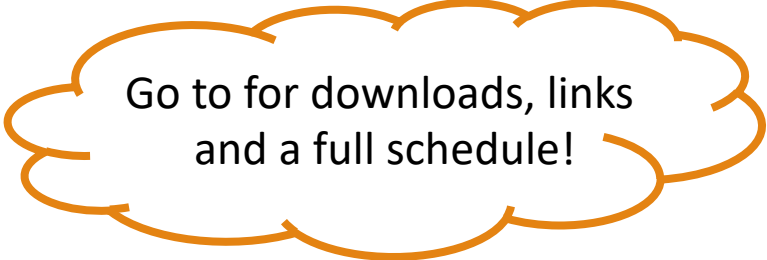


# HPC Workshop 2024

*Upward Bound – Day 2*

<https://uwec.ly/hpcworkshop>



Go to for downloads, links  
and a full schedule!



**Please log into your machine when you take a seat.**

# HPC Workshop: Last Week

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Intro to computational science  
and HPC

Tyler Bauer  
Blugold Center for HPC



Building “trees” in South  
African shrubs

Dr. Nora Mitchell  
Biology

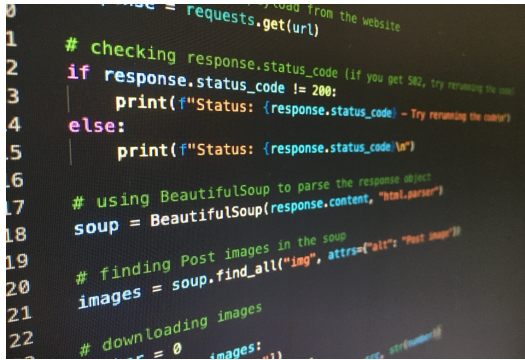


What stresses out  
California ground squirrels?

Dr. Jennifer Smith  
Biology

# HPC Workshop: Today

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Coding in Python

Somin Lee  
Blugold Center for HPC




How to engineer a  
super-bouncy ball

Dr. Ying Ma  
Materials Science and  
Biomedical Engineering



The Lives of the Stars

Dr. Bill Wolf  
Physics + Astronomy



**SCIENCE • TECHNOLOGY • ENGINEERING + ARTS • MATHEMATICS**

© Iowa PBS

Panel Discussion on STEAM careers with:

Dr. Bill Wolf – Assistant Professor (Physics + Astronomy)

Dr. Jennifer Smith – Assistant Professor (Biology)

Dr. Kao Yang – Former Upward Bound and UWEC Graduate (Ph. D in Material Science)

Melody Manteufel – Outreach Counselor (Advising, Retention + Career Center)

Elaina Plonis – Research Student (Physics + Astrophysics Emphasis Major & Math + Computer Science Minor)

# Workshop Website

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<https://uwec.ly/hpcworkshop>

**Contains the schedule, presentations, and important links.**

**OPEN**

 **nDemand**

<https://ondemand.hpc.uwec.edu>

*You can also get to OnDemand from our webpage*

# OnDemand - Login

## Welcome to BOSE!

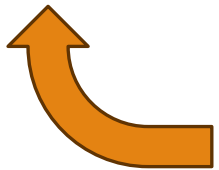
You appear to be a new member of the cluster, so there are a few steps you'll need to accomplish first before you're able to use this system.

1. Click [this button](#) to access the terminal / shell version of BOSE first.
2. You'll be asked to enter your UWEC password and trigger the Duo Authentication process.
3. Once logged in, go through and accept our Terms Of Service.
4. After you accept the terms, you can close out of that tab once you are presented with [username@bose ~].
5. Finally, click [this button](#) to log in again.

*Already used BOSE and are getting this message, or this message isn't going away after going through the steps? Please contact us at [BGSC.ADMINS@uwec.edu](mailto:BGSC.ADMINS@uwec.edu).*

- Blugold Center for High Performance Computing









[HPC Website](#) | [HPC Wiki](#)



See this? Raise your hand and we'll catch you up.

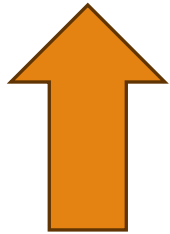
# OnDemand – Dashboard / Home

Pinned Apps A featured subset of [all available apps](#)

 <p>Home Directory System Installed App</p>	 <p>Jupyter Notebook System Installed App</p>	 <p>BOSE Cluster Shell Access System Installed App</p>	 <p>Desktop System Installed App</p>
 <p>Job Composer System Installed App</p>	 <p>Active Jobs System Installed App</p>	 <p>Visual Studio Code System Installed App</p>	 <p>RStudio Server (Preview) System Installed App</p>










# Lost? Go back to home!



Go Back  
Home  
(Dashboard)

# OnDemand – Getting presentation files

**Pinned Apps** A featured subset of all available apps

 <p>Jupyter Notebook System Installed App</p>	 <p>BOSE Cluster Shell Access System Installed App</p>	 <p>Home Directory System Installed App</p>	 <p>Job Composer System Installed App</p>
 <p>Active Jobs System Installed App</p>	 <p>Desktop System Installed App</p>	 <p>Visual Studio Code (Preview) System Installed App</p>	

[*username*@bose ~]\$

┌  
└  
Username

┌  
└  
Machine  
(Host)

┌  
└  
Location

┌  
└  
Command Start

The Prompt

Command Start

Type:

getfiles 4 ← Means “get the files for session #4”

*(You'll be doing this in each session today)*

Commands we'll be using:

**ls** - View files in current directory (l as in 'lamp')

**pwd** - Show where you currently are

**cd** - Change your directory

**sbatch** – Submit a job to our supercomputer

Check out the Linux Quick Guide on the website as a reference.

# Let's check those files out!

Type:

cd (Go back to home)

ls (Verify you see Day\_2)

cd Day\_2/Session\_4 (Go to our session files)

ls (Verify you see runscript.sh)

Let's run a program on a supercomputer!

Type:

```
sbatch runscript.sh
```

Does it say “Submitted batch job #”?

You did it!

Let's go check it out!

# OnDemand – File Manager

**Pinned Apps** A featured subset of [all available apps](#)



Jupyter Notebook

System Installed App



BOSE Cluster Shell Access

System Installed App



Home Directory

System Installed App



Job Composer

System Installed App



Active Jobs

System Installed App



Desktop

System Installed App



Visual Studio Code (Preview)

System Installed App



# OnDemand - Jupyter

**Pinned Apps** A featured subset of [all available apps](#)



Jupyter Notebook

System Installed App



BOSE Cluster Shell Access

System Installed App



Home Directory

System Installed App



Job Composer

System Installed App



Active Jobs

System Installed App



Desktop

System Installed App



Visual Studio Code (Preview)

System Installed App

# Creating a Notebook

Once you click the Jupyter button, you should see something like this

The screenshot shows the configuration page for a Jupyter Notebook. The breadcrumb trail is 'Home / My Interactive Sessions / Jupyter Notebook'. On the left, there are two sidebar menus: 'Interactive Apps' and 'Interactive Apps [Sandbox]'. The 'Interactive Apps' menu has 'Jupyter Notebook' selected. The 'Interactive Apps [Sandbox]' menu has 'RStudio Server (Preview)' selected. The main content area is titled 'Jupyter Notebook' and contains the following settings:

- Accounting Group:** A dropdown menu with 'ub\_workshop\_2024' selected. Below it is the text: 'Which research/class account is this tied to?'
- Slurm Partition:** A dropdown menu with 'Week (7 Days) - Default' selected. Below it is the text: 'Which partition are you running the job on?'
- CPU Cores:** A text input field with '1' entered. Below it is the text: 'How many cores do you want to request? (Max of 64)'
- Memory:** A text input field with '1G' entered. Below it is the text: 'How much memory do you want to request? M = Megabytes, G = Gigabytes'
- # GPU Cards:** A dropdown menu with 'No GPUs - Default' selected. Below it is the text: '(GPU Partition Only) How many GPUs would you like to reserve? 0 = No GPU needed, max of 3. Please do not use multiple GPUs if you do not need them.'
- Number of hours:** A text input field with '1' entered.

## Use these settings

Accounting Group: ub\_workshop\_2024

Slurm partition: Week

CPU Cores: 8

Memory: 15G

#GPU cards: No GPUs

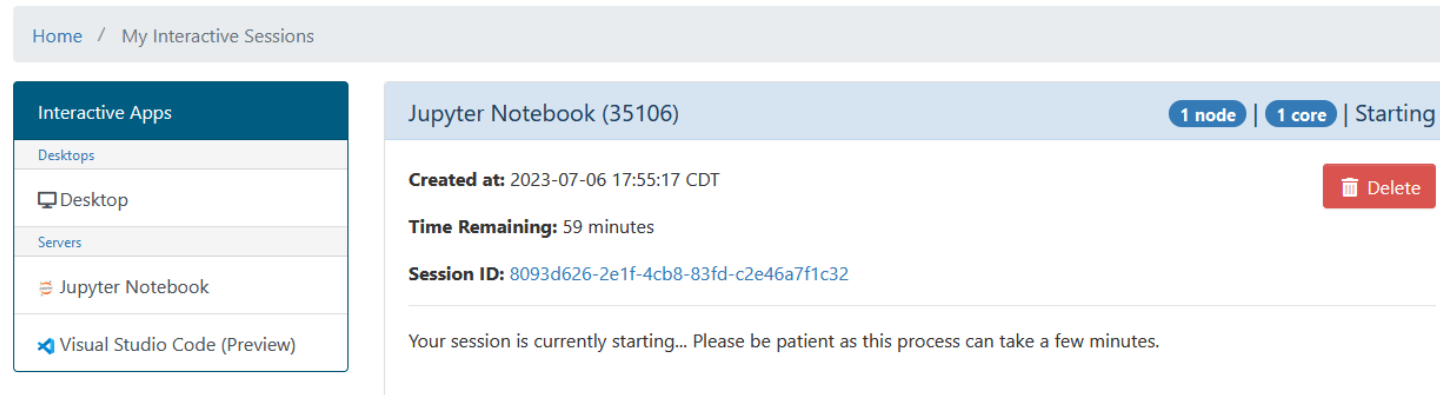
Number of Hours: 2

Working Directory: Leave empty

Then, click

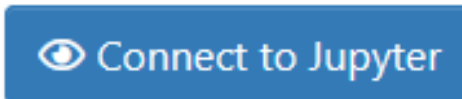


Once you have created your notebook, you should see a screen like this



The screenshot shows a web interface for managing interactive sessions. At the top, there is a breadcrumb trail: "Home / My Interactive Sessions". On the left, a sidebar titled "Interactive Apps" contains a list of options: "Desktops", "Desktop" (with a monitor icon), "Servers", "Jupyter Notebook" (with a notebook icon), and "Visual Studio Code (Preview)" (with a VS Code icon). The main content area displays details for a "Jupyter Notebook (35106)" session. The session status is "Starting", with "1 node" and "1 core" allocated. It was "Created at: 2023-07-06 17:55:17 CDT" and has "Time Remaining: 59 minutes". The "Session ID" is "8093d626-2e1f-4cb8-83fd-c2e46a7f1c32". A red "Delete" button is visible. A message at the bottom of the session card states: "Your session is currently starting... Please be patient as this process can take a few minutes."

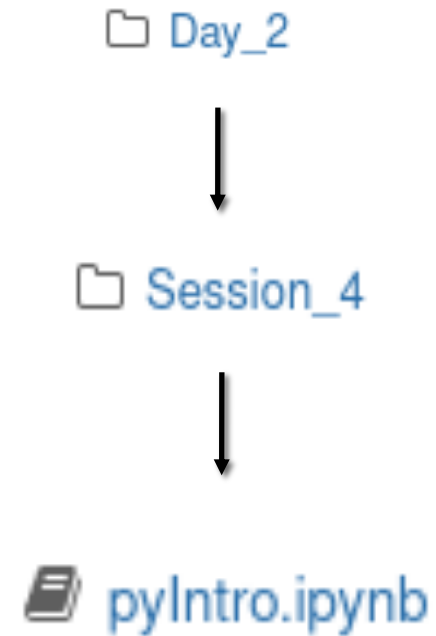
Once your notebook has started, click this button to access it:



# Jupyter file view

---

You should now see a list of the files in your home directory. Open these folders:



# Python

---

THE BASICS



# What is Python?

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- Increasingly popular programming language
- Considered easy to learn and understand
- Supports interactive programming (e.g. Jupyter)
- 137,000+ Libraries Available
  - Code created by other people to make everyone's life easier



# What is it used for?

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- Task Automation
- Artificial Intelligence, Machine Learning, Deep Learning
- Data Analysis
- Data Visualization
- Game Development
- Web Development





# Jupyter Notebook

---

- Supports variety of languages: Python, R, Ruby, C++, Stata
- Cell-Based = Run blocks of code at a time rather than everything at once
- Visually see tables, images, graphs, 3D renderings
- **How To Use:**
  - Each piece of code is in a “Cell” that must be ran individually
  - Run a cell by clicking “Run” or pressing “Shift+Enter”
  - Wait for results – “In [\*]” on left means running, a number means done.



# Let's code in Python!

## Task 1: print() function

```
print("Hello, World!")  
  
print("You can put any text here!")
```

## Task 2: Variables

```
name = "Somin"  
age = 24  
is_student = True
```

## Task 3: Display variables

```
print(name)  
print(age)  
print(is_student)
```

**Make sure to press "Run" after each task!**

#### Task 4: Display variable with string

```
print("My name is " + name)
```

#### Task 5: Arithmetic operations

```
#Addition
```

```
print(5 + 3)
```

```
#Subtraction
```

```
print(10 - 4)
```

```
#Multiplication
```

```
print(7 * 2)
```

```
#Division
```

```
print(8 / 2)
```

```
#Modulus (remainder)
```

```
print(9 % 4)
```

**Make sure to press “Run” after each task!**

## Task 6: String Operations

```
#Concatenation
first_name = "Somin"
last_name = "Lee"
full_name = first_name + " " + last_name
print(full_name)
```

```
#Repetition
laugh = "Ha" * 3
print(laugh)
```

**Make sure to press “Run” after each task!**

## Task 7: Import module

```
import random
```

## Task 8: Set variables

```
# The computer picks a random number between 1 and 10  
number_to_guess = random.randint(1, 10)
```

```
# Variable to store the user's guess  
guess = 0
```

**Make sure to press “Run” after each task!**

## Task 9: While loop and if statement

```
print("Guess the number:")  
  
# Loop until the user guesses the correct number  
while guess != number_to_guess:  
    guess = int(input())          # Get user input and convert it to integer  
  
    if guess < number_to_guess:  # If user guess is lower than the number  
  
        print("Too low! Try again:")  
    elif guess > number_to_guess: # If user guess is higher than the number  
        print("Too high! Try again:")  
  
    else:                        # not lower & not higher? guess is correct  
        print("Congratulations! You guessed it!")
```

**Make sure to press “Run” after each task!**

# You created a game!

Once you have run the last two cells that you coded, you should see a screen like this.

Type in your guess in the box and play the game!

Guess the number (between 1 and 10):

**We Did It!**





Any  
Questions?

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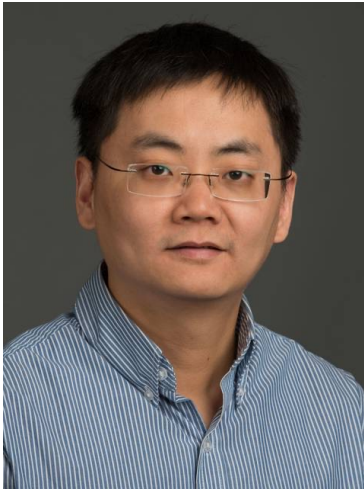
# Today's Schedule

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Time	Who	What
9:00 – 10:15	Blugold Center for HPC	Recap of June 21st and coding in Python
10:30 – 11:45	Dr. Ying Ma	How to engineer a super-bouncy ball
11:45 – 12:45	LUNCH	LUNCH
12:45 – 2:00	Dr. Bill Wolf	The Lives of the Stars
2:15 – 3:15	Workshop Faculty + Guests	Careers in STEAM in Phillips Hall 265

# Next Up

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## How to engineer a super-bouncy ball

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Dr. Ying Ma, Ph.D.  
Materials Science and Biomedical Engineering  
Associate Professor

**Pull up the website if you haven't already!**

**Website: <https://uwec.ly/hpcworkshop>**

# Lunch Break

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BE BACK BY 12:45PM

# Next Up

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## The Lives of the Stars

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Dr. William Wolf, Ph.D.  
Physics and Astronomy  
Assistant Professor

**Pull up the website if you haven't already!**

**Website: <https://uwec.ly/hpcworkshop>**

Next Up – Panel Discussion

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**Let's move to room 265!**