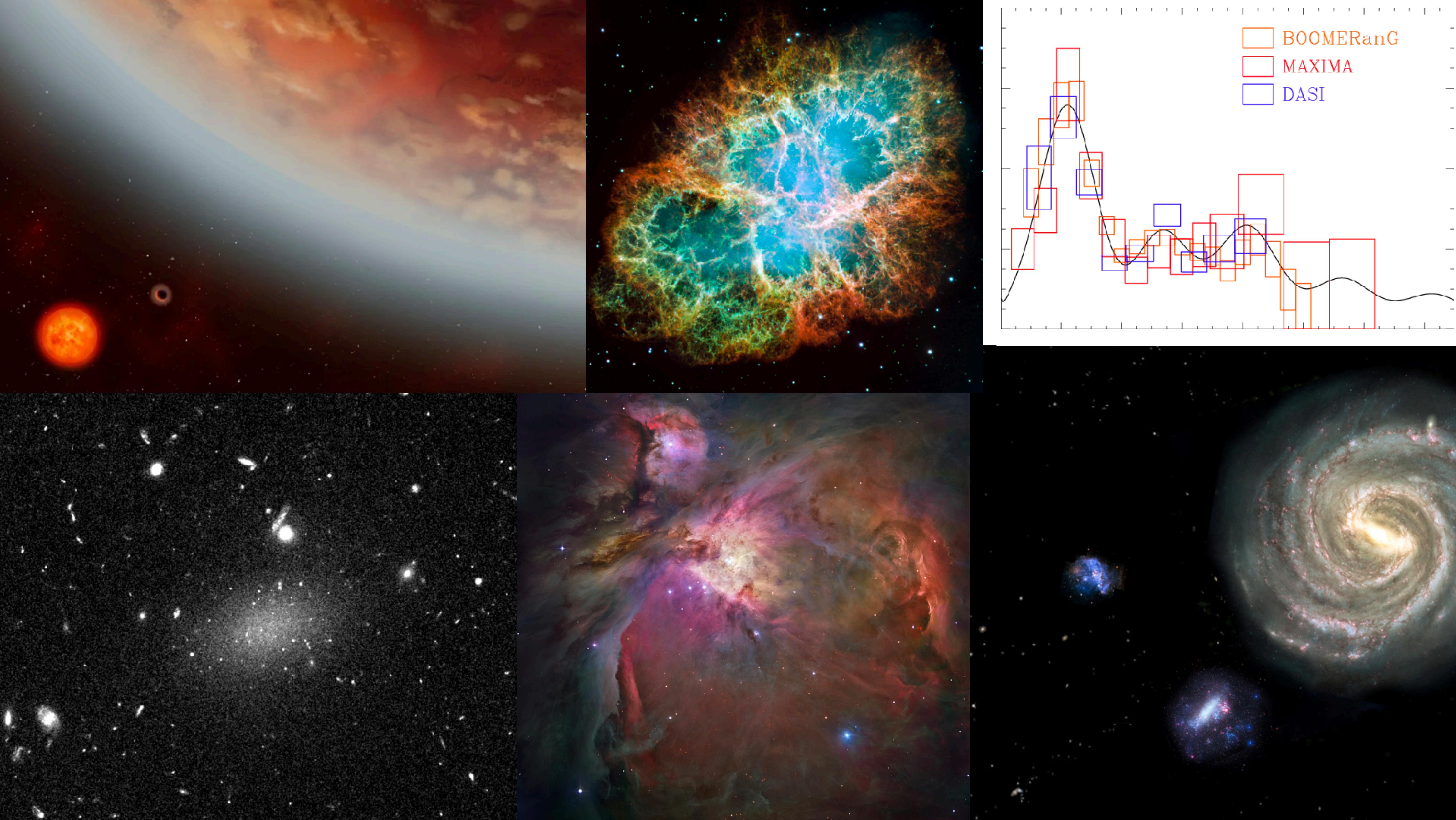


AST1501 - Introduction to Research

Jo Bovy





```

crop_center = img_data.shape[1] / 2, img_data.shape[0] / 2
crop_size = units.Quantity(100,100), units.pixel)

## what I want to do
# open the header and image data
# create the file object with header info and data:
# CCD_TEMP
# EXP_TIME
# PICTTYPE
# img_data.shape <- to verify the proper geometry
# CROP(data)
#. min, max, mean, std_dev

# Let's create the crop

img_crop = Cutout2D(img_data, crop_center, crop_size)

# and write the required header and data into a sample dict

img_sample = { 'PICTTYPE' : img_header[0].header['PICTTYPE'],
               'ff_geometry' : img_data.shape,
               'crop_geometry' : img_crop.shape,
               'EXPTIME' : img_header[0].header['EXPTIME'],
               'CCD-TEMP' : img_header[0].header['CCD-TEMP'],
               'min' : np.min(img_crop.data),
               'max' : np.max(img_crop.data),
               'mean' : np.mean(img_crop.data),
               'std dev' : np.std(img_crop.data),
               'data' : img_crop.data
             }

#join it to the main data_set, keyed off file name

data_set[file.split('/')[-1]] = img_sample

# let's show one of the crops.

```

Hom1

Source Rich Text

Recompile

File outline

Introduction

1 % !TEX root = template.tex

2

3 \section{Introduction}

4 \label{sec:introduction}

5

6 Artificial Neural Networks (ANN) are powerful learning algorithms inspired by the brain to store information \cite{hi}. Similar to the human brain, ANN is based on a collection of neurons with many connections between them. Neural networks have been used to find unknown relationships between various parameters based on large numbers of examples. Examples of successful applications of neural networks are object detection, image classification, computer vision, speech recognition. Moreover, neural networks are more and more used in medical applications. There are many types of neural networks architectures. Examples of various types of neural networks are the Hopfield network, the multilayer perceptron, the Boltzmann machine, and the Kohonen network.

7

8 In this homework, the focus is on two different neural networks for solving two kinds of supervised learning problems. For this reason, the analysis will be divided into two building blocks:

9 \begin{enumerate}

10 itemsep=0pt

ads

QUICK FIELD: Author First Author Abstract Year Fulltext All Search

author:lockhart, k

Your search returned 36 results

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Bulk Actions

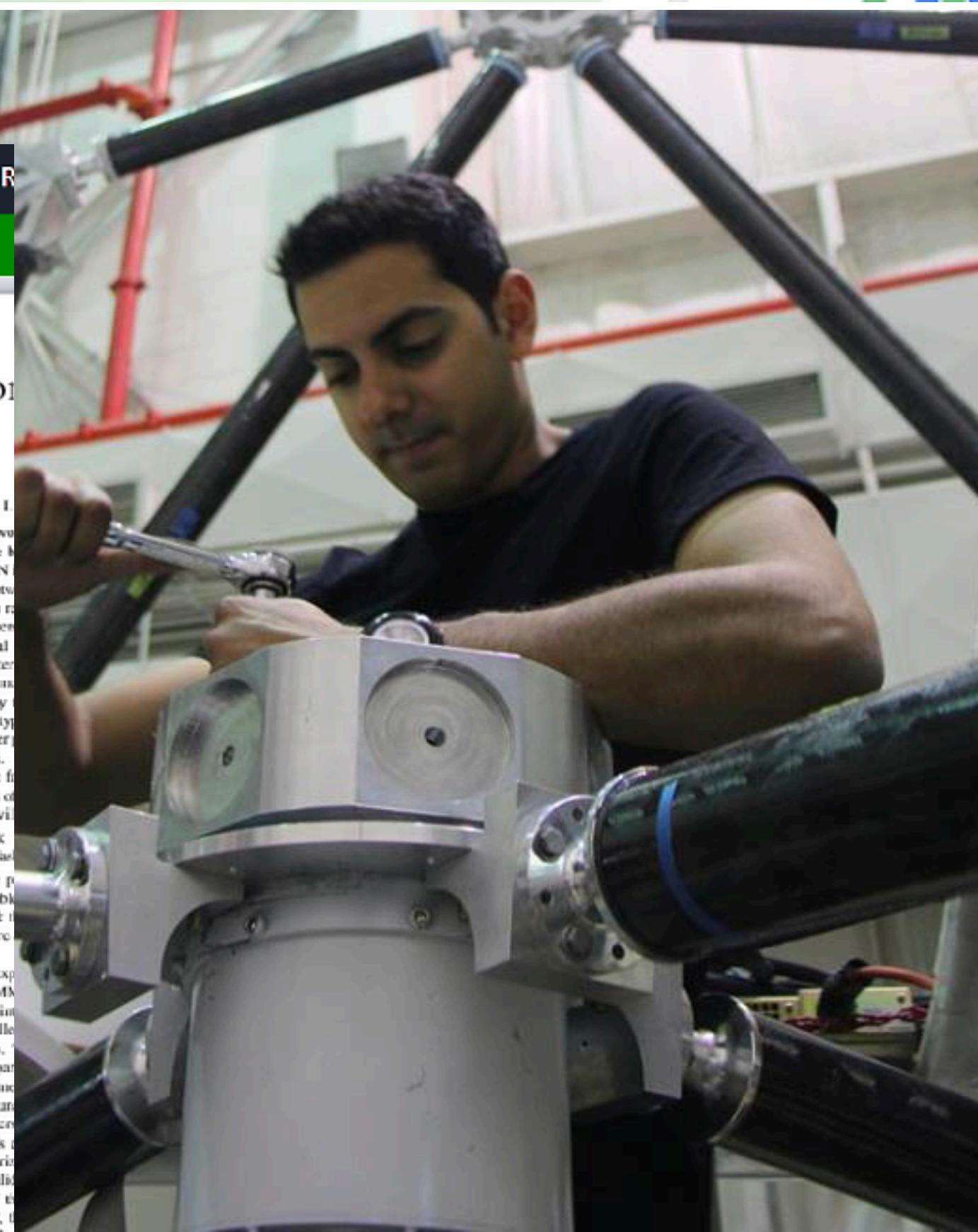
In ORCID

Clean Delete

Years Citations Reads

referred non-referred

10
8
6
4



Course structure

AST1501 Course structure

- Two parts:
 - Weekly meetings for Fall term and part of Winter term —> intro to research
 - Research project with supervisor in research group
- High-level goals:
 - Introduce you to research groups in the department
 - Gain research experience
 - Learn a variety of skills and tools for doing research

Research project

Research project

- Goal of 1501/1500 series is to introduce you to the breadth and variety of research done in the department
- Expected to work on two projects in different areas of astrophysics and/or with different techniques (theory/data-analysis/observation/instrumentation/...)
- One main goal is to find a thesis supervisor → 1501/1500 supervisors need to be graduate faculty
 - Postdocs/non-grad faculty can be co-supervisors
 - But need graduate faculty as main supervisor

How to find a supervisor

For both 1501/1500

- Faculty intros in this course: ~20 min. research overview; some during next two weeks, more later in the Fall
- Jamboree
- Email professors to set up meetings and discuss possible projects
- You might want to attend different group meetings (can facilitate)
- Other
- Deadline Oct 5 for 1501, Mar 18 for 1500

Stages of the research project

- You should be working on a well-defined, contained research project that can get to an interesting result in ~8 months
 - Ideally has possible extensions into PhD research (but not necessary!)
- First goal: understand background and motivation, come up with plan
 - –> Research proposal/presentation due Oct/Nov.
- Then work on research, providing occasional updates to me and during a mid-project presentation (late Jan)
- Finally, write up research as proto-paper and present final results (Mar/Apr)
- 1500 will repeat this procedure, but in condensed May-August timeline

Main project deadlines

- **Project supervisor:** Oct. 5
- **Project proposal:**
 - First draft: Oct. 31
 - Peer feedback: Nov. 9
 - Revised draft: Nov. 16
 - Presentations: Nov. 21, 23
- **Mid-project presentation:** Jan. 29 and Feb. 1
- **Abstract for final talk:** Feb. 26
- **Final project:**
 - First draft: Mar. 21
 - Peer feedback: Mar. 29
 - Revised draft: Apr. 5
 - Presentations: mid April

Grading scheme

- Participation in class and department events (colloquia, TASTY, etc.): 25%
- Project proposal: 20%, breakdown:
 - First draft: 5%
 - Peer feedback: 5%
 - Revised draft: 5%
 - Presentations: 5%
- Monthly check-ins: 10%
- Mid-project presentation: 15%
- Final project: 30%, breakdown:
 - First draft: 8%
 - Peer feedback: 7%
 - Revised draft: 5%
 - Presentations: 10%

Intro to research

Introduction to research

- Other main part of 1501 is a set of lectures/activities introducing you to research skills and tools
- Topics covering: literature, coding, writing papers, writing proposals, writing feedback on other's work, version control, making website, ...
 - Please suggest additional topics
- Some guest lectures, panels
- Will largely involve in-class work with no assignments (but related to research-project goals)

Some logistics

Logistics

- All info on course website:
<https://github.com/jbovy/AST1501-Intro-to-Research>
- Meeting times:
 - Fall: Tue/Thu 3-4pm in AB113
 - Winter: Mon 10-11 /Thu 3-4pm in AB113
- Slack channel: #ast1501-2023-2024 on the Astro@UofT slack → main communication channel
- Course schedule there under development, please check for updates

Course schedule

Fall term:

Date	Topic	Deliverable	Material(s)
Sept. 12	Intro		
Sept. 14	Faculty intros: Gwen Eadie, Bart Ripperda, Laurie Rousseau-Nepton		
Sept. 19	The business of being a graduate student		
Sept. 21	Faculty intros: Maya Fishbach, Juan Mena Parra, Adam Hincks		
Sept. 26	Faculty intros: Marta Bryan, Ting Li, Josh Speagle		
Sept. 28	Intro to writing in astronomy		
Oct. 3	No class		
Oct. 5	Library resources (NuRee Lee)	Project supervisor	
Oct. 10	Intro to Python in astro I		
Oct. 12	Intro to Python in astro II		

Oct. 17	Faculty intros		
Oct. 19	Faculty intros		
Oct. 24	Panel on supervision		
Oct. 26	Proposal co-writing session		
Oct. 31	Version control with git and GitHub	Project proposal	
Nov. 2	Scientific computing in Python		
Nov. 7	How to write a good research application		
Nov. 9	Faculty intros	Peer feedback on proposal	
Nov. 14	Basic stats intro (Gwen Eadie?)		
Nov. 16	Faculty intros	Revised proposal	
Nov. 21	Presentations	Proposal presentations	
Nov. 23	Presentations	Proposal presentations	
Nov. 28	How to access astronomical data		
Nov. 30	Collaborations large and small		
Dec. 5	End-of-term check-in		
Dec. 7	End-of-term check-in		

Topics poll

- LaTeX and overleaf
- Python:
 - basics
 - Numerical computing in Python with numpy
 - Scientific computing in Python with scipy
 - Hardware-accelerated computing in Python with numba/cython/jax/pytorch/...
 - Setting up a reproducible environment
- Version control
- Stats
- Web development
- ...