Lecture 1 – Intro to Julia/JuMP

Module 2 – Julia

CS/ISyE/ECE 524

Learning Outcomes

By the end of this module, you should….

- Understand why we use Julia in this class
- See how to run the most recent versions of Julia, IJulia, and JuMP
- Begin to understand basic functionality and important tips & tricks for using Julia effectively
- See how we build and solve an optimization model in Julia/JuMP with an example

Advantages of Julia

- Syntax similar to MATLAB
- Designed for scientific computing but with functionality of modern OO languages
- Dynamic language with speed comparable to statically compiled languages (e.g. C)
- Designed for parallelism and distributed computing
- Can call Python, C functions directly
- IJulia notebooks
- Free and open-source

Disadvantages of Julia

- Not widely used (engineers use MATLAB, data scientists use Python, R)
- Still unclear if it will be adopted by more people in more fields
- Support is not at the same level as e.g. Python (community is small but very active!)
- Doesn't have the same robust package systems of other languages (if you want it, you have to build it yourself)
- No good IDE

Getting Started

Help with Julia:

- Differences between Julia & other languages: https://docs.julialang.org/en/v1.3/manual/noteworthy-differences/
- Useful tutorial (you should work through this on your own time!): https://learnxinyminutes.com/docs/julia/ (*NOTE: This is based on Julia v1.0.0 – we are using v1.3.1*)
- Julia manual: https://docs.julialang.org/en/v1.3/
- ? opens help mode in Julia
- Piazza discussion forum
- If you're new to programming, spend some time reading the "Think Julia" book. It provides an introduction to computer programming and is in the Julia language: https://benlauwens.github.io/ThinkJulia.jl/latest/book.html

Getting Started

Help with IJulia Notebooks:

- IJulia command list: in command mode (ESC), press h
- Markdown reference: https://github.com/adam-p/markdown-here/wiki/Markdown-Cheatsheet
- LATEX (LAY-teck or LAH-teck) cheat sheet: http://users.dickinson.edu/~richesod/latex/latexcheatsheet.pdf
- DeTEXify: http://detexify.kirelabs.org/classify.html

Help with JuMP:

- JuMP manual: http://www.juliaopt.org/JuMP.jl/v0.21/
- We will have lots of examples on Canvas that you can use as templates!

Package Installation and Management

```
using “name”
```

USE THE NAMED PACKAGE IN YOUR CURRENT JULIA FILE (INCLUDING PKG)

```
Pkg.add(“name”)
```

DOWNLOAD AND INSTALL A NEW PACKAGE

```
Pkg.status()
```

LIST OF INSTALLED PACKAGES

```
Pkg.update()
```

UPDATE ALL INSTALLED PACKAGES

Some things to know about Julia Packages

Any command involving “Pkg” can take up to a few minutes to run. I don’t know why.

Any time a package is updated, the first time you try using it, Julia will update its cache, which may take 10–30 sec. This only happens the first time.

If a successfully installed package produces an error when you try using it, try restarting the kernel.

Creating your first IJulia Notebook

- You will need to add the IJulia package with “Pkg.add(“IJulia”) before you can use it the first time
- To create a new notebook, open Julia and type:

```
using IJulia
notebook()
```

- Or, on a command prompt, run:

```
jupyter notebook
```

IJulia Notebook Tutorial