ACES: Introduction to Julia

2025 ACES Summer Workshop

20 July 2025

High Performance
Research Computing
DIVISION OF RESEARCH

Introduction to Julia: Outline

Part I: A brief overview of Julia

Julia is a high-level general-purpose dynamic programming language primarily designed for **high-performance numerical analysis and computational science**.

- Born in MIT's Computer Science and Artificial Intelligence Lab in 2009
- Combined the best features of Ruby, MatLab, C, Python, R, and others
- First release in 2012
- Latest stable release v1.11.4 as of Mar 10, 2025
- https://julialang.org/
- customized for "greedy, unreasonable, demanding programmers"
- Julia Computing established in 2015 to provide commercial support

Major features of **Julia:**

- **Fast**: designed for high performance
- **General**: supports different programming patterns
- **Dynamic**: dynamically-typed with good support for interactive use
- **Technical**: efficient numerical computing with a mathematics-friendly syntax
- **Optionally typed**: a rich language of descriptive data types
- **Composable**: Julia's packages naturally work well together

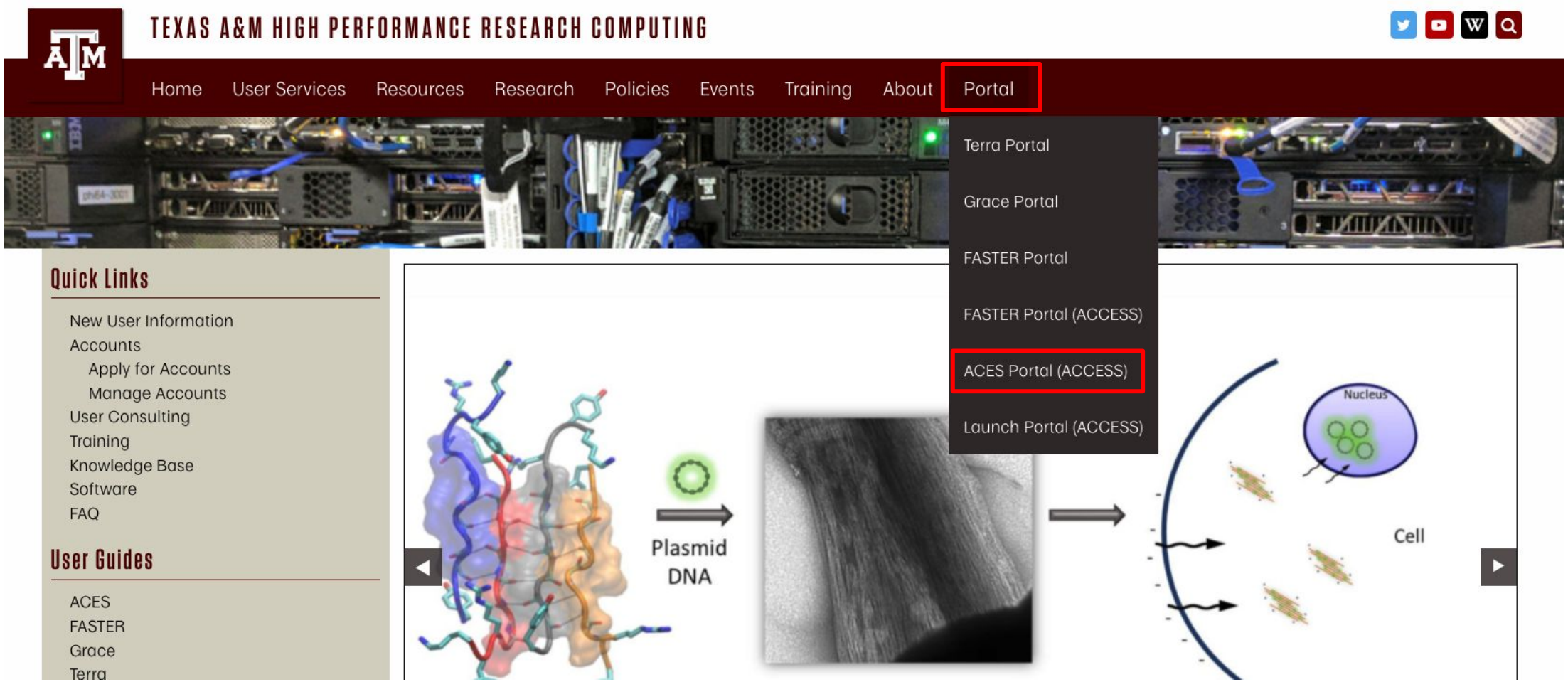
"Julia is as programmable as Python while it is as fast as Fortran for number crunching. It is like ***Python on steroids****."*

--an anonymous Julia user on the first impression of Julia.

Where to Run Julia

- Juno IDE - developed for the Julia language (no longer under development)
- VSCode - extensions for Julia are actively being managed
- Jupyter Notebook
- Julia REPL
    - Run, Evaluate, Print, Loop
    - Interactive
    - Searchable history, tab-completion, keybindings, dedicated help and shell modes
- More information: https://hprc.tamu.edu/kb/Software/Julia/

Accessing the HPRC ACES Portal



HPRC webpage: hprc.tamu.edu

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OnDemand provides an integrated, single access point for all of your HPC resources.

Message of the Day

ACES Maintenance Status, October 10

The planned maintenance for the PCIe Gen5 composability fabrics has been completed. The PVCs in two Gen5 fabrics will remain unavailable until replacement components arrive tomorrow or next week.

IMPORTANT POLICY INFORMATION

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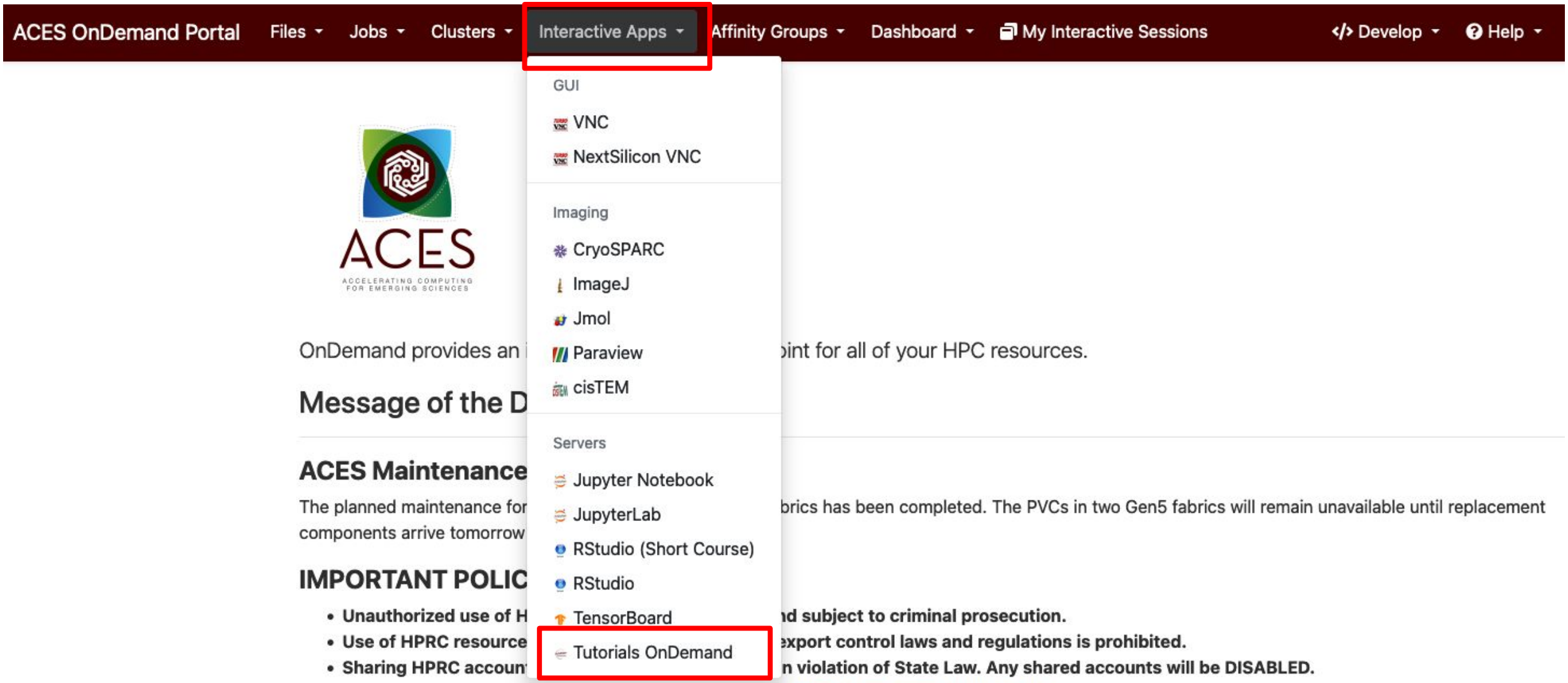
- **Authorized users must also adhere to ALL policies at: https://hprc.tamu.edu/policies**

!! WARNING: THERE ARE ONLY NIGHTLY BACKUPS OF USER HOME DIRECTORIES. !!

Run the following commands to install the necessary packages:

```
$ mkdir $SCRATCH/.julia
$ ln -s $SCRATCH/.julia
$ module load Julia/1.11.4-linux-x86_64
$ julia
julia> ]
(v1.11) pkg> add IJulia
(v1.11) pkg> add PrettyTables
(v1.11) pkg> add Plots
(v1.11) pkg> add CSV
(v1.11) pkg> add XLSX
(v1.11) pkg> add DataFrames
(v1.11) pkg> add StatsPlots
```

Press backspace to exit the pkg manager and type exit() to quit Julia


ACES OnDemand Portal
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Help
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Imaging
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RStudio
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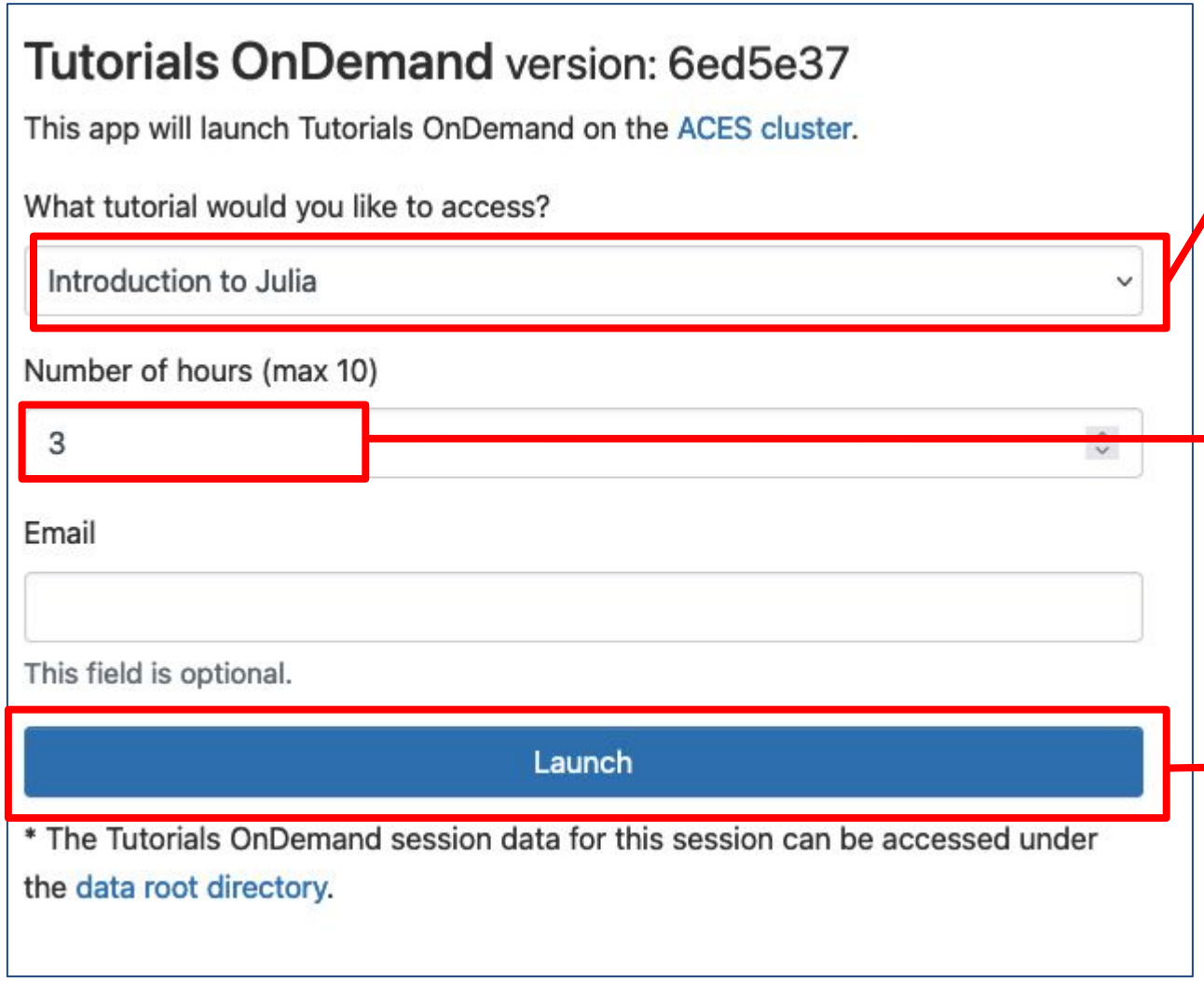
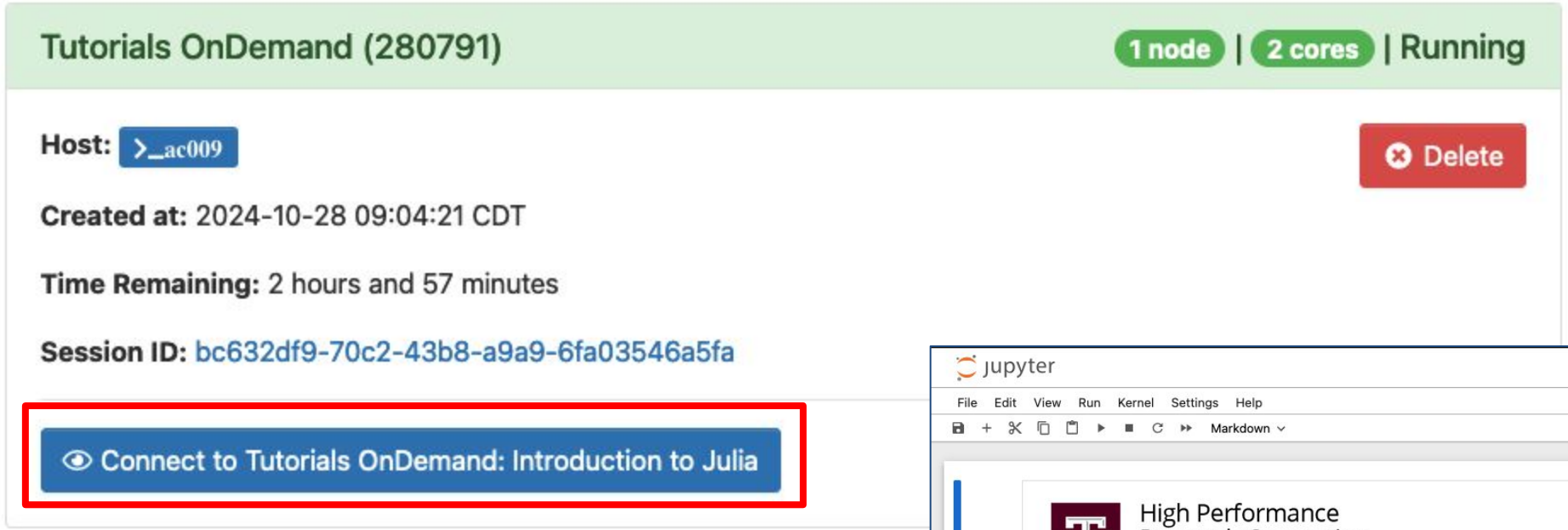


Select “Introduction to Julia” from the dropdown menu

Set number of hours to 1

Click “Launch”


Tutorials OnDemand (280791)
1 node | 2 cores | Running
Host: >_ac009
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Created at: 2024-10-28 09:04:21 CDT
Time Remaining: 2 hours and 57 minutes
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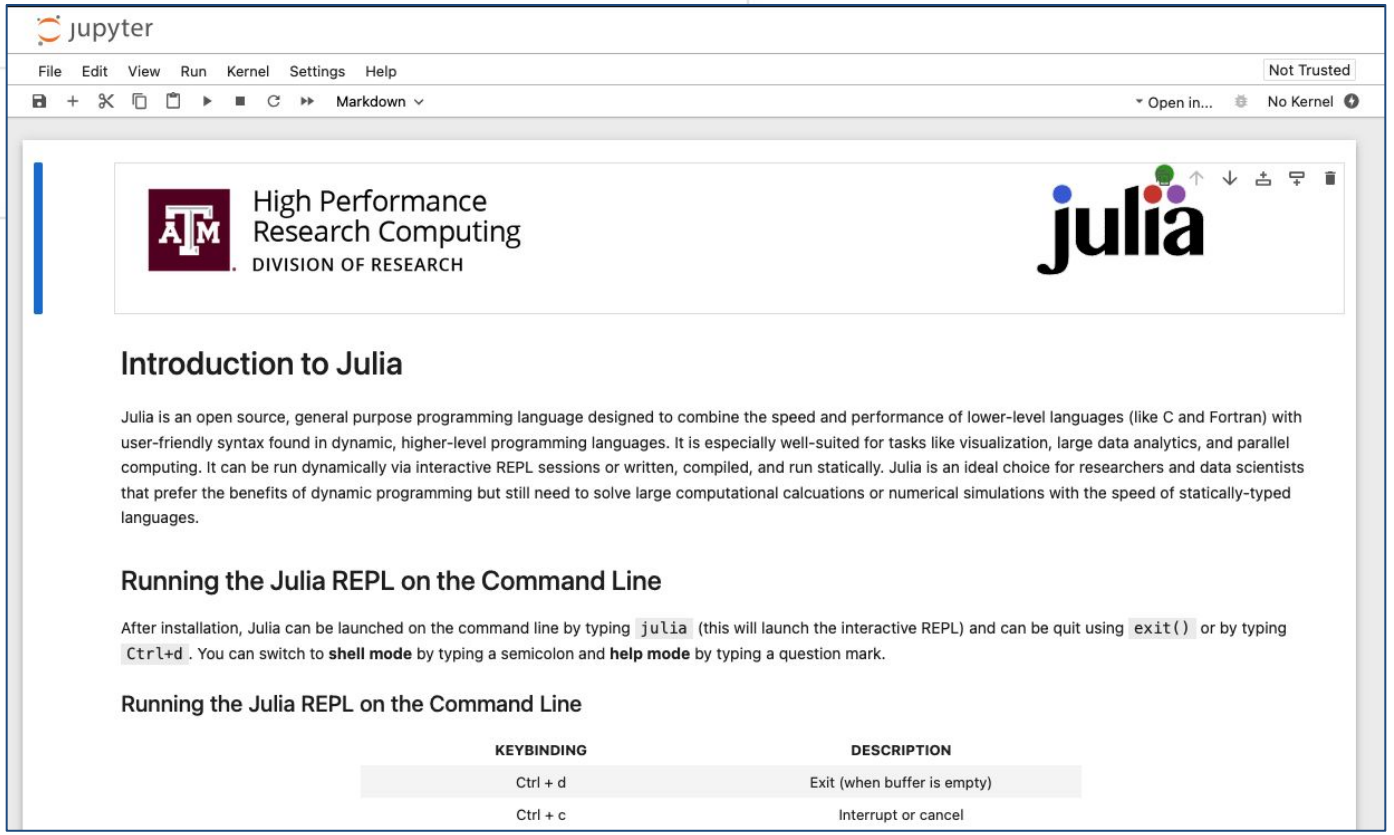
Connect to Tutorials OnDemand: Introduction to Julia


jupyter
File Edit View Run Kernel Settings Help
Not Trusted
Markdown
Open in...
No Kernel
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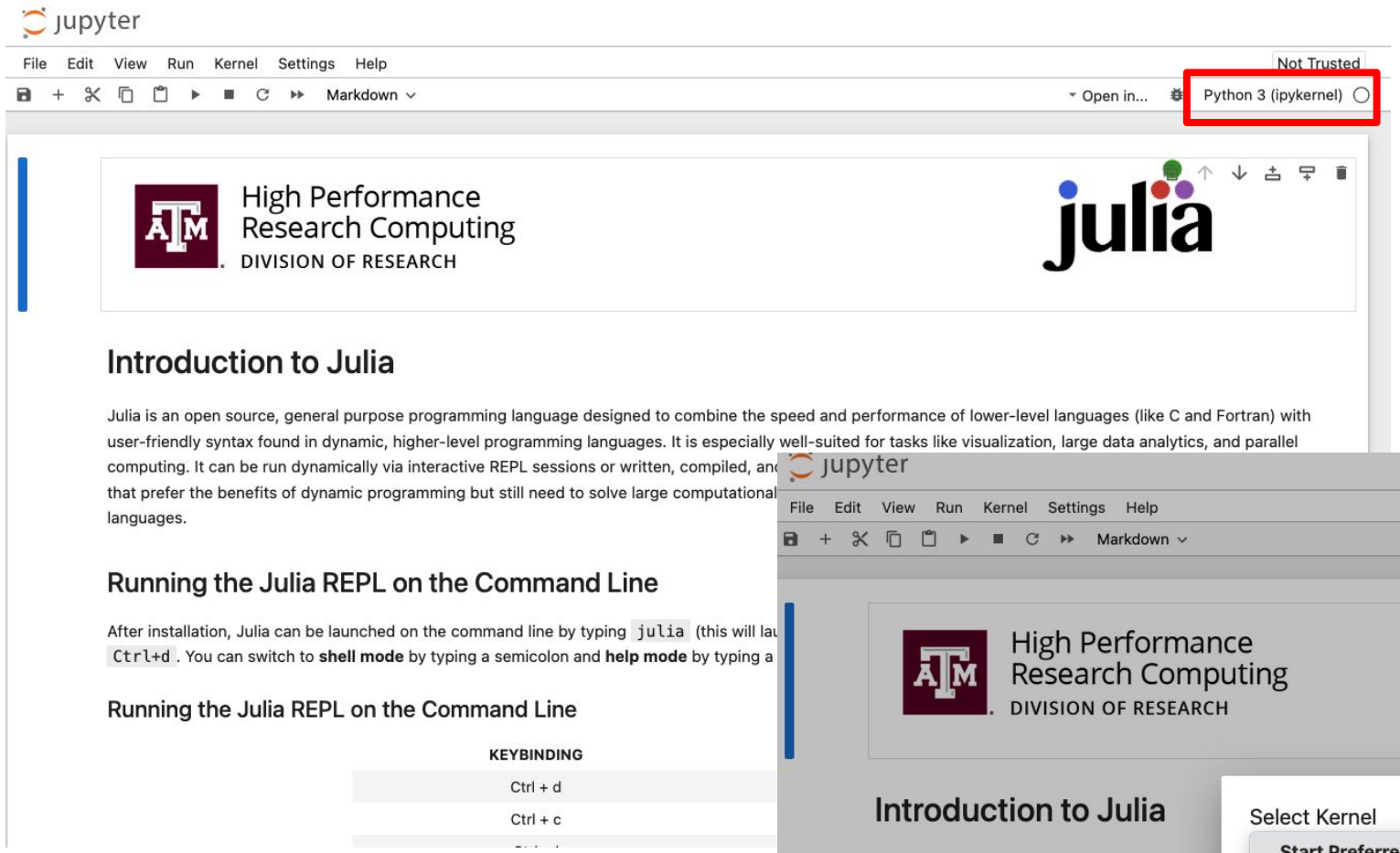
Introduction to Julia
Julia is an open source, general purpose programming language designed to combine the speed and performance of lower-level languages (like C and Fortran) with user-friendly syntax found in dynamic, higher-level programming languages. It is especially well-suited for tasks like visualization, large data analytics, and parallel computing. It can be run dynamically via interactive REPL sessions or written, compiled, and run statically. Julia is an ideal choice for researchers and data scientists that prefer the benefits of dynamic programming but still need to solve large computational calcuations or numerical simulations with the speed of statically-typed languages.
Running the Julia REPL on the Command Line
After installation, Julia can be launched on the command line by typing julia (this will launch the interactive REPL) and can be quit using exit() or by typing Ctrl+d. You can switch to shell mode by typing a semicolon and help mode by typing a question mark.
Running the Julia REPL on the Command Line
KEYBINDING
DESCRIPTION
Ctrl + d
Exit (when buffer is empty)
Ctrl + c
Interrupt or cancel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Python 3 (ipykernel)
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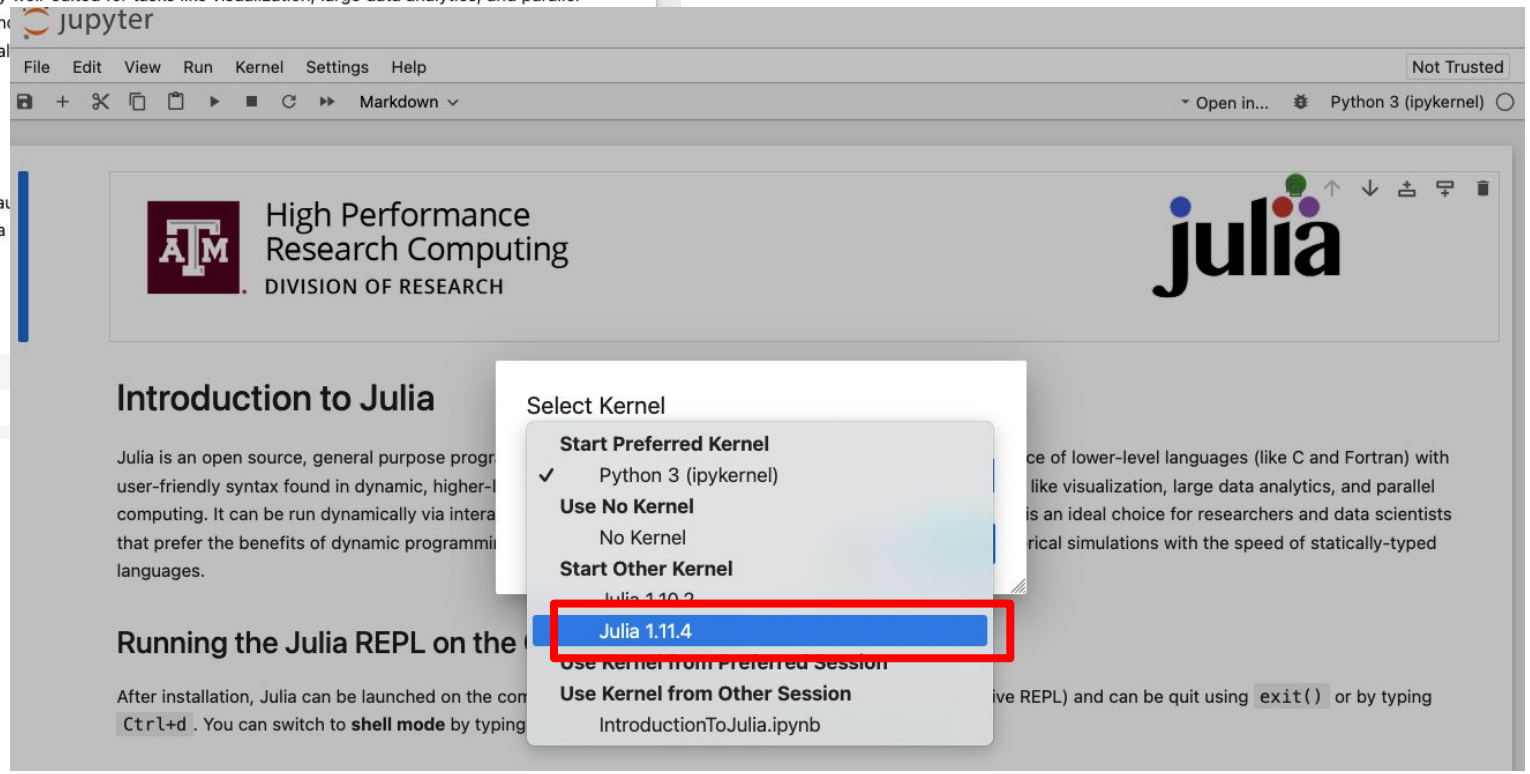
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Introduction to Julia
Select Kernel
Start Preferred Kernel
Python 3 (ipykernel)
Use No Kernel
No Kernel
Start Other Kernel
Julia 1.11.4
Use Kernel from Other Session
IntroductionToJulia.ipynb
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