Research software development workflows in Julia, applied to JuMP

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Solutions Showcases – Friday 23 October

workflow

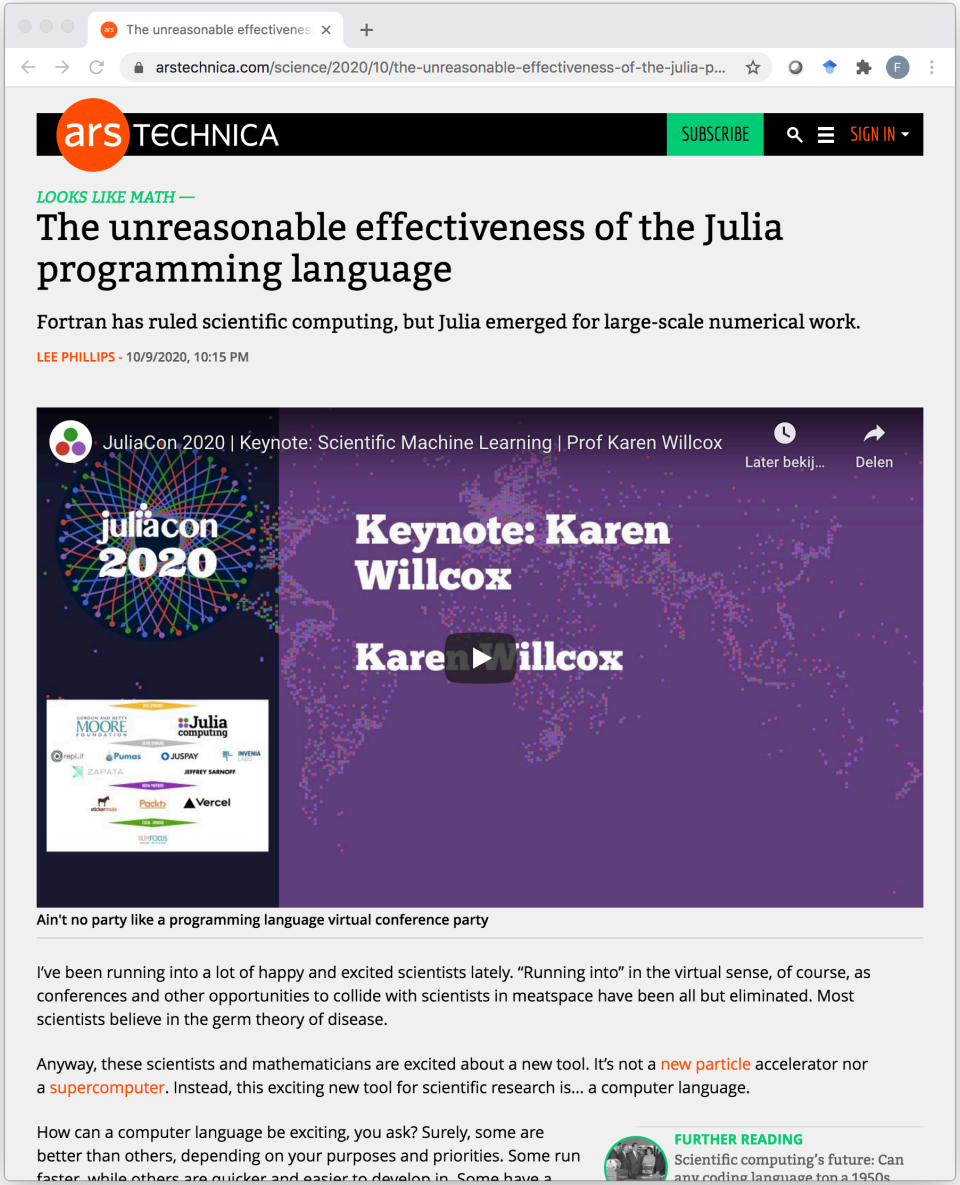
- set up julia + VSCode

Why Julia? - Speed!

https://julialang.org/benchmarks/

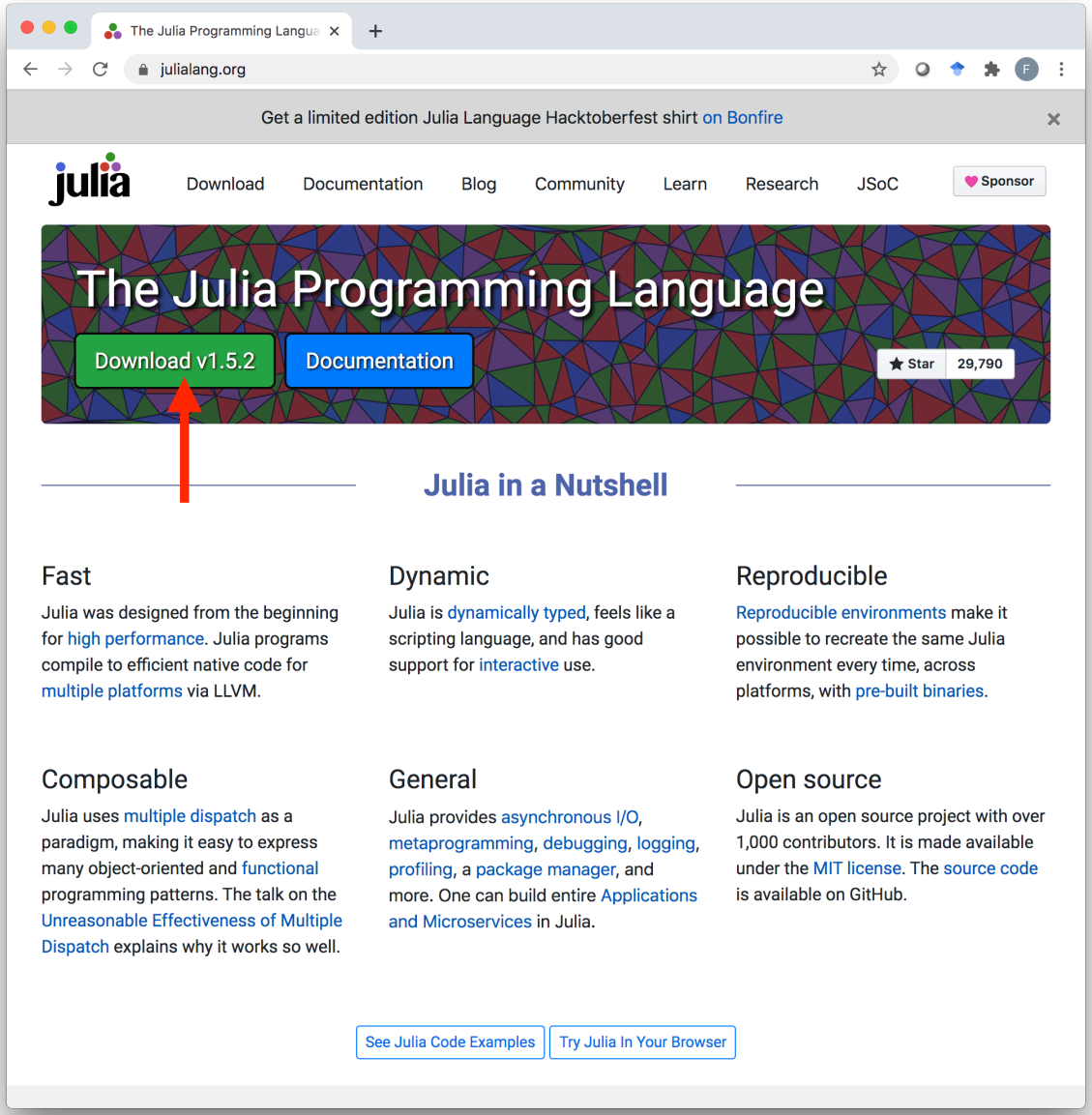
Why Julia?

- free and open source (MIT licensed) designed for scientific / technical computing
- not needed to vectorise code for performance; unvectorised code can also be fast
- designed for parallelism and distributed computation
- efficient support for Unicode, including but not limited to
  UTF-8
- you can finally use emojis as variables



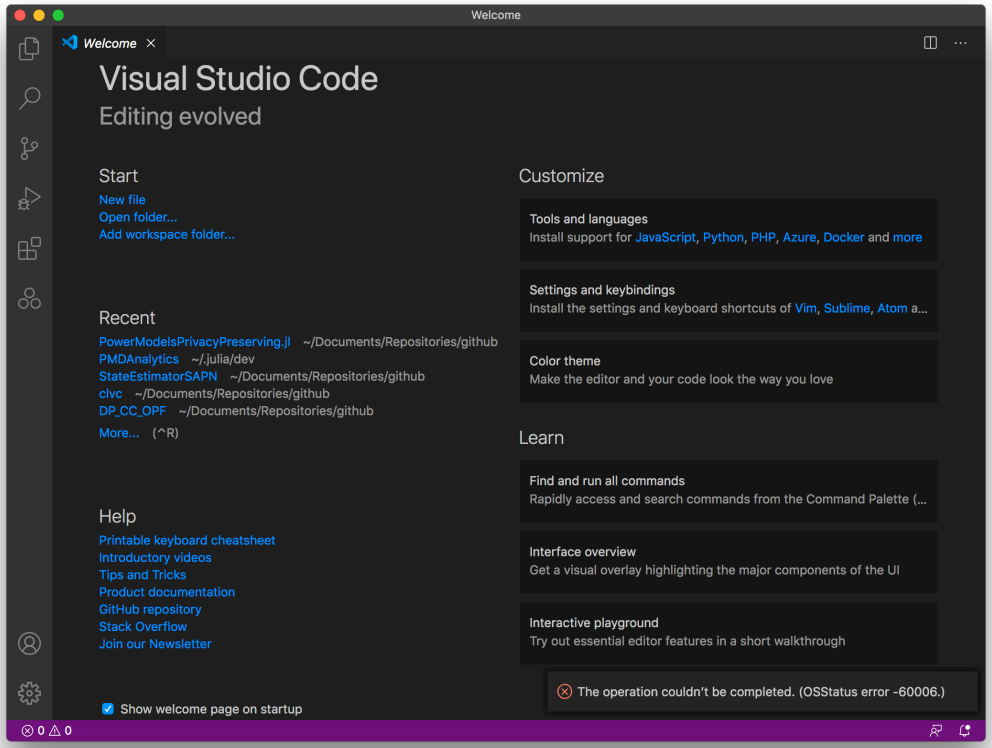
Get Julia

- https://julialang.org/
- 1.5.2 (stable)
- mac, windows, linux
- cheatsheets.quantecon.org



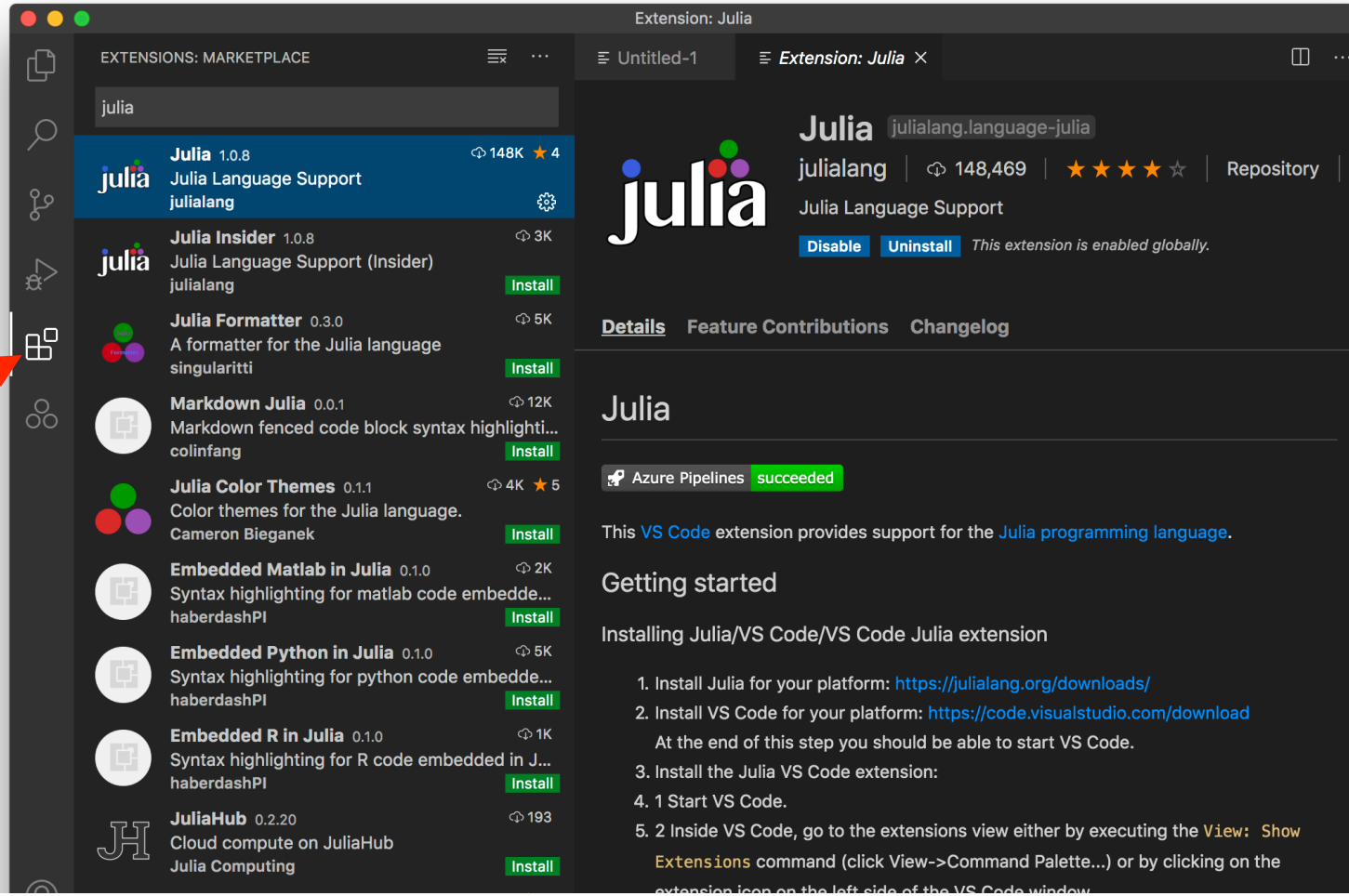
Visual Studio Code

- https://code.visualstudio.com/
  - Mac, Windows and Linux



Julia Plugin for VSCode

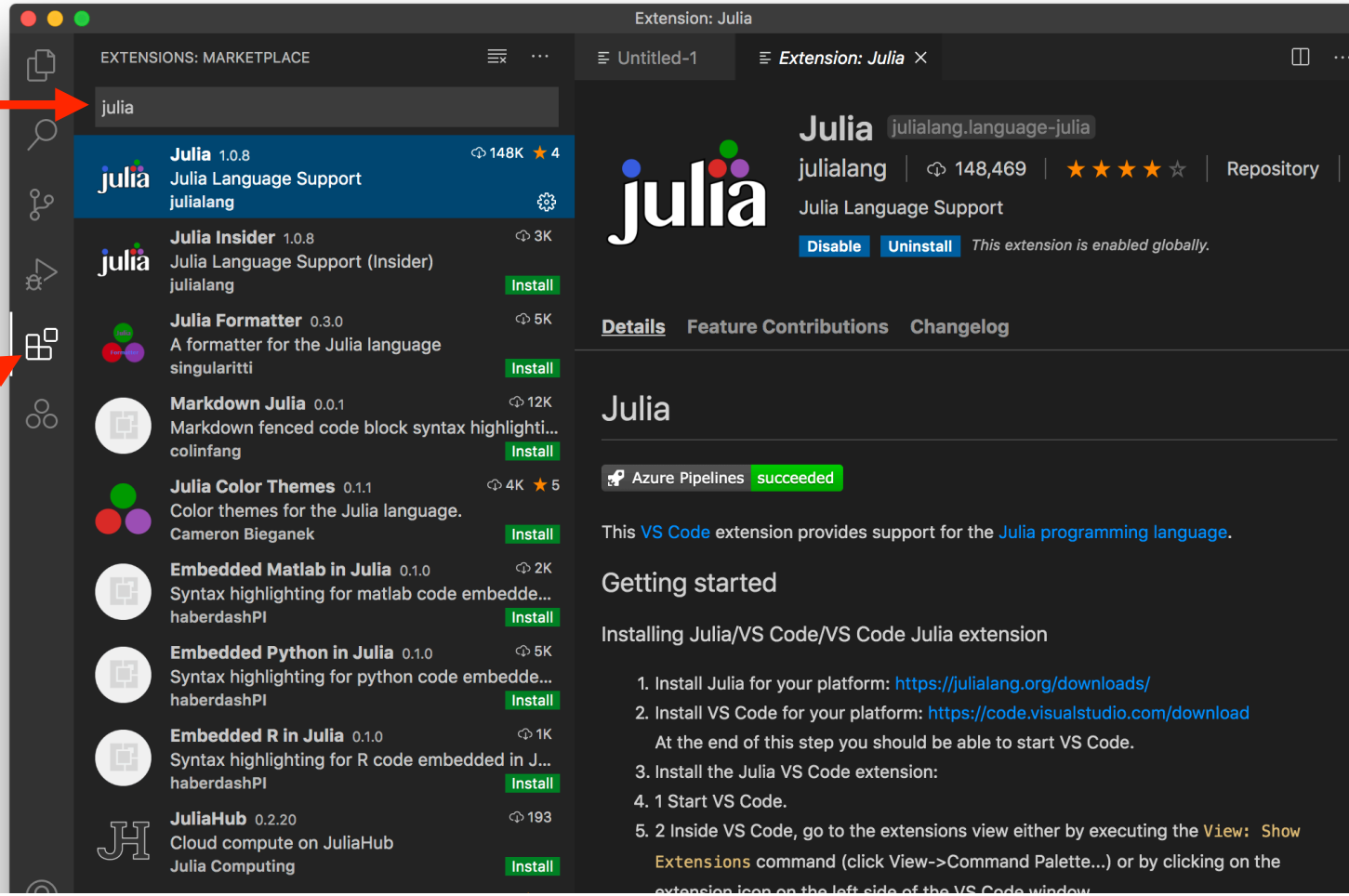
Extensions



Julia Plugin for VSCode

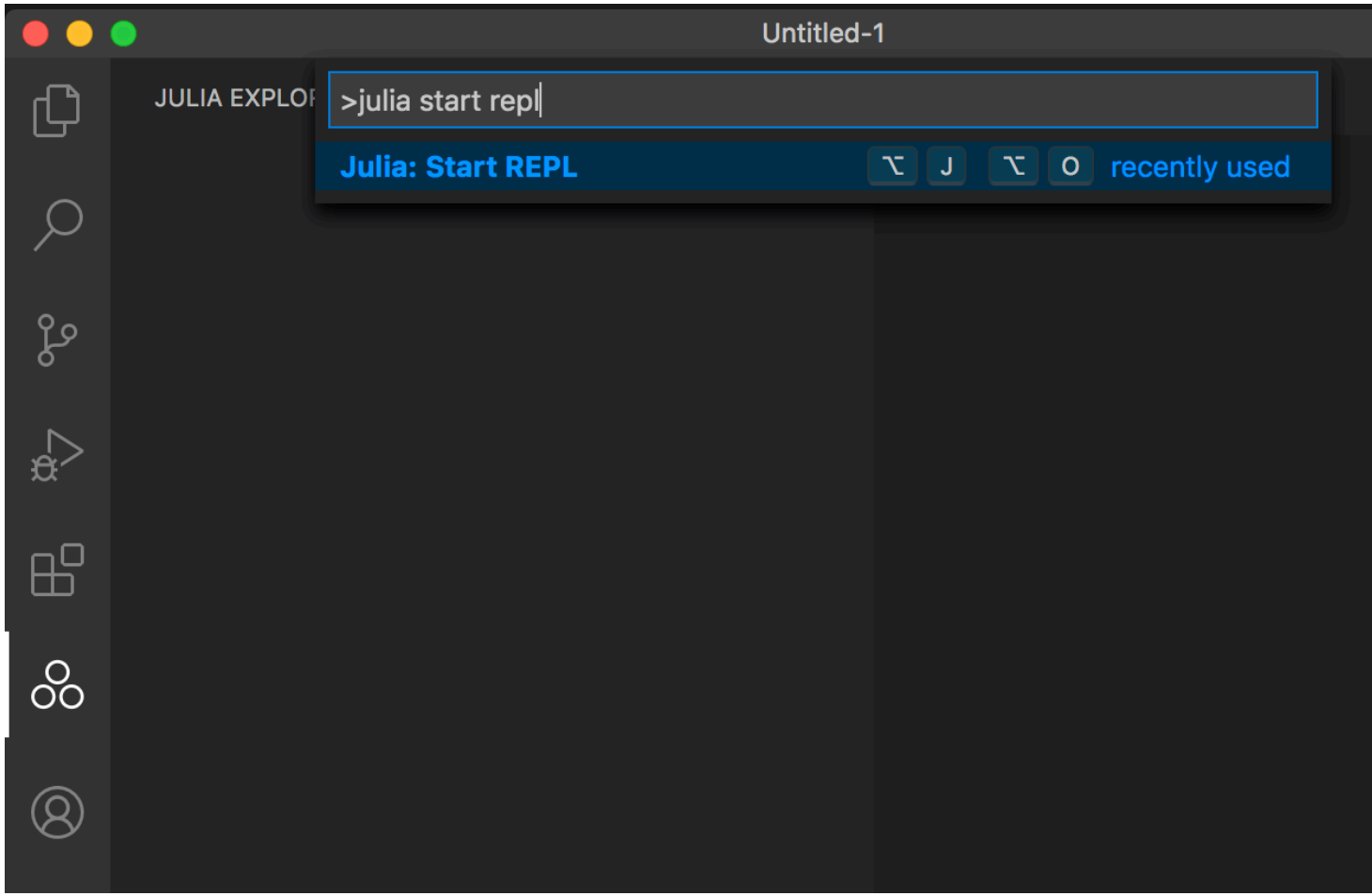
type in ‘Julia’ and install

Extensions



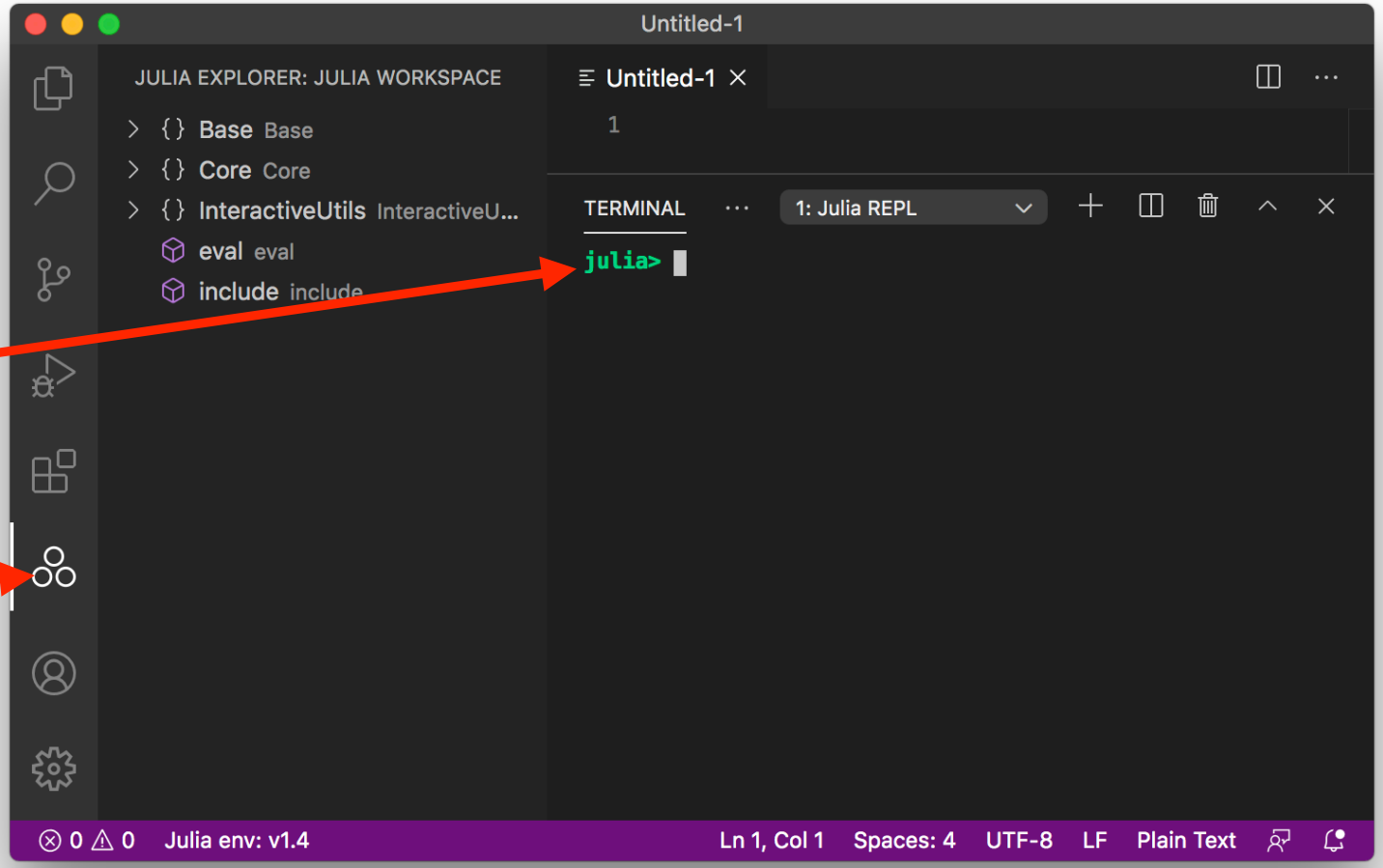
Open REPL in VSCode

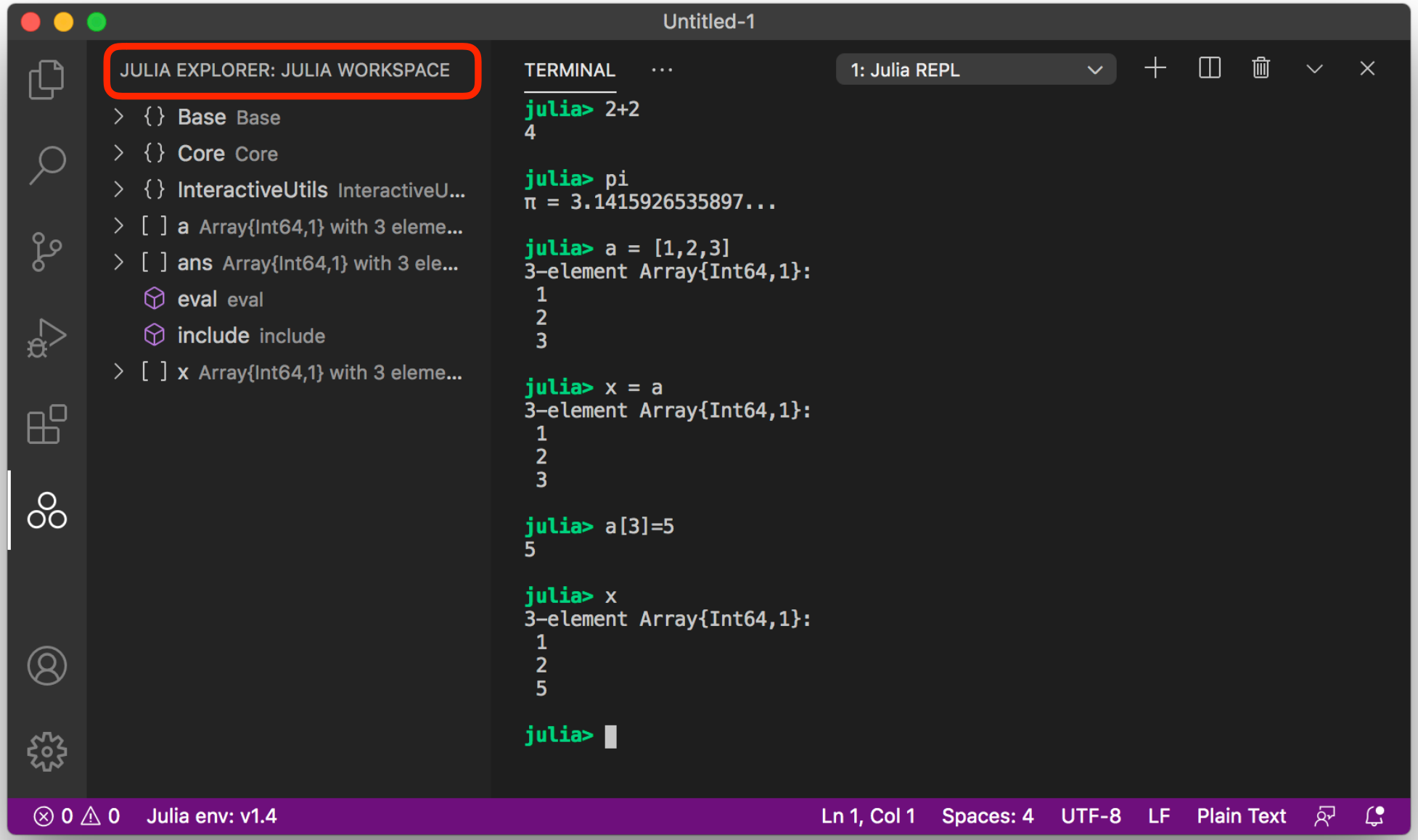
- view -> command pallette -> type ‘julia start REPL’ -> enter
  - or alt (option) + j, alt (option) + o



REPL

- read-eval-print loop
- interactive ‘interpreter’
- with workspace (variable) browser



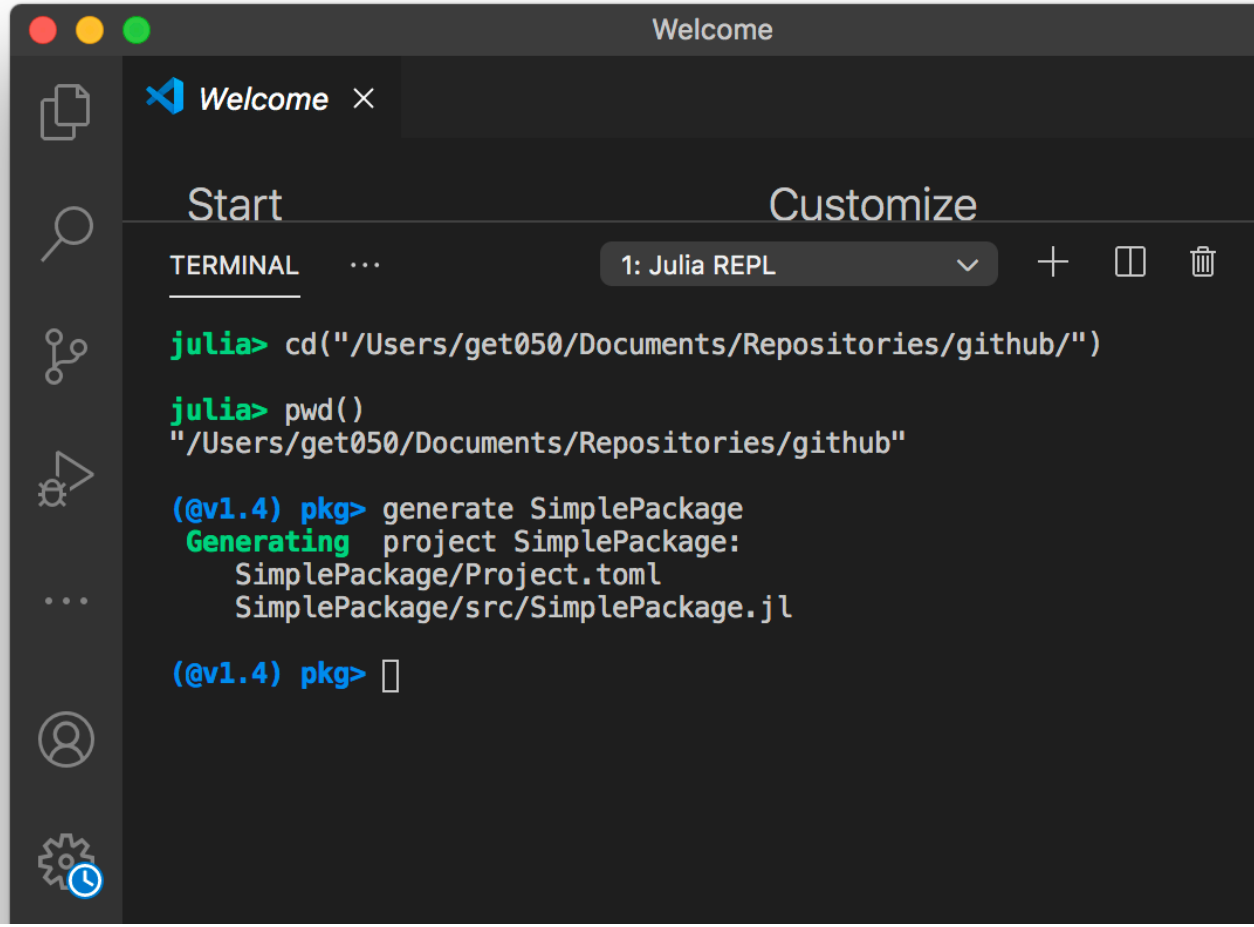

Untitled-1
JULIA EXPLORER: JULIA WORKSPACE
{} Base Base
{} Core Core
{} InteractiveUtils InteractiveU...
[ ] a Array{Int64,1} with 3 eleme...
[ ] ans Array{Int64,1} with 3 ele...
eval eval
include include
[ ] x Array{Int64,1} with 3 eleme...
TERMINAL
1: Julia REPL
julia> 2+2
4
julia> pi
π = 3.1415926535897...
julia> a = [1,2,3]
3-element Array{Int64,1}:
1
2
3
julia> x = a
3-element Array{Int64,1}:
1
2
3
julia> a[3]=5
5
julia> x
3-element Array{Int64,1}:
1
2
5
julia>
0 0
Julia env: v1.4
Ln 1, Col 1
Spaces: 4
UTF-8
LF
Plain Text

Package setup

- package initialisation workflow
- can be done many different ways, what I present is one of them
- resources:
  - https://github.com/invenia/PkgTemplates.jl
  - Developing Julia Packages | Chris Rackauckas: https://www.youtube.com/watch?v=QVmU29rCjaA
  - Pkg, Project.toml, Manifest.toml and Environments | Fredrik Ekre: https://www.youtube.com/watch?v=q-LV4zoxc-E
  - Using VS Code for Julia development | David Anthoff: https://www.youtube.com/watch?v=ldhnP00Y1Ks

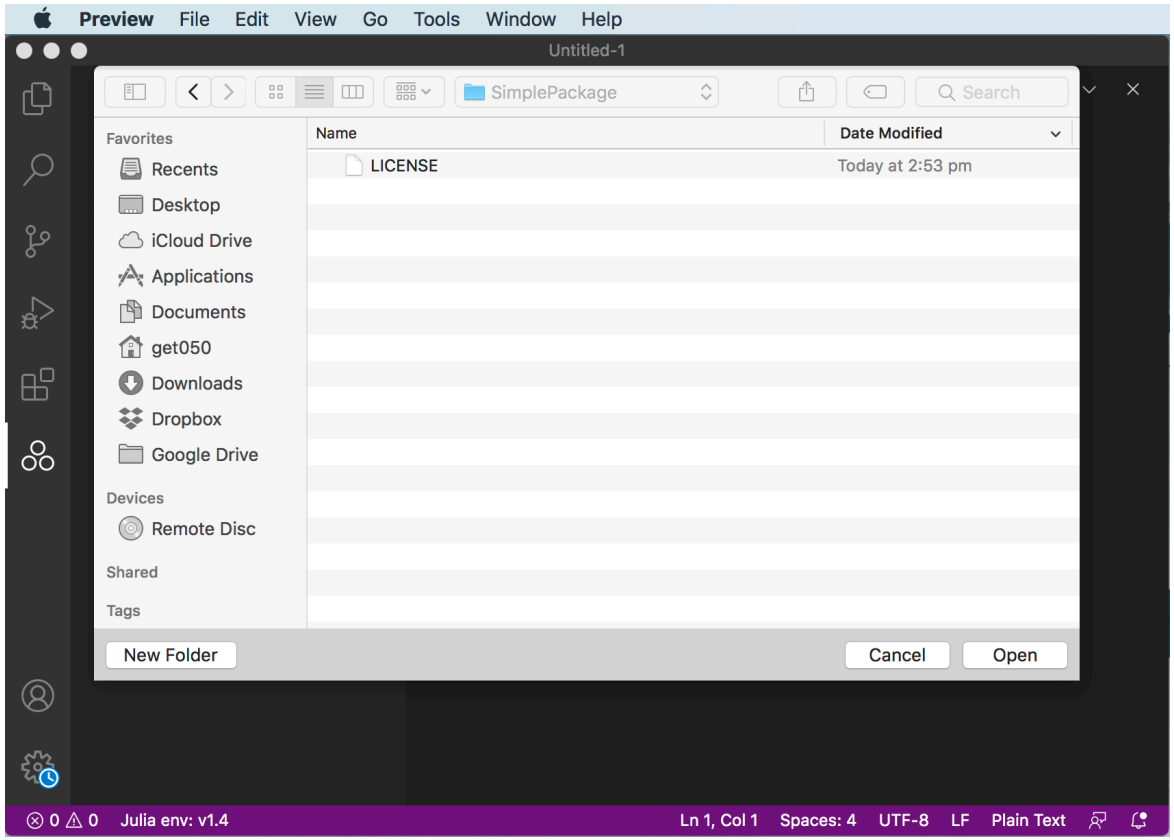
generate new package

- navigate to folder where you want to generate a new Package



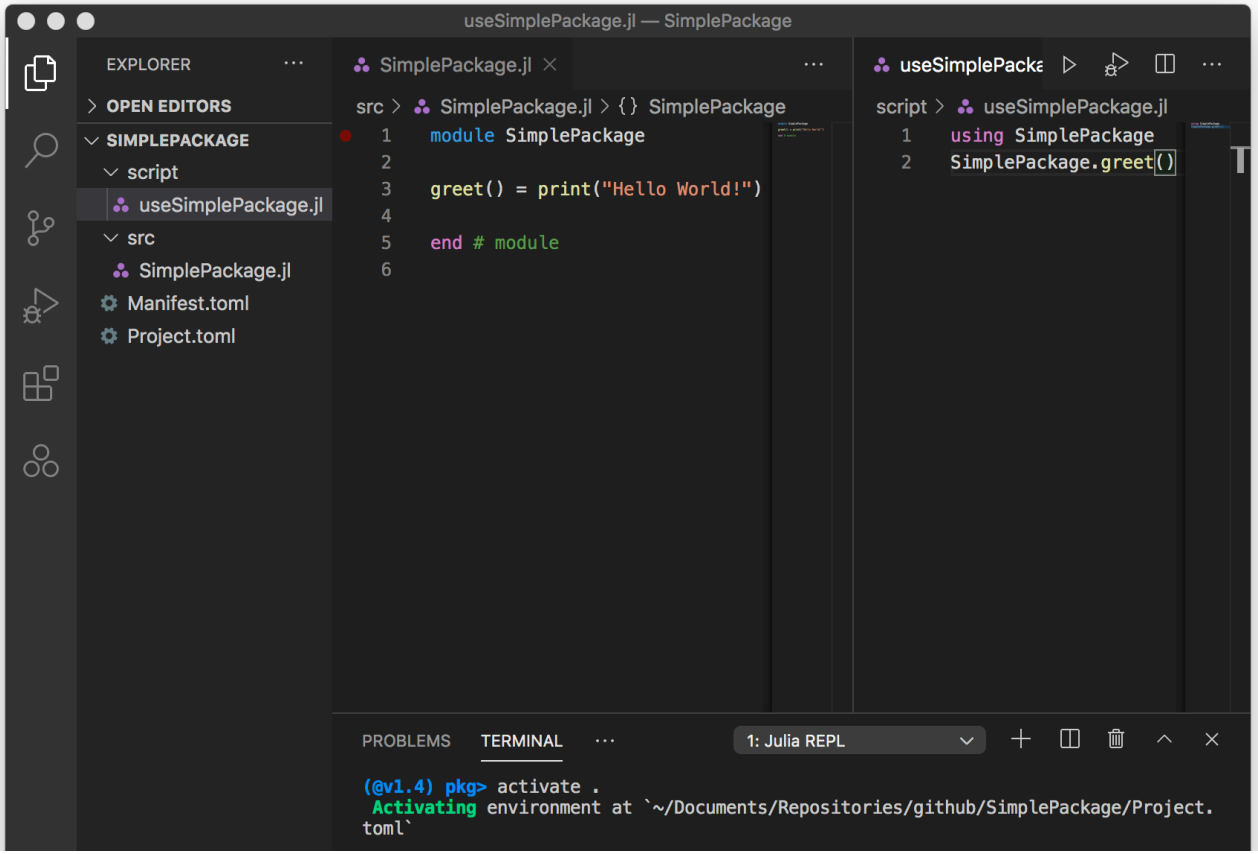
open folder in VSCode

- file -> open (folder)
- point to ‘SimplePackage’



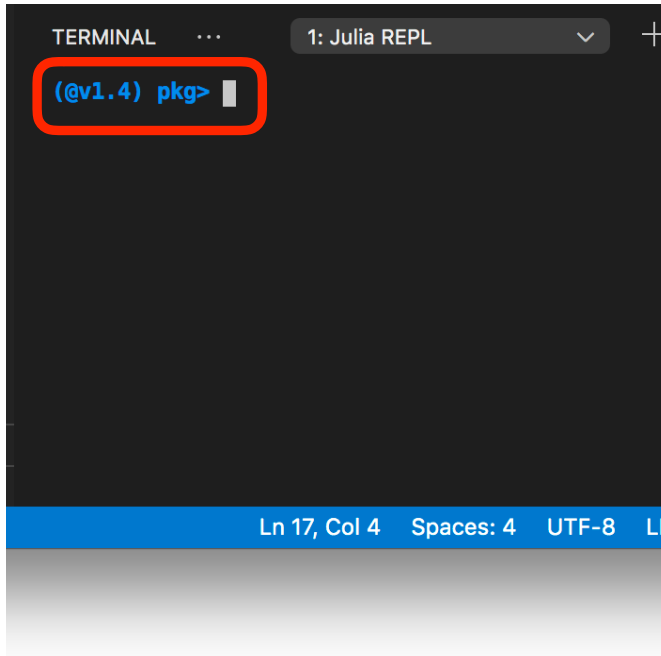
hello world

- /src contains the package code
- other folders are optional
  - we store a script that uses our module in /script/useSimplePackage.jl



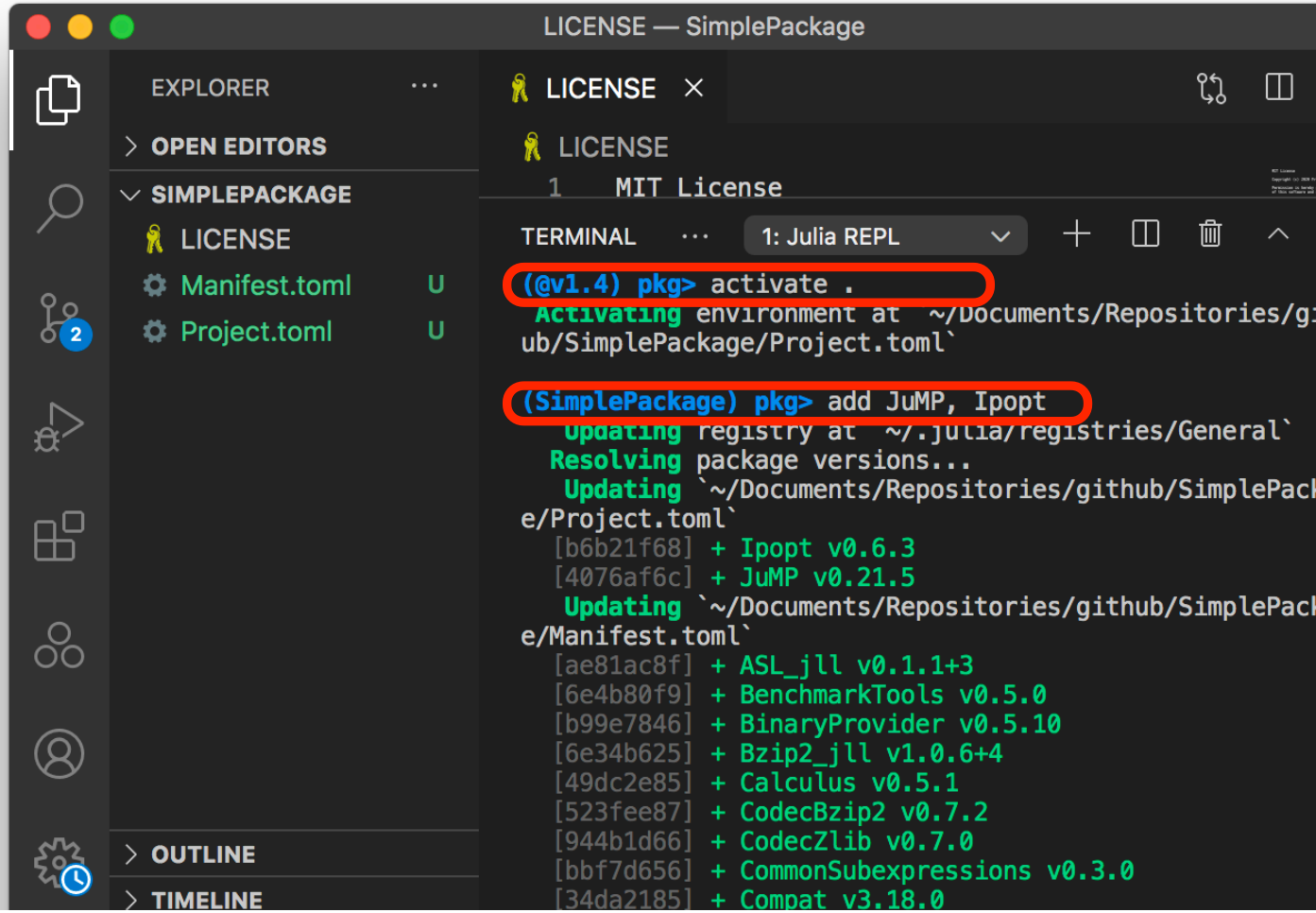
package manager

- enter package mode by typing ‘]’ in REPL
  - press backspace to leave
- https://docs.julialang.org/en/v1/stdlib/Pkg/



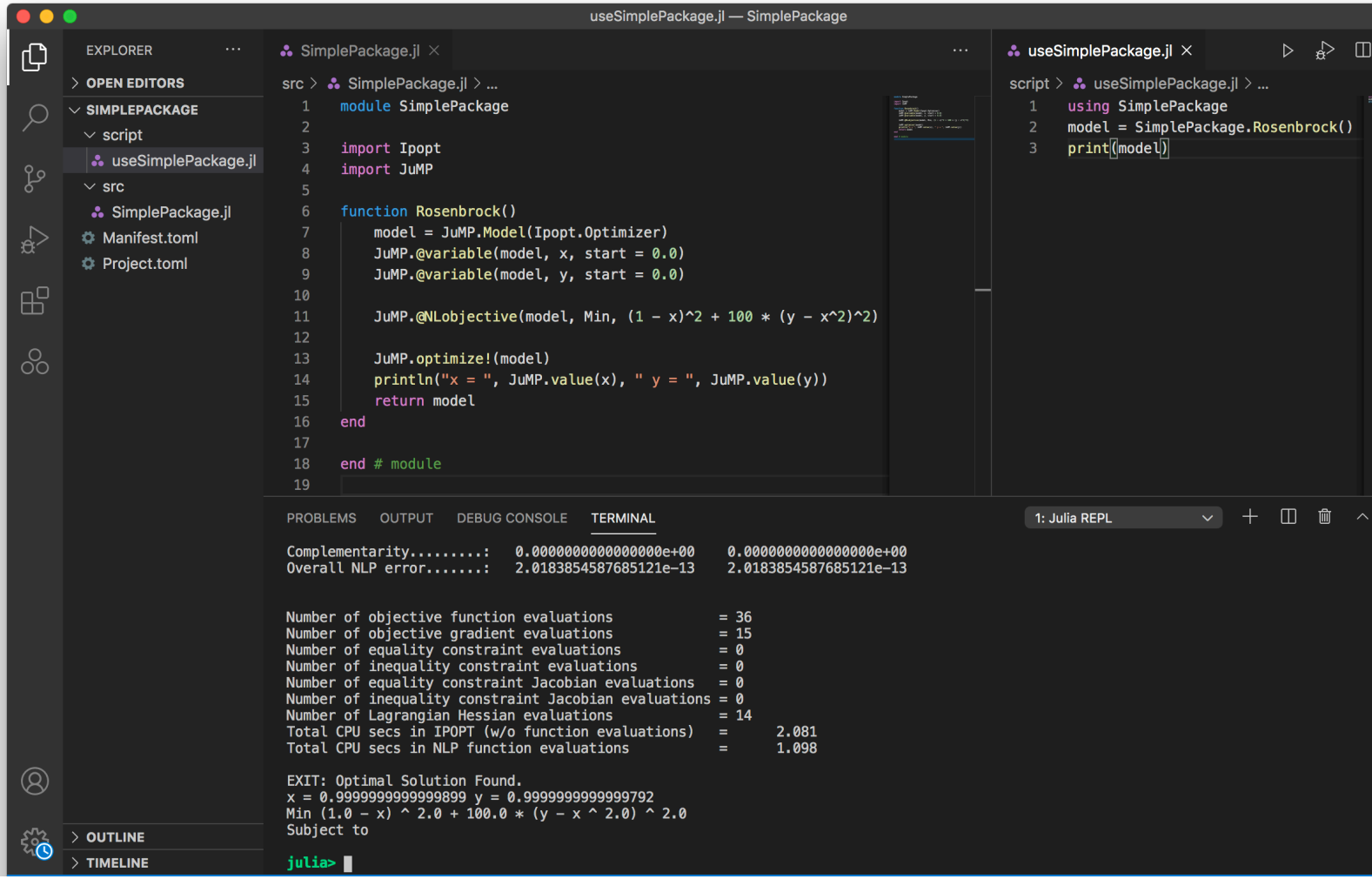
Make environment

- activate environment in current folder
- add ‘JuMP’ and ‘Ipopt’ packages



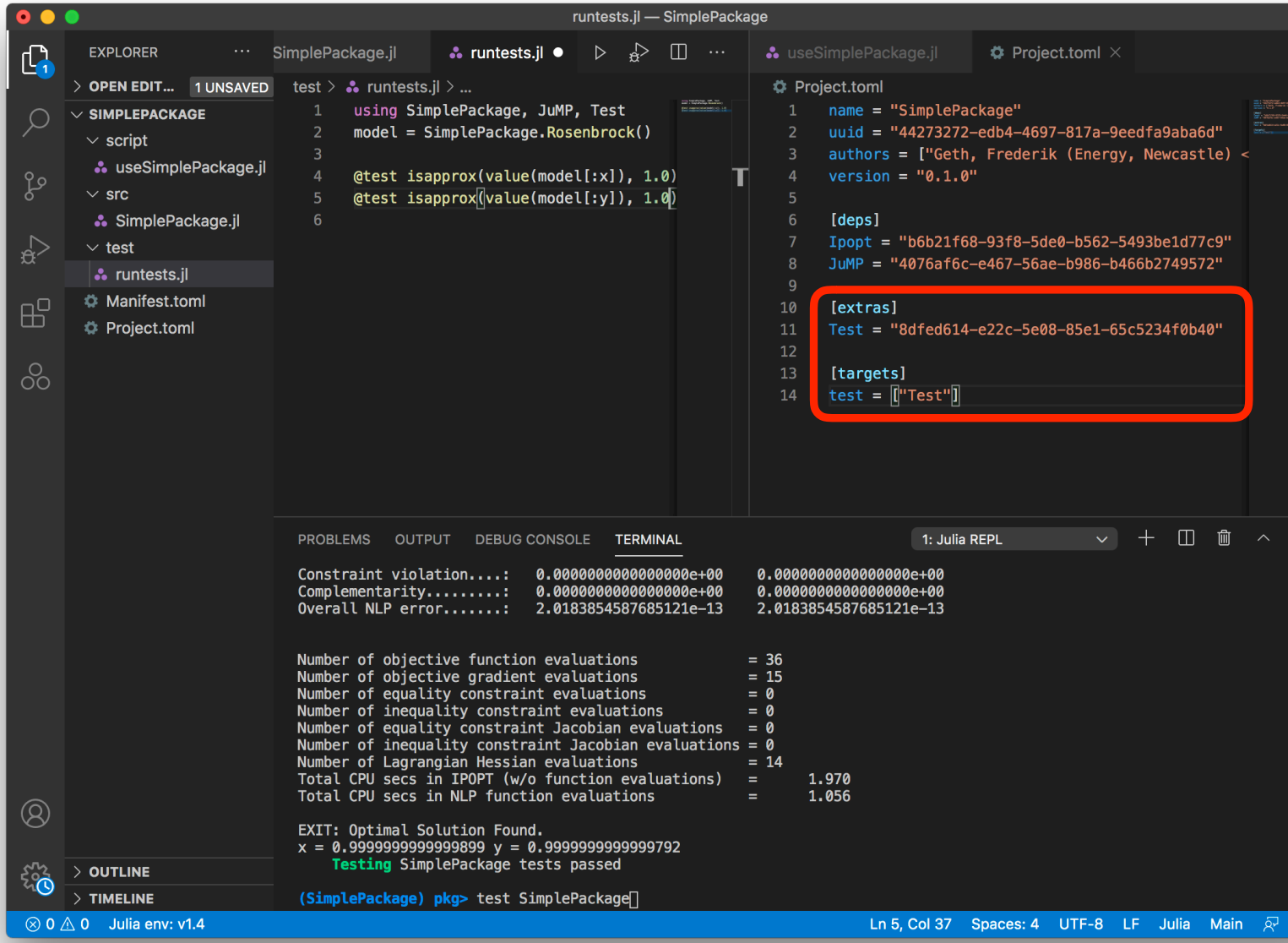
JuMP example

- example from https://jump.dev/JuMP.jl/stable/nlp/
  - Ipopt and JuMP as dependencies



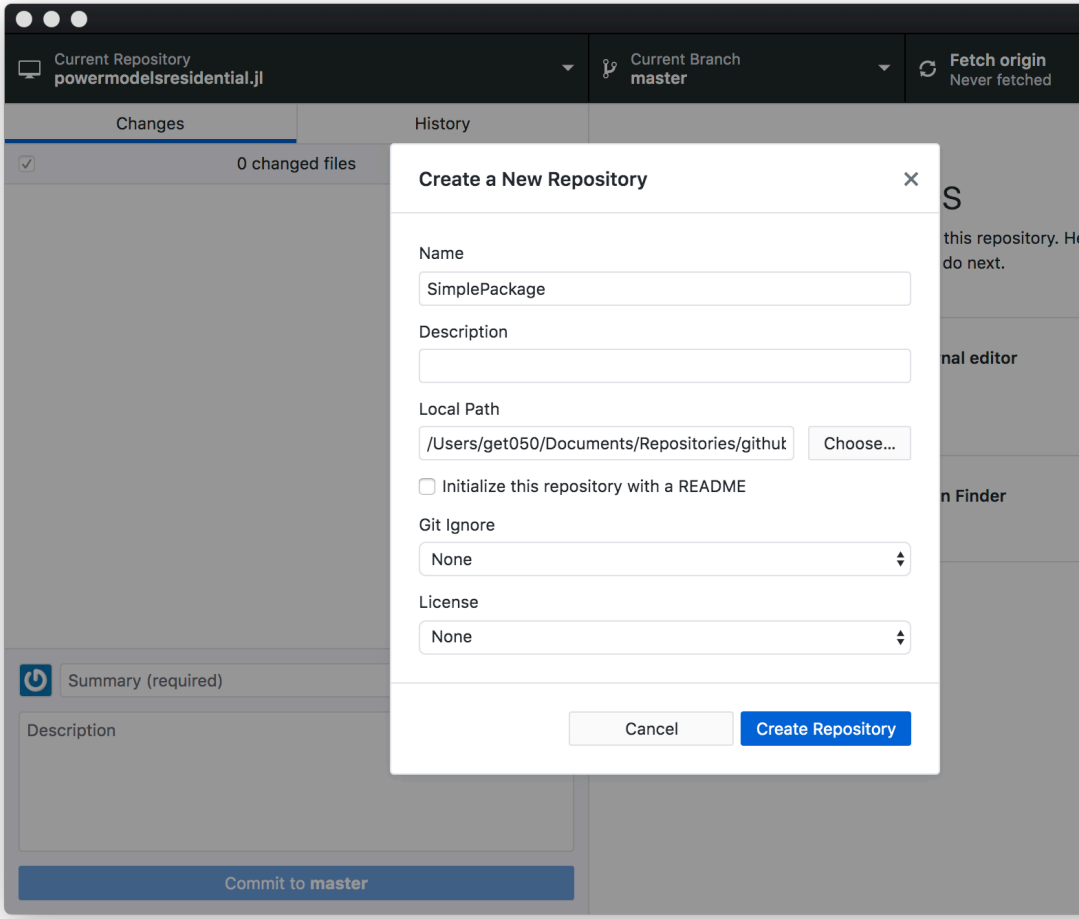
Testing

- add /test/ runtests.jl
- add ‘Test’ as dependency for testing
-] test SimplePackage
  - triggers runtests.jl



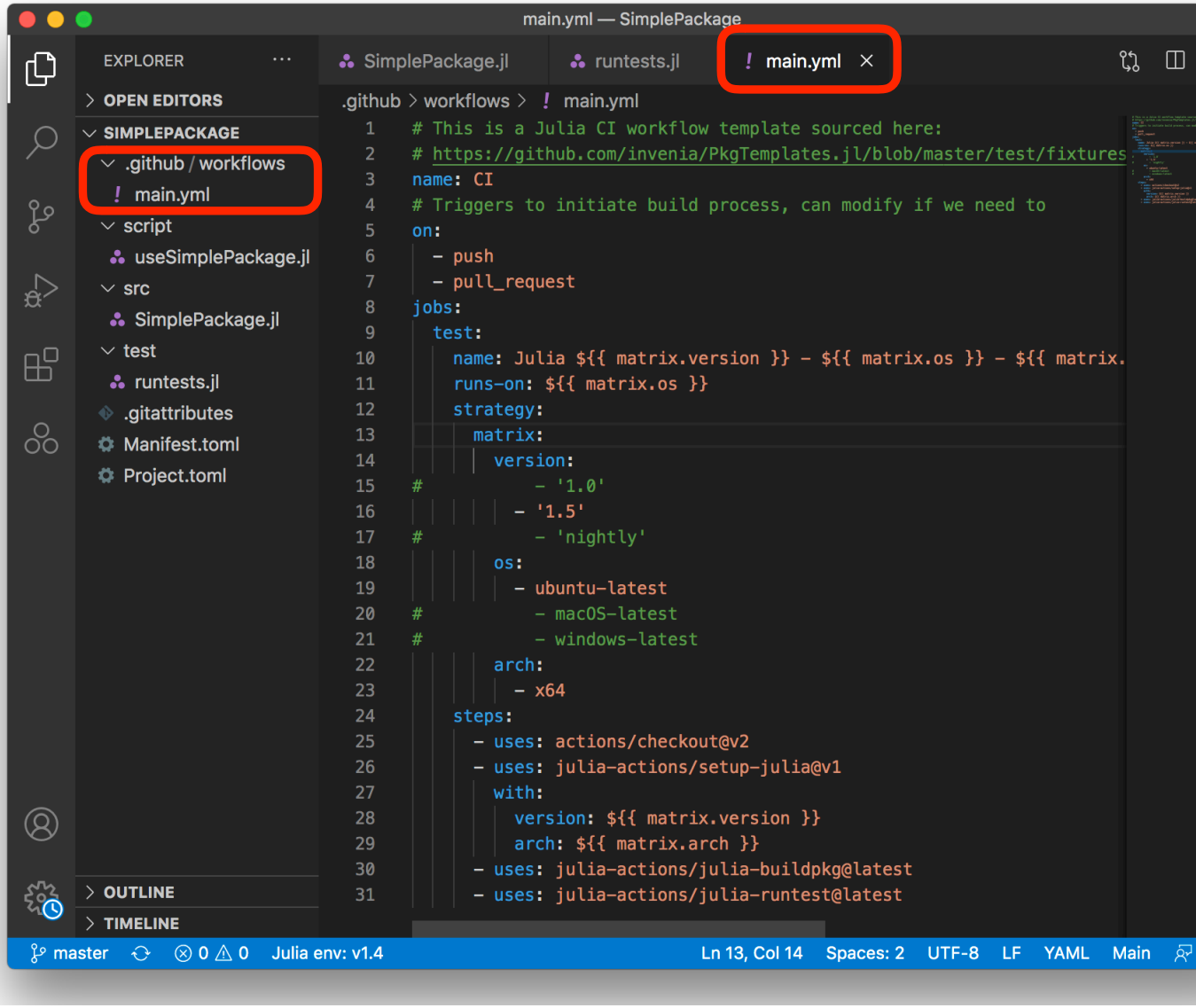
Initialize repository

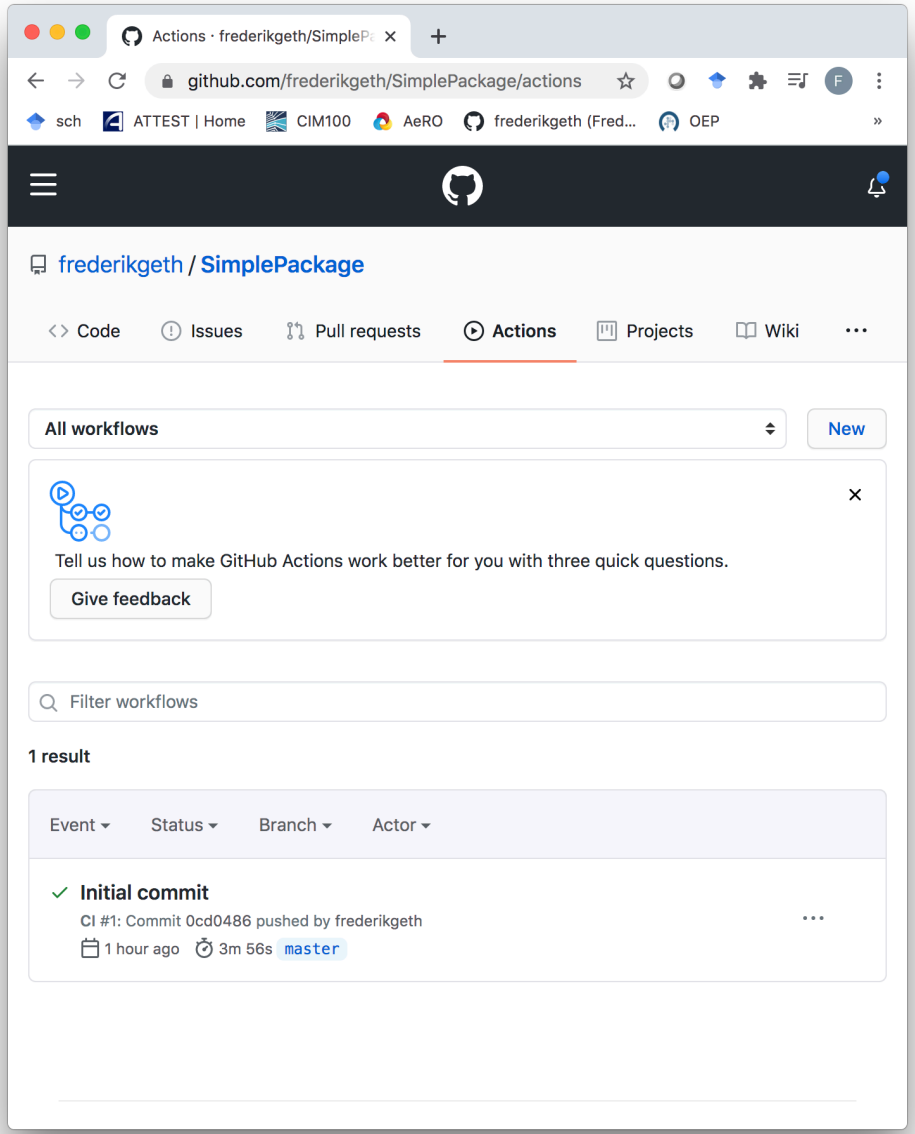
- here Github Desktop
  - File-> New Repository
  - point to ‘SimplePackage’ folder
- can also use Source Tree, command line

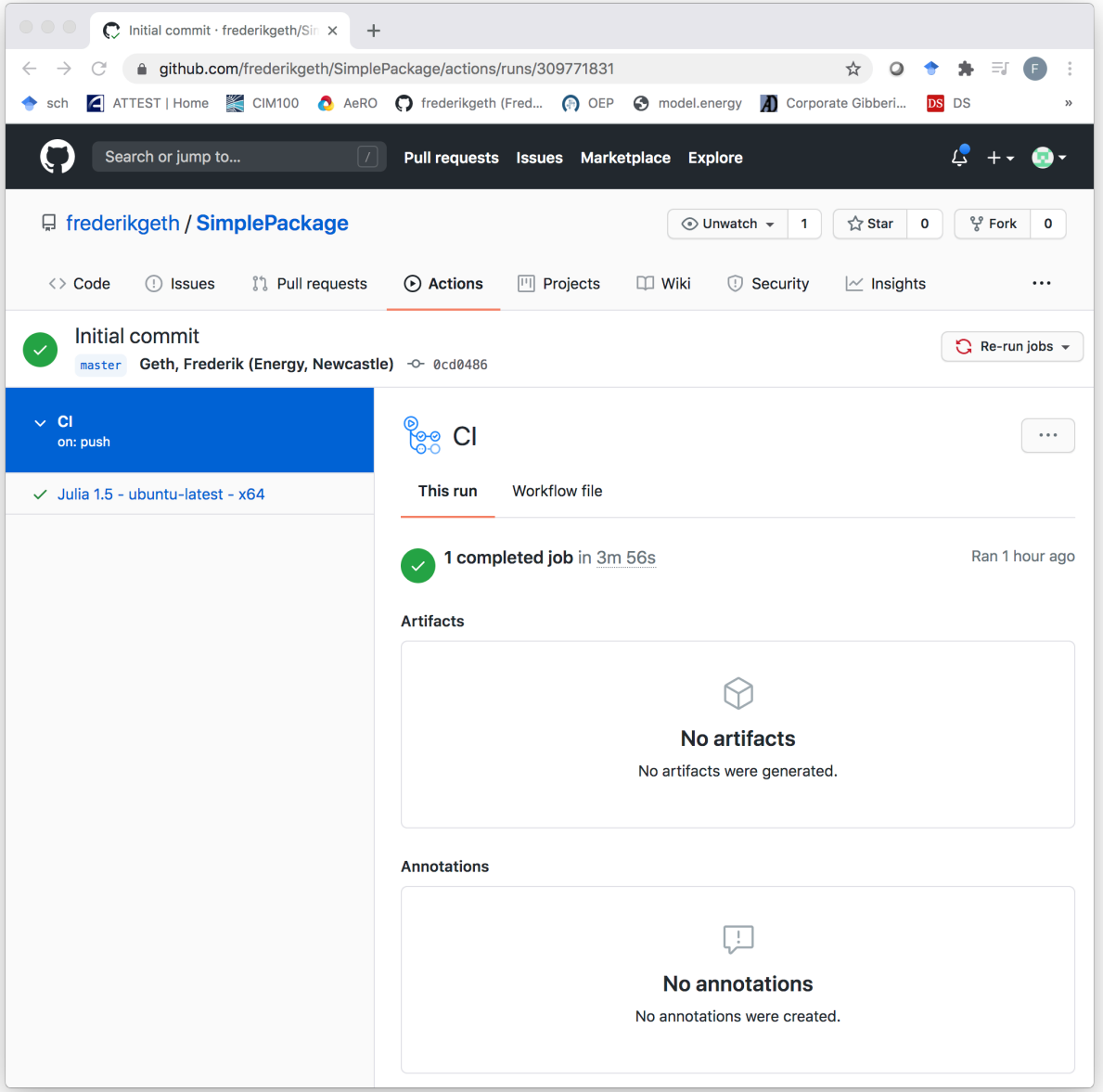


CI

- add config file for Github Actions
  - run tests on the package
  - free if open-source




Actions · frederikgeth/SimpleP
github.com/frederikgeth/SimplePackage/actions
frederikgeth / SimplePackage
Code
Issues
Pull requests
Actions
Projects
Wiki
All workflows
New
Tell us how to make GitHub Actions work better for you with three quick questions.
Give feedback
Filter workflows
1 result
Event
Status
Branch
Actor
Initial commit
CI #1: Commit 0cd0486 pushed by frederikgeth
1 hour ago
3m 56s
master


Initial commit · frederikgeth/Sir
github.com/frederikgeth/SimplePackage/actions/runs/309771831
Search or jump to...
Pull requests
Issues
Marketplace
Explore
frederikgeth / SimplePackage
Unwatch
1
Star
0
Fork
0
Code
Issues
Pull requests
Actions
Projects
Wiki
Security
Insights
Initial commit
master
Geth, Frederik (Energy, Newcastle)
0cd0486
Re-run jobs
CI
on: push
Julia 1.5 - ubuntu-latest - x64
CI
This run
Workflow file
1 completed job in 3m 56s
Ran 1 hour ago
Artifacts
No artifacts
No artifacts were generated.
Annotations
No annotations
No annotations were created.

Questions?

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