Lecture II - First Steps in Julia

Applied Optimization with Julia

Dr. Tobias Vlćek

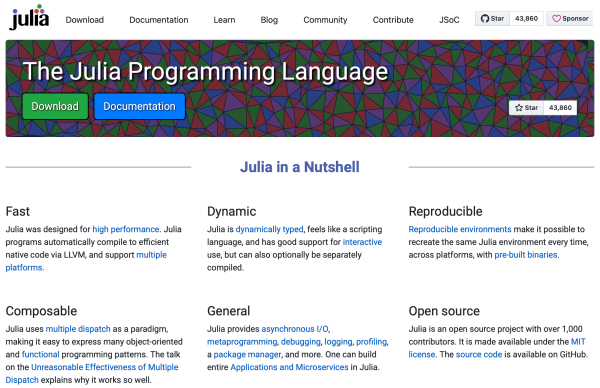
University of Hamburg - Fall 2024

Quick Recap on the Technical Setup

Download and Install Julia

To prepare for the upcoming lectures, we start by installing the Julia Programming Language and an Integrated Development Environment (IDE) to work with Julia.

Installaing Julia



- Head to julialang.org and follow the instructions.

VS Code

- Next, we are going to install VS Code
- Alternatively, you can install VS Codium
- It is essentially VS Code but without any tracking by MS

Installing VS Code

- Head to the website code.visualstudio.com
- OR to the webside vscodium.com
- Download and install the latest release

Verify the Installation

- Start the IDE and take a look around
- Search for the field “Extensions” on the left sidebar
- Click it and search for “Julia”
- Download and install “Julia (Julia Language Support)”

Create a new file

- Create a new file with a ".jl" ending
- Save it somewhere on your computer
- e.g., in a folder that you will use in the course

```
1 print("Hello World!")
```

- Run the file by clicking "run" in the upper right corner
- OR by pressing "Control+Enter" or "STRG+Enter"

Everything working?

- If the terminal opens with a `Hello World!` → perfect!
- If not, it is likely that the IDE **cannot find the path** to Julia
- Try to determine the path and save it to VS Code
- After saving it, try to run the file again

> **Tip**
>
> Don’t worry if it is not running right away. We will fix this together!

Learning Julia

Julia as a Programming Language

- Following three lectures are dedicated to learning the basics
- Start with the very basics and gradually move on
- Focus in the first two lectures on the programming language
- Third lecture dedicated to **Mathematical Optimization**

Working with VS Code

Notebooks in VS Code

- The easiest way is by using VS Code
- Install the Jupyter Extension
- Now, you can open `.ipynb` files
- Here you can run the code in the cells

Downloading the Notebooks

- You will find the tutorial notebooks next to the tutorial pages
- On each page, you will find a button `Jupyter` on the right
- Click it to download the notebook and save it
- I'd recommend storing the notebooks **in a separate directory for this course**

Learning by doing

- The best way to learn a programming language is **by doing**
- We will therefore solve problems the coming weeks
- The goal is to get you familiar with the language
- You can discuss the problems with your fellow students
- You can hand in your solutions to receive bonus points!

Working with IJulia

IJulia

- IJulia is an interface between Julia and Jupyter Notebooks
- Popular tool for data analysis and visualization
- You can use IJulia to run **Julia code in the notebooks**

Installing IJulia

- Open the VS Code IDE and start a terminal
- Start Julia by typing `julia` in the terminal
- Install IJulia by typing `]` to open the package manager
- Install IJulia by typing `add IJulia`
- Press `Enter`

Running IJulia

```
1 using IJulia; notebook()
```

- Start IJulia by typing the above code in the Julia prompt
- This will open a new browser window
- You can now run code in the notebooks

Submission of Assignments

Submission of Assignments

- You can work in groups of up to three people
- Submit the assignment via OpenOlat
- You will submit your assignment by uploading a notebook
- The assignment is due **the day before the next tutorial**

Grading of Assignments

- Each assignment is worth 0.5 points
- You can get a maximum of 6.0 points from the assignments
- The points will be added to your exam points
- You need to pass the exam first, to receive any bonus points!

Five Tutorials for this Week

Topics of the Tutorials

- **Variables**: Learn how to assign values to variables
- **Vectors**: Learn how to create and manipulate vectors
- **Comparisons**: Learn how to compare values
- **Loops**: Learn how to use loops to repeat code
- **Scope**: Learn about the scope of variables

Get started with the tutorials

- Download the first notebook and open it
- Start with the **first problem and solve it step by step**
- You can find the tutorials here on the website
- **You can ask questions anytime!**

Literature

Literature

- Lauwens, B., & Downey, A. B. (2019). Think Julia: How to think like a computer scientist (First edition). O'Reilly®. Link to the free book website.
- Julia Documentation

For more interesting literature to learn more about Julia, take a look at the literature list of this course.