Northwestern
INFORMATION TECHNOLOGY

Julia – Week 2 Day 1

Sophie van Genderen, Assoc Computational Specialist
Julia Giannini, Computational Specialist

Northwestern IT Research Computing and Data Services

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Covered in today's class

- Quiz
- Review
- Quest OnDemand
- Julia Projects and Kernels
- Data Science Packages and Examples

Julia

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Quiz

- Kahoot link: https://create.kahoot.it/share/enter-kahoot-title/8734e027-991f-4b80-bc21-bc556256e6b2

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Why Julia?

- Superior performance for numerical analysis and scientific computing because of “Just-In-Time” (JIT) compilation vs. Interpreted
  - Compiled vs. Interpreted languages
- Built-in parallelism, great for heavy computations
- No external libraries needed for Mathematics
- Data Models

Comparing Python to Julia

Key Indicator	Julia	Python
Maturity	Created in 2012	Created in 1991
Scope	General-purpose, but data-oriented	General-purpose and used for almost everything
Language Type	High Level, (Just in Time) Compiled	High Level, Interpreted
Typing	Dynamically-typed language, but also offers the ability to specify types (Static)	Dynamic, the type for a variable is decided at runtime
Open-source	Yes	Yes
Usage	Data Science and Machine Learning – especially work with data models	Mobile/web Dev, AI, Data Science, web scripting, game development, security ops.
Data Science	Math functions are easy to write and understand – no external libraries are needed for math functions	Requires NumPy or other libraries for advanced math
Performance	Fast development and production, high speed runtime, can handle millions of data threads	Fast for development, slow for production

Review: Connecting to Quest

- ssh
  - Done via terminal
  - ssh <netid>@login.quest.northwestern.edu

Review: Log into Quest and Load Julia

- ssh to Quest

```
[netid@quser]$ module load julia/1.11.4
[netid@quser]$ julia


 _       _ _(_)_     |  Documentation: https://docs.julialang.org
(_)     | (_) (_)    |
 _ _   _| |_  __ _   |  Type "?" for help, "]?" for Pkg help.
| | | | | | |/ _` |  |
| | |_| | | | (_| |  |  Version 1.11.4 (2025-03-10)
_/ |\__'_|_|_|\__'_|  |  Official https://julialang.org/ release
|__/                   |


julia> 2 + 4
```

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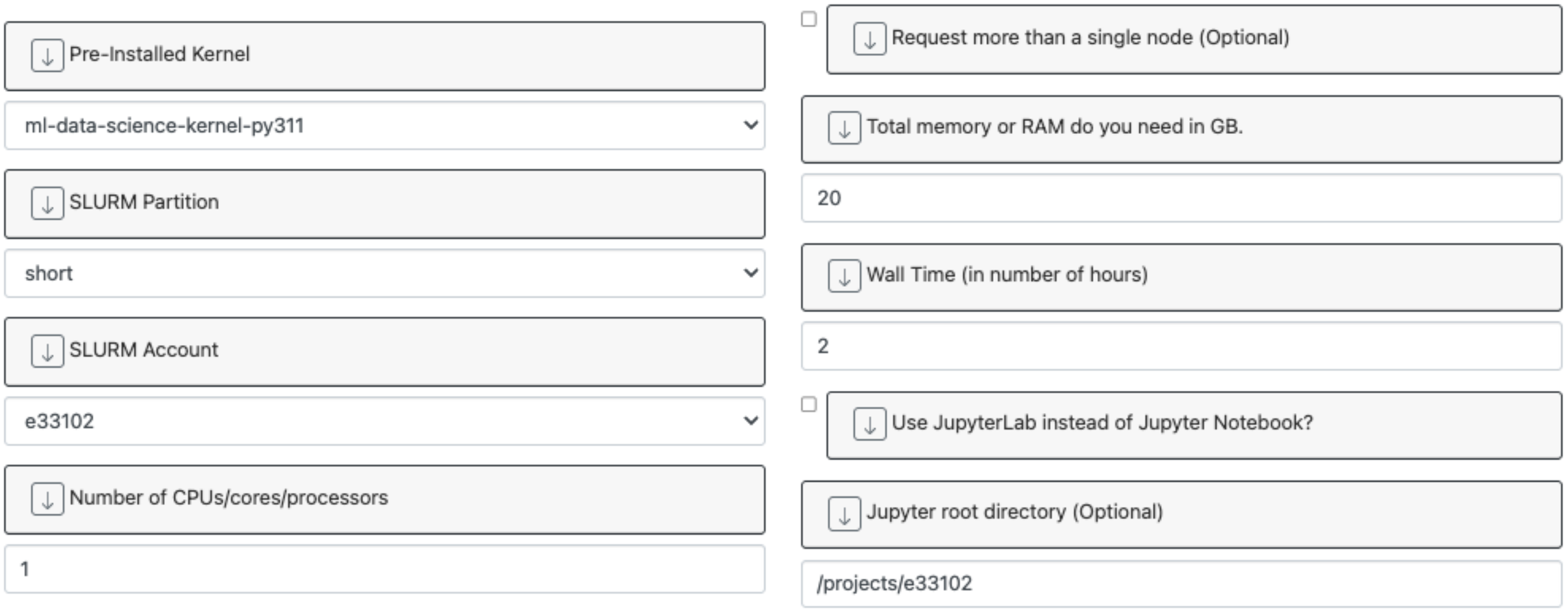
Quest OnDemand

- Open OnDemand
  - Good for interactive development!
  - Requires VPN or Campus WiFi
  - Uses Quest Partitions
- https://ondemand.quest.northwestern.edu/
- https://rcdsdocs.it.northwestern.edu/systems/quest/ondemand/ondemand.html

Quest OnDemand – Job Card Options



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Julia Projects and Kernels

- Project
  - Folder with associated specific packages
  - .toml file
  - Julia scripts that rely on those packages
- Make a new project

Make a New Julia Project

- Project
  - Specific packages for the project you're working on
  - Make a directory yourself in /projects/e33102 if you have not already
    - `cd /projects/e33102`
    - `mkdir <NAME_OR_NETID>`
    - `cd <NAME_OR_NETID>`
  - In your directory, make a directory for your julia project
    - `mkdir my_ml_ds_project`
    - `cd my_ml_ds_project`
    - `module load julia/1.11.4`
    - `julia --project=.`

Share a Julia Project

- As long as `Project.toml` is available to you, you can share the project with other users

```
[netid@quser]$ cd /projects/e33102/<NAME>/my_ml_ds_project
[netid@quser]$ cp /projects/e33102/ml_ds_kernel_example/Project.toml .
[netid@quser]$ julia -project=.
julia > using Pkg
julia > Pkg.status()
julia > Pkg.instantiate()

## This may take a while
```

Make a Kernel

```
[netid@quser]$ julia --project=.
julia > using Pkg
julia > using Conda
julia > using IJulia
julia > installkernel("Julia 1.11.4 - my_ml_ds_project", "--
project=/projects/e33102/<NAME>/my_ml_ds_project")
```

- Login to Quest onDemand and start a Jupyter session
- Create an iPython notebook and activate your kernel
- Documentation: https://rcdsdocs.it.northwestern.edu/systems/quest/ondemand/ondemand.html

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Data Science - Packages

Packages

- https://juliapackages.com/c/data-science

Data Science - Example

- Copy the Jupyter Notebook to your own directory

```
[netid@quser]$ cd /projects/e33102
[netid@quser]$ cd <netID/last name>
[netid@quser]$ cp /projects/e33102/example-
code/Julia_DS_Example.ipynb .
```

Data Science - Example

- Go to Quest OnDemand and use the job you previously started
- Open the notebook
- Select your kernel
- Fill out the empty examples

Thank You!

Questions about Quest? Email us at: quest-help@northwestern.edu