

Computational Astrophysics Research Preparation (CARP) Spring 2024 Workshop

Location: [San Diego Supercomputer Center](#), Synthesis Center E143

Date: May, 27, 2024 - May, 31, 2024

Time: 9:00 am - 4:00[†] pm

Workshop Schedule

Day 1: Programming & Plotting in Python Part I

Learning objectives: By the end of this lesson, you will:

- Learn the basics of Python: variables, data types, loops, and conditionals.
- Find and read documentation for the standard library interactively (in the interpreter) and online.
- Explain common ways for loops are normally implemented.
- Write for loops that use the Accumulator pattern to aggregate values.
- Write for loops to perform operations on files given their names in a list.
- Learn strategies for establishing supportive mentorship networks.

Morning Session

- ❖ 8:30 AM - 9:00 AM: Breakfast
- ❖ 9:00 AM - 9:30 AM: Introductions & Ice-Breaker Activity
- ❖ 9:30 AM - 9:45 AM: [Running & Quitting Python](#)
- ❖ 9:45 AM - 10:05 AM: [Variables and Assignment](#)

[†]A few days include an optional lesson that extends beyond 4:00 pm

- ❖ 10:05 - 10:15 AM: Break
- ❖ 10:15 AM - 10:35 PM: [Data Types & Type Conversion](#)
- ❖ 10:35 AM - 11:00 PM: [Built-in Functions & Help](#)
- ❖ 11:00 AM - 11:10 AM: Break
- ❖ 11:10 AM - 12:00 PM: [Libraries](#) & [Reading Tabular Data](#)
- ❖ 12:00 PM - 1:00 PM: Lunch

Afternoon Session

- ❖ 1:00 PM - 1:30 PM: [Pandas DataFrames](#)
 - ❖ 1:30 PM - 2:15 PM: [Lists](#) & [For Loops](#)
 - ❖ 2:15 PM - 2:25 PM: Break
 - ❖ 2:30 PM - 3:00 PM: [Conditionals](#)
 - ❖ 3:00 PM - 3:05 PM: Break
 - ❖ 3:05 PM - 4:00 PM: **Mentorship for Academic Success**
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Day 2: Programming & Plotting in Python Part II

Learning objectives: By the end of this lesson, you will:

- Write a function that takes a small, fixed number of arguments and produces a single result.
- Identify local and global variables
- Identify parameters as local variables.
- Create a time series plot showing a single data set.
- Create a scatter plot showing the relationship between two data sets.
- Gain insights into the transfer process, expectations, and available resources.

Morning Session

- ❖ 8:30 AM - 9:00 AM: Breakfast
- ❖ 9:00 AM - 9:50 AM: [Looping Over Data Sets](#) & [Writing Functions](#)
- ❖ 9:50 AM - 10:00 AM: Break
- ❖ 10:00 AM - 10:50 AM: [Variable Scope](#) & [Programming Style](#)
- ❖ 10:50 AM - 11:00 AM: Break
- ❖ 11:00 AM - 12:00 PM: [Plotting](#)
- ❖ 12:00 PM - 1:00 PM: Lunch w/ Emily Woo from Transfer Student Services

Afternoon Session

- ❖ 1:00 PM - 2:00 PM: **Demystifying the Transfer Process (Q&A)**
- ❖ 2:00 PM - 2:10 PM: Break

❖ 2:10 PM - 4:00 PM: Introduction to Visualization & Wrap-up

Day 3: The Unix Shell

Learning objectives: By the end of this lesson, you will:

- Explain how the shell relates to the keyboard, the screen, the operating system, and users' programs.
- Explain when and why command-line interfaces should be used instead of graphical interfaces.
- Explain the similarities and differences between a file and a directory.
- Translate an absolute path into a relative path and vice versa.
- Delete, copy and move specific files and/or directories.
- Combine sequences of commands to get new output
- Demonstrate how to see what commands have recently been executed.
- Run a shell script from the command line.

Morning Session

- ❖ 8:30 AM - 9:00 AM: Breakfast
- ❖ 9:00 AM - 10:00 AM: [Introducing the Shell](#) & [Navigating Files and Directories](#)
- ❖ 10:00 AM - 10:10 AM: Break
- ❖ 10:10 AM - 11:00 AM: [Working with Files and Directories](#)
- ❖ 11:10 AM - 12:00 PM [Pipes & Filters](#)
- ❖ 12:00 PM - 1:00 PM: Lunch

Afternoon Session

- ❖ 1:00 PM - 2:00 PM: **Tour of Supercomputer Center w/ Bob Sinkovits**
 - ❖ 2:00 PM - 2:05 PM: Workshop Photo in front of SDSC! 📷
 - ❖ 2:05 PM - 2:50 PM: [Loops](#)
 - ❖ 2:50 PM - 3:00 PM: Break
 - ❖ 3:00 PM - 3:45 PM: [Shell Scripts](#)
 - ❖ 3:45 PM - 4:00 PM: Break
 - ❖ 4:00 PM - 4:45 PM: [Finding Things](#) (Optional) 🔍
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Day 4: Foundations of Astronomical Data Science

Part I & Post Transfer Survival Strategies

Learning objectives: By the end of this lesson, you will:

- Learn more intermediate Bash shell scripting techniques.
- Compose a basic query in Astronomical Data Query Language ([ADQL](#)) and Structured Query Language (SQL).
- Use queries to explore a database and its tables.
- Use queries to download data.
- Use Python string formatting to compose more complex ADQL queries.
- Select rows and columns from an [Astropy Table](#).
- Acquire effective time management techniques to balance academic and transfer preparation responsibilities.

Morning Session

- ❖ 8:30 AM - 9:00 AM: Breakfast
- ❖ 9:00 AM - 10:30 AM: [COMPLECS: Intermediate Linux and Shell Scripting](#) w/ Dr. Robert Sinkovits
- ❖ 10:30 AM - 10:40 PM: Break
- ❖ 10:40 AM - 12:00 PM [Basic Queries](#)
- ❖ 12:00 PM - 1:00 PM Lunch

Afternoon Session

- ❖ 1:00 PM - 2:00 PM: [Coordinate Transformations Part I](#)
 - ❖ 2:00 PM - 2:10 PM: Break
 - ❖ 2:15 PM - 3:00 PM: **Triton Transfer Presentation (Post Transfer Survival Strategies)** 🦂
 - ❖ 3:00 PM - 3:10 PM: Break
 - ❖ 3:10 PM - 3:45 PM: [Coordinate Transformations Part II](#)
 - ❖ 3:45 PM - 3:55 PM: Break
 - ❖ 3:55 PM - 4:50 PM: [Plotting and Tabular Data](#) (Optional)
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Day 5: Foundations of Astronomical Data Science

Part II

Learning objectives: By the end of this lesson, you will:

- Use a Boolean Pandas [Series](#) to select rows in a Pandas [DataFrame](#).
- Save multiple DataFrames in an HDF5 file.
- Transform proper motions from one frame to another.
- Use [isochrone](#) data to specify a polygon and determine which points fall inside it.
- Design a figure that tells a compelling story.
- Use Matplotlib features to customize the appearance of figures.

Morning Session

- ❖ 8:30 AM - 9:00 AM: Breakfast
- ❖ 9:00 AM - 10:05 AM: [Plotting & Pandas](#)
- ❖ 10:05 AM - 10:15 AM: Break
- ❖ 10:15 AM - 11:25 AM: [Transform & Select](#)
- ❖ 11:25 PM - 11:35 PM: Break
- ❖ 11:30 AM - 12:00 PM: [Join Part I](#)
- ❖ 12:00 PM - 1:00 PM: Lunch

Afternoon Session

- ❖ 1:00 PM - 2:00 PM: [Join Part II](#)
 - ❖ 2:00 PM - 2:10 PM: Break
 - ❖ 2:10 PM - 2:50 PM: [Photometry](#)
 - ❖ 2:50 PM - 3:00 PM: Break
 - ❖ 3:00 PM - 4:00 PM: [Visualization](#)
 - ❖ 4:00 PM - 4:10 PM: Closing Statements
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