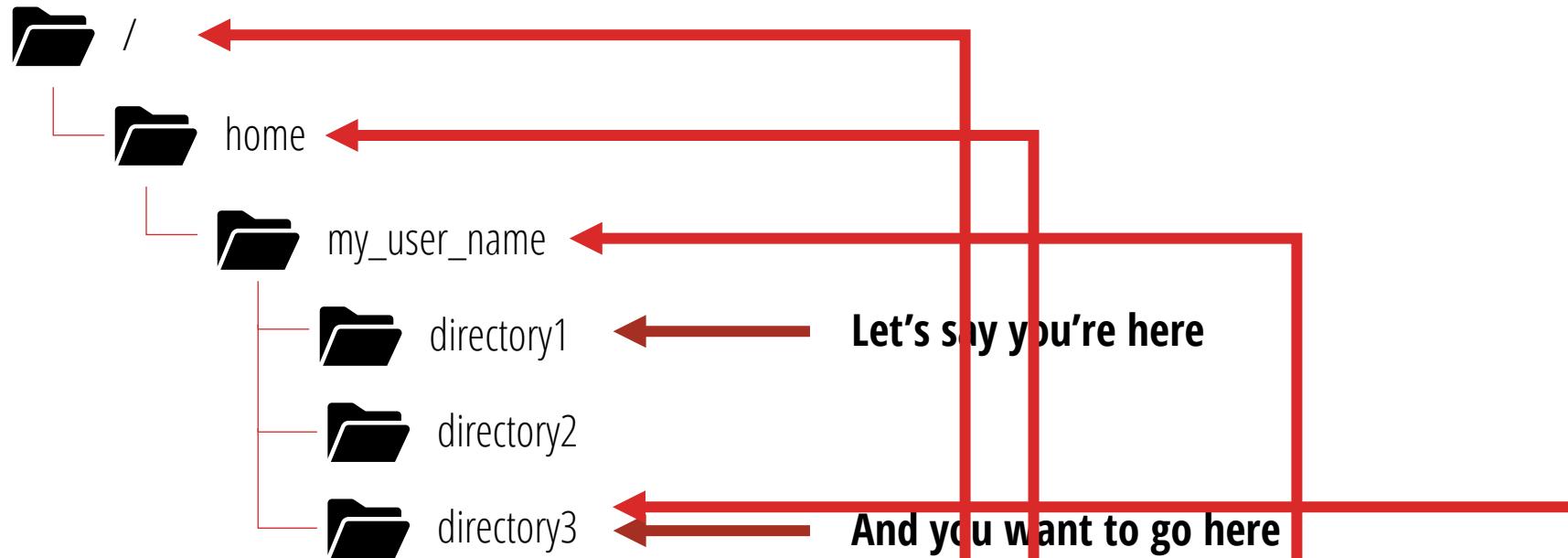


Or you could use absolute paths (i.e., right from the top):

```
cd /home/my_user_name/directory3
```

# Navigating your directories

Typically, on your computer, there's a tree of directories:

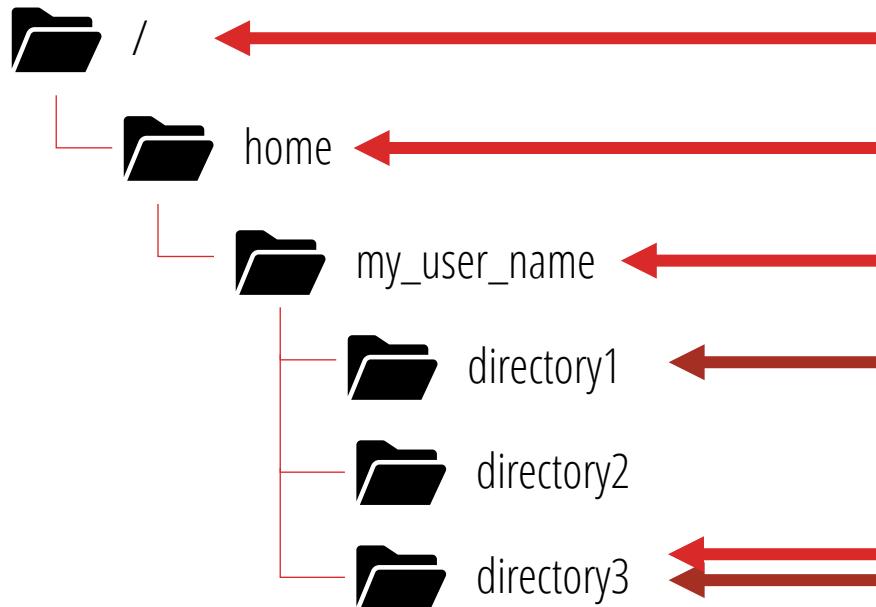


Or you could use absolute paths (i.e., right from the top):

```
cd /home/my_user_name/directory3
```

# Navigating your directories

Typically, on your computer, there's a tree of directories:



## HOT TIP

It's okay to be lazy, and something you want to be lazy about is typing. You can usually press "tab" to try to complete the name of directories and/or files, if you start typing the first few letters.



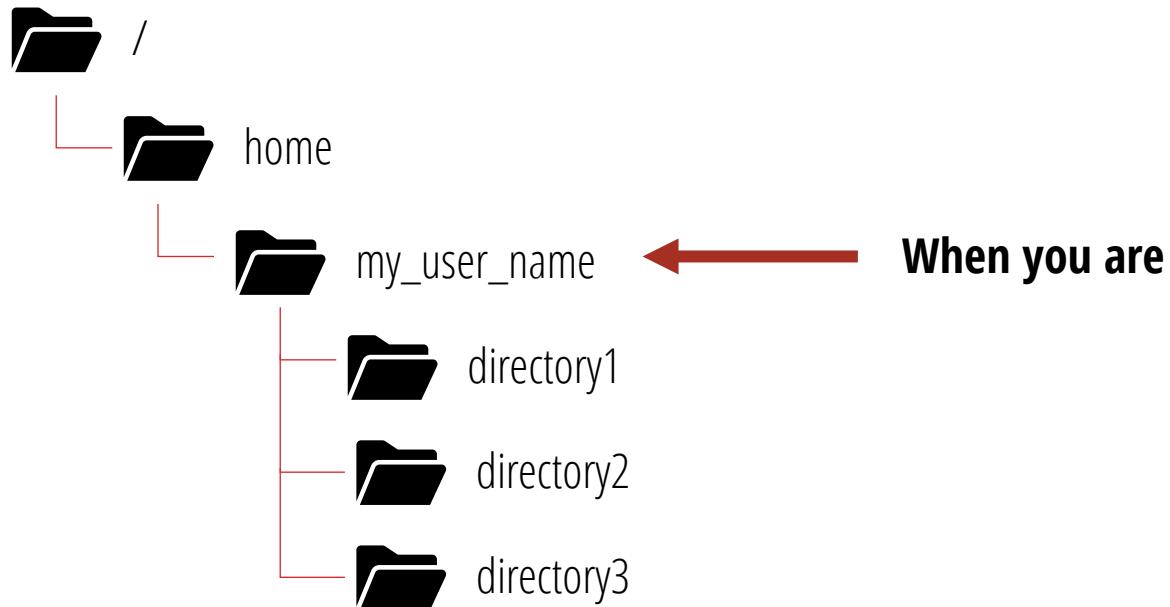
Or you could use absolute paths (i.e., right from the top):

```
cd /home/my_user_name/directory3
```



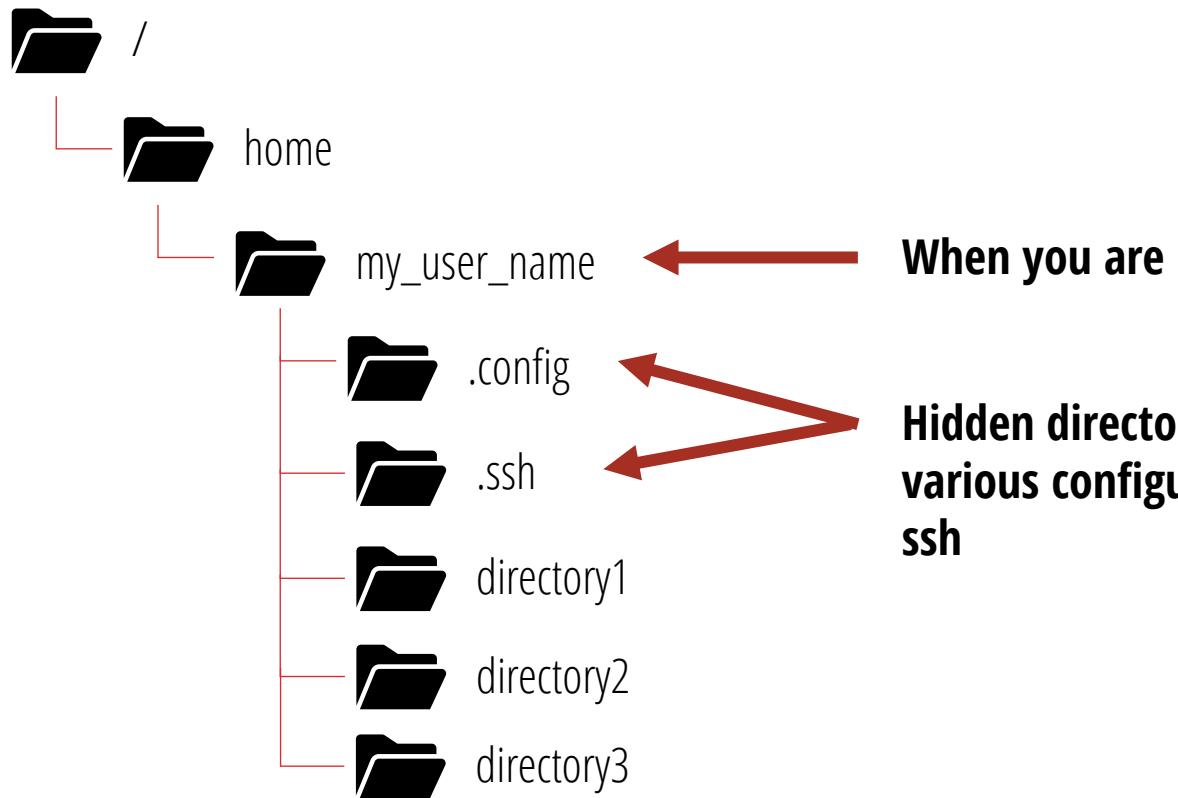
# Hidden Directories

When you run an “ls”, you don’t see everything. In your home directory, try running “ls –a”



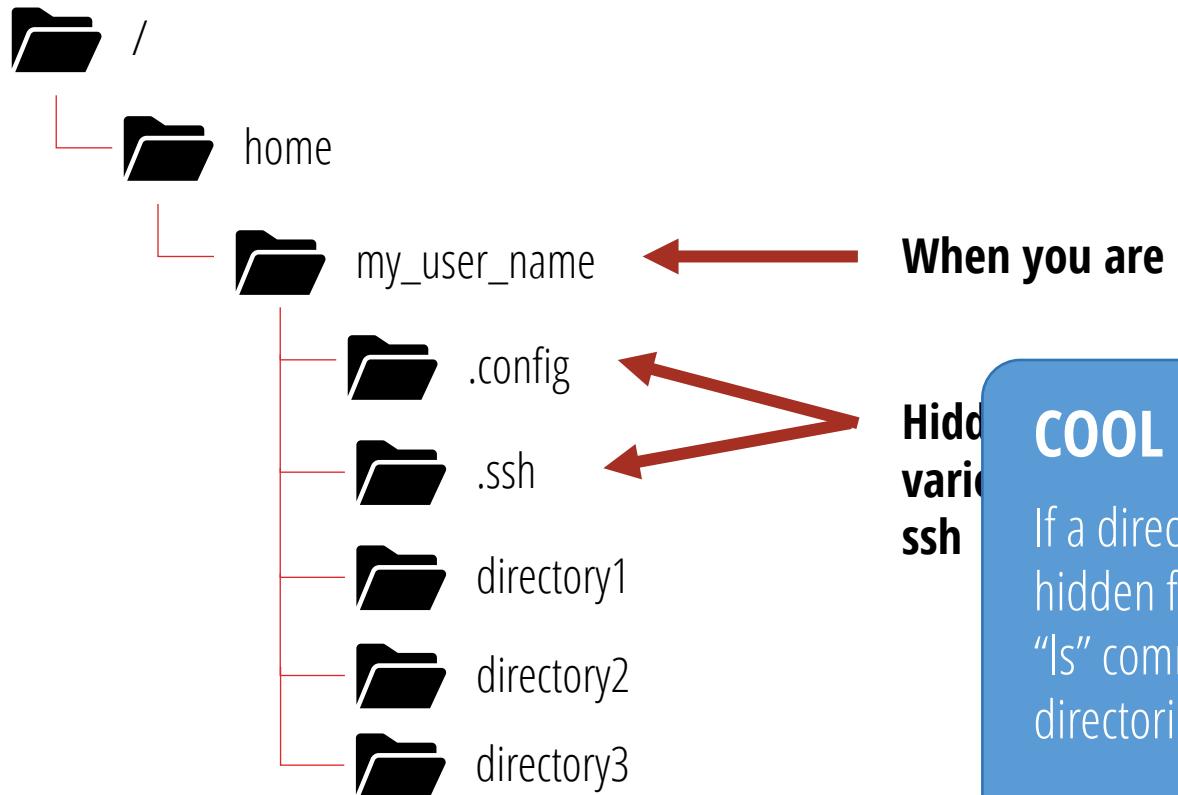
# Hidden Directories

When you run an “ls”, you don’t see everything. In your home directory, try running “ls –a”



# Hidden Directories

When you run an “ls”, you don’t see everything. In your home directory, try running “ls –a”



## COOL CATCH

If a directory or file starts with a period (.), it is a hidden file, and won’t show up by default with the “ls” command. We’ll be playing with a bunch of such directories and files in this bootcamp.



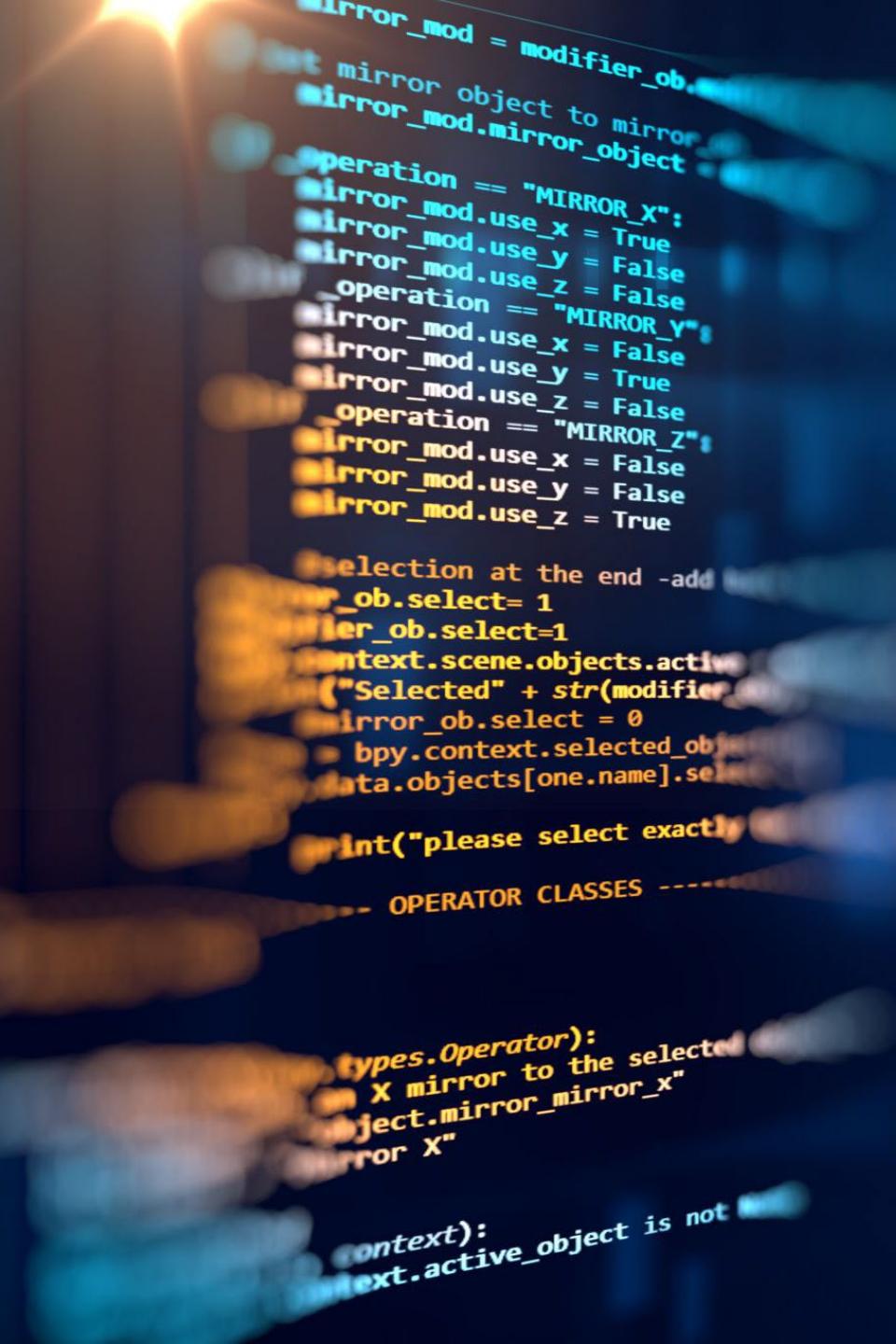
# SSH

---

One of the most powerful things about computing is often connecting to other computers! The way most computers that you'll encounter doing this is through the command line through a program called "ssh". That stands for "**S**ecure **sh**eLL".

Importantly, anything you communicate across different computers will be encrypted.

If you're going to use a system like Compute Canada/SciNet or CITA, this will be important for you.



# Some Basic SSH Commands

```
> ssh <server_name> # ssh into <server_name> with whatever your current  
username is  
  
> ssh <username>@<server_name> # ssh into a server with a specific  
username  
  
> ssh <server_name> -l <username> # same as above, but longer  
  
> ssh-keygen # generates a security key to allow you to login to places  
without a password  
  
> ssh-copy-id <server_name> # copies your generated security key over to  
<server_name>
```



# Some Basic SSH Commands

```
> ssh <server_name> # ssh into <server_name> with whatever your current  
username is
```

```
> ssh <username>@<server_name> # ssh into a server with a specific  
username
```

```
> ssh <server_name> -l <username> # same as above, but longer
```

```
> ssh-keygen # generates a security key to  
without a password
```

```
> ssh-copy-id <server_name> # copies your  
<server_name>
```

## HOT TIP

You can save settings for different ssh servers in your  
~/.ssh/config file, for instance, if you'd like ports  
forwarded, or if you'd like to use a specific user  
name



# Some Basic SSH Commands

```
> ssh <server_name> # ssh into <server_name> with whatever your current  
username is
```

```
> ssh <username>@<server_name> # ssh into a server with a specific  
username
```

```
> ssh <server_name> -l <username> # same as above, but longer
```

```
> ssh-keygen # generates a security key to  
without a password
```

```
> ssh-copy-id <server_name> # copies your  
<server_name>
```

## HOT TIP

If you need to forward a **port** from another computer to yours, you can use the **-L** flag. For instance, if you wanted to forward port 8888 to your computer's port 8888, you can use the flag:

**-L 8888:localhost:8888**



# Moving Files around

More often than not, you'll want to move files around a system, or between systems. Here's how to do it on your own computer:

```
> cp <file_name> <destination_name> # copy a single file from one location  
to another  
  
> cp -r <directory_name> <destination_name> # copy a whole directory (and  
everything in it) from one location to another  
  
> mv <file_name> <destination_name> # move a file or directory from one  
location to another
```



# Moving Files around

More often than not, you'll want to move files around a system, or between systems.

## HOT TIP

Wildcards (\*) are your friend! If you want to copy a selection of files that match a certain bit of the filename, you can use a wildcard to represent everything that's *not* supposed to match. For instance:

\*.txt

Will match:

a.txt, b.txt, c.txt



onputer:

```
name> # copy a single file from one location
```

```
ation_name> # copy a whole directory (and its contents) to another
```

```
ame> # move a file or directory from one
```



# Moving Files around

How about on another system? You can copy over ssh using **scp**:

```
> scp <file_name> <user_name>@<server_name>:<destination_name> # copy a single file from your computer to a server.
```

```
> scp <user_name>@<server_name>:<file_name> <destination_name> # copy a file from a server to a location on your computer.
```

```
:<directory_name> <destination_name> # copy a directory and its contents to a location on your computer.
```

## HOT TIP

For individual files, or if you don't remember exactly what the file was called, don't be a hero – use a GUI. For Windows, I use the WinSCP client. For Mac OSX, Cyberduck is a popular choice.



# Moving Files around

How about on another system? You can copy

```
> scp <file_name> <user_name>@<server_name>:  
single file from your computer to a server
```

```
> scp <user_name>@<server_name>:<file_name>  
single file from a server to location
```

```
> scp -r <user_name>@<server_name>:<directory>  
copy a directory from a server to local computer
```

## HOT TIP

Is the file you want openly available on the internet? If so, an easy way to grab the file is using the command **wget**. If you have a particular URL, you can download the file to your current directory by:

```
wget <url_of_file>
```



#



# Moving Files around

How about on another system? You can copy over ssh using **scp**:

```
> scp <file_name> <user_name>@<server_name>:<destination_name> # copy a  
single file from your computer to a server.
```

## HOT TIP

Do you have a more complicated/larger transfer that you need to complete? Perhaps you need to run it regularly? Take a look at **rsync** which is beyond the scope of this bootcamp, but will help you immensely. There's a lot of options, so best to Google/Search for what you'd like to do for the correct command.



```
<user_name> <destination_name> # copy a  
file from your computer.
```

```
<directory_name> <destination_name> #  
copy a directory and all its contents on your computer.
```

# Exercises for this session

- Make a shared google doc with all the tips that have been useful to you
- Set up an overleaf document with AAS, MNRAS, etc. template
- Sign up for an ADS account
  - create a library on a topic that interests you (e.g. black holes, gravitational waves, etc)
  - Set up a weekly e-mail reminder
- ADS exercise
  - pick a paper, get the bibtex code, put into the .bib file on your overleaf, document, and make a citation to the paper in the .tex file.
  - Export library to bibtex file and import in Overleaf
- Make a Trello board for your life
- Make a new directory, and copy a file from a server that we'll give you

