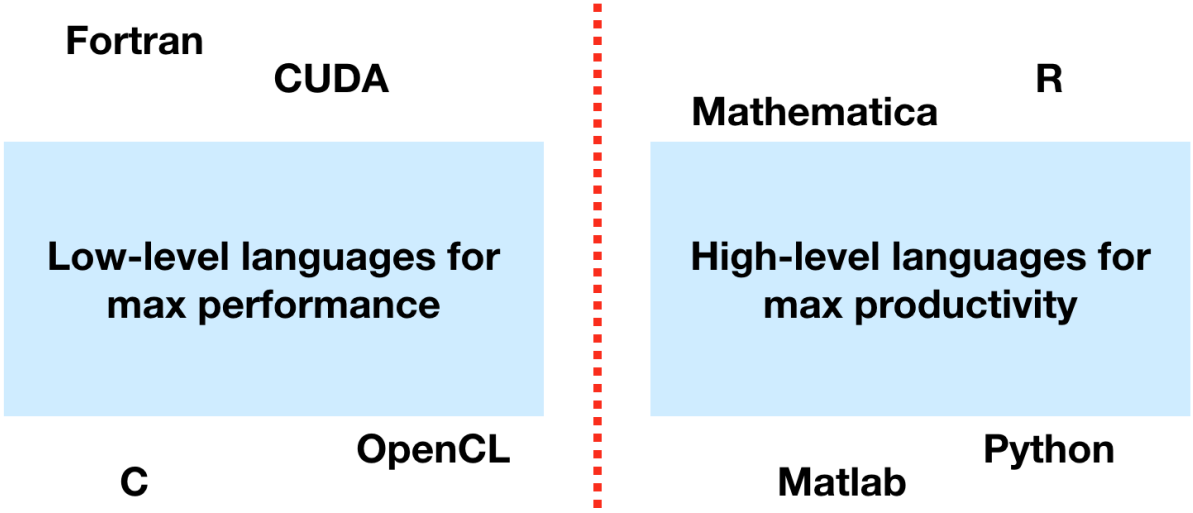
Introduction to Julia

Introduction

- Julia started in 2009
- Big idea: 2 language problem



Why I like Julia

1. It's really, really fast without special tweaks
2. Programming syntax is close to the mathematics
3. Parallelism is straightforward
4. Open-source ecosystem on Github: free & tightly integrated
5. Codebase is in Julia
6. Can call R, Python, C, etc
7. Speed without needing a compiler or other packages
8. Functions do different things depending on the *types* of variables
9. Super easy to do unit-testing

(Based (somewhat) on Maistre (2019))

Why I don't like Julia

- Still young — was changing a lot, has settled down
- Documentation, Stack Overflow is not as good as MATLAB, Stata, R
- Not as many packages (but still a lot)
- Plotting takes a long time
- No `estout` or `stargazer/textables` packages yet
- Normal headaches of setting up open-source software

When I use Julia

- For computational work
  - If I have to build it from scratch
    - Dynamic programs
    - Optimization
    - Structural estimation
  - If it requires a lot of computations
- Not exploratory data analysis
- Not OLS

Getting started in Julia

- Download language: Julia binary
  - Installs to `C:\Users\username\AppData\Roaming\julia` or `~\.julia`
- Need a development environment
  - REPL is the command-line version
  - Atom is the RStudio for Julia
    - Install uber-juno package for Atom
  - Jupyter notebooks also work
  - Microsoft VS Code
    - Requires Julia extension
- Great "Getting Started" guide at QuantEcon

Adding packages & opening Jupyter

To add packages

- Open the REPL (julia command line)
- Type `]` to switch to "Package" mode

  ```
  add IJulia
  ```

- `backspace` to go back to regular prompt
- Open a Jupyter notebook

  ```
  jupyterlab()
  ```

Julia scripts

Always load packages (as in R: `library(ggplot2)`)

Jupyter great for analysis using other people's functions

```
using Plots    # load Plots package
gr()           # tell it to use GR to plot (vs PyPlot, Plotly.js,

x = -10.0 : 0.5 : 10.0    # create a "range"
y = x.^2                  # broadcast operation with `.^`

plot(x, y,
    title = "my first plot",
    labels = "\$x^2\$", legend = :top
)
```

Julia in Atom

Jupyter won't cut it for more serious coding. I'm developing a new version of my likelihood function.

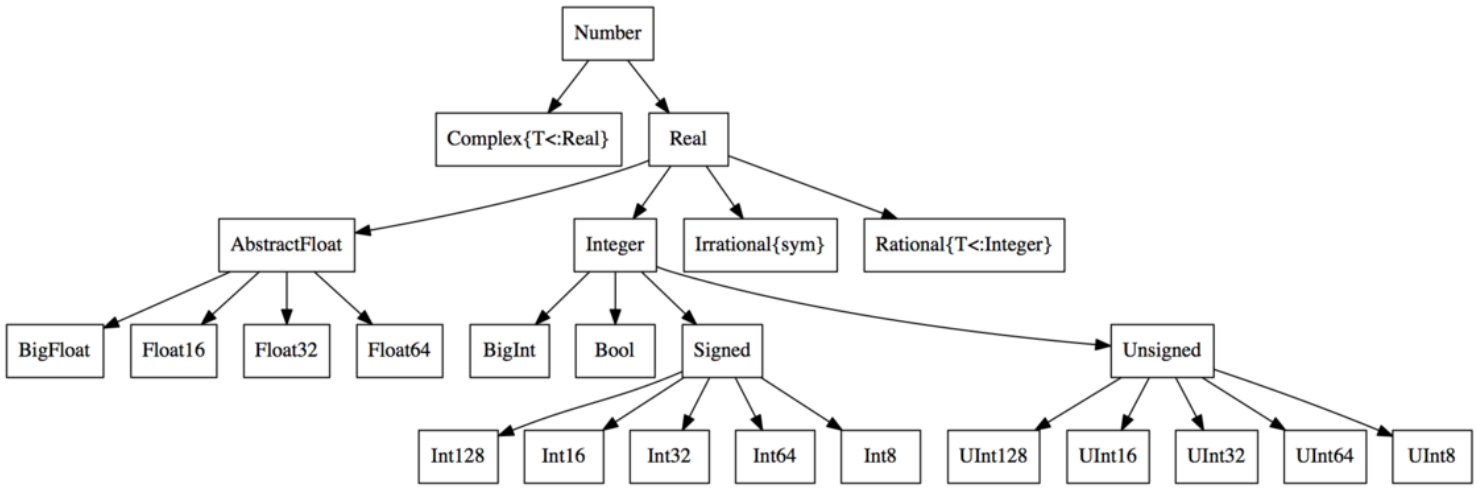
Clone package to `~/.julia/dev/ShaleDrillingLikelihood` or `C:\Users\username\AppData\Roaming\julia\dev\ShaleDrillingLikelih` with

```
] dev https://github.com/magerton/ShaleDrillingLikelihood.jl.git
```

- Project outline:
  - `README`, `License`, `.gitattributes`, `.gitignore`
  - `REQUIRE` file lists dependencies, superseded by new package system
  - `src/ShaleDrillingLikelihood.jl` defines a `module` (package) and loads other scripts
  - `test/runtests.jl` runs unit-tests
    - I build code through tests
    - `Revise` package reloads functions in module without restarting

Things to know about Julia

- Type system is very important



Julia resources

- Julia vs MATLAB, R Syntax
- Quantecon Lectures
- Julia Cheat Sheet

References

Maistre, Gabriel Gauci. 2019. "10 Reasons Why You Should Learn Julia." *Medium*. Accessed September 23. https://blog.goodaudience.com/10-reasons-why-you-should-learn-julia-d786ac29c6ca.