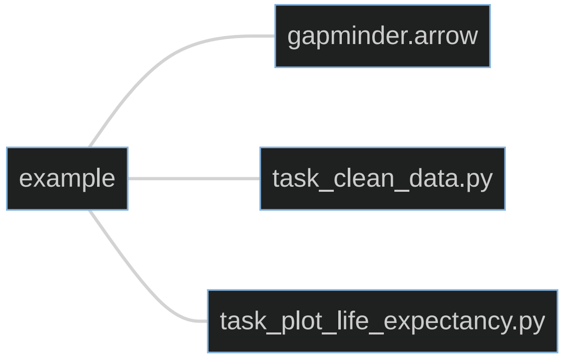
Effective Programming Practices for Economists

Reproducible Research

What does pytask do?

Janoś Gabler and Hans-Martin von Gaudecker

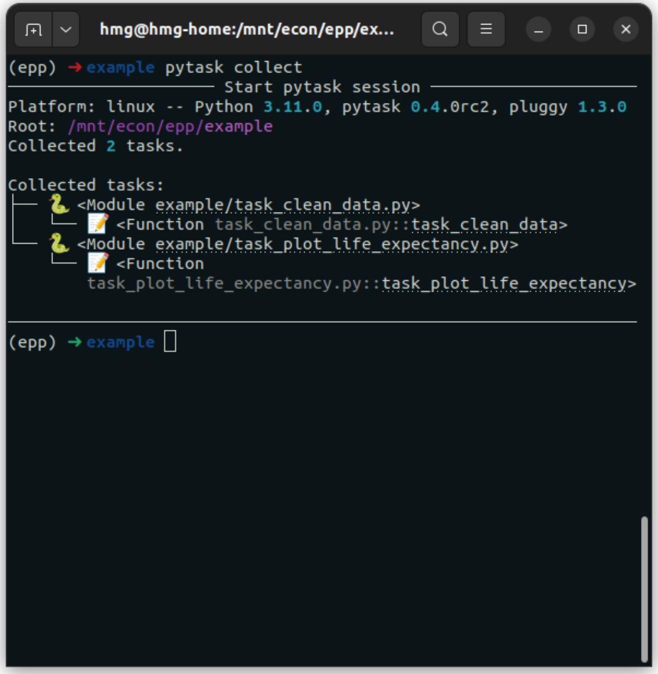
A tiny example project



- `example/task_clean_data.py`
  - Contains the function `task_clean_data`
  - If called, the function reads in `example/gapminder.arrow` and produces `example/bld/data.pkl`
- `example/task_plot_life_expectancy.py`
  - Contains the function `task_plot_life_expectancy`
  - If called, the function reads in `example/bld/data.pkl` and produces `example/bld/life_expectancy.svg`

Step 1: collection

- Go through all folders in working directory
- Collect all files with name `` `task_XXX.py` ``
- Go through those files and collect all functions that start with `` `task_` ``
- Task functions and their (default) inputs will be used to construct the workflow

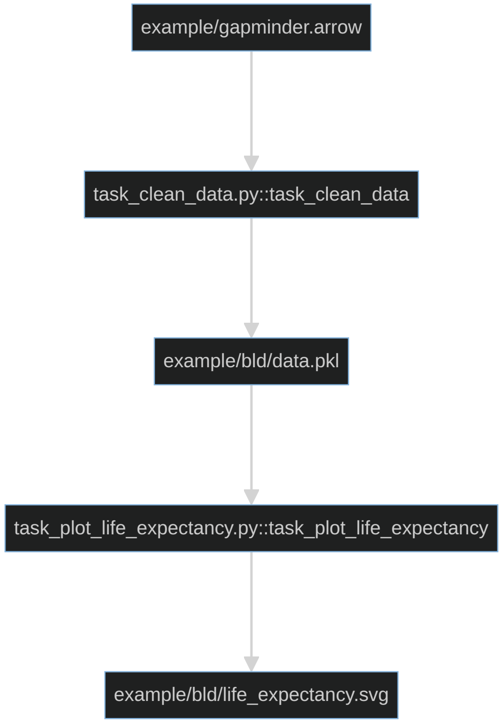


```
(epp) ➜ example pytask collect
──────────────────── Start pytask session ────────────────────
Platform: linux -- Python 3.11.0, pytask 0.4.0rc2, pluggy 1.3.0
Root: /mnt/econ/epp/example
Collected 2 tasks.

Collected tasks:
├── 🐍 <Module example/task_clean_data.py>
│   └── 📝 <Function task_clean_data.py::task_clean_data>
└── 🐍 <Module example/task_plot_life_expectancy.py>
    └── 📝 <Function
        task_plot_life_expectancy.py::task_plot_life_expectancy>

──────────────────────────────────────────────────────────────
(epp) ➜ example 
```

Step 2: Dependency graph (DAG)

- Inspect function signatures to build a dependency graph
- `` `produces` `` describes function output
- Other arguments are function dependencies
- DAG structure enables to determine an order of execution that respects dependency structure (topological sort)

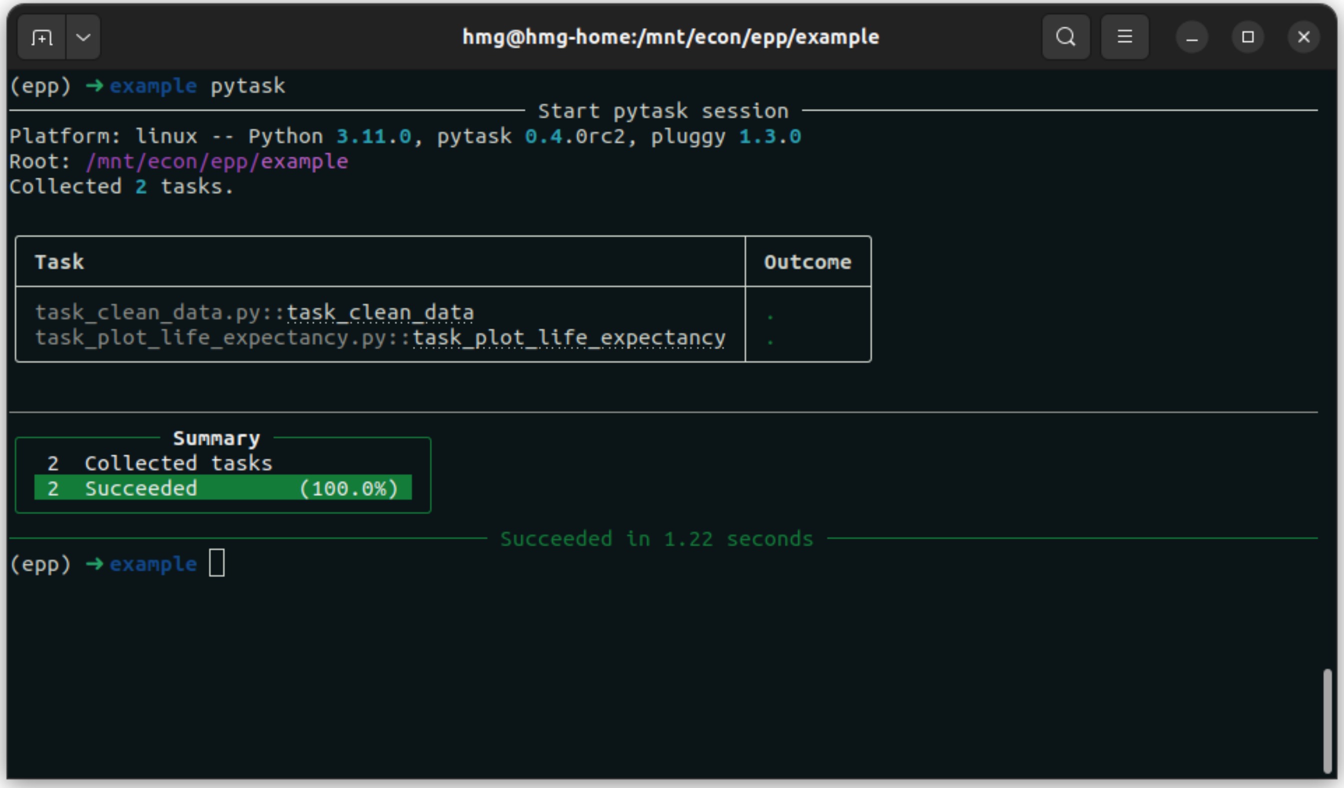
Can you see the DAG?


example/gapminder.arrow
task_clean_data.py::task_clean_data
example/bld/data.pkl
task_plot_life_expectancy.py::task_plot_life_expectancy
example/bld/life_expectancy.svg

Step 3: Track changes and execute

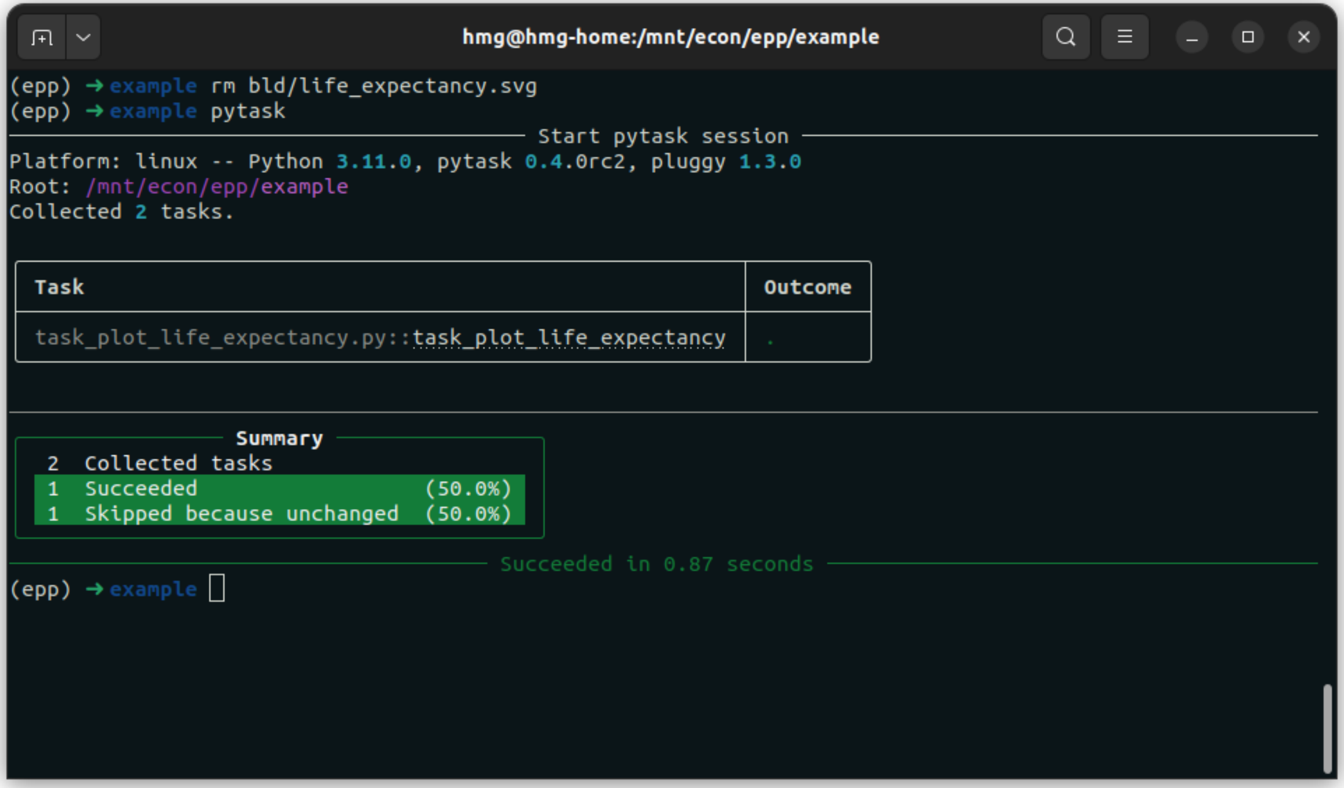
- Pytask knows which files should need to be generated
- Also keeps track on when code or products have changed
- Functions are only run if:
  - They have changed
  - A dependency has changed
- Huge time savings in large empirical projects!

Run for the first time



```
(epp) → example pytask
──────────────────────────────── Start pytask session ────────────────────────────────
Platform: linux -- Python 3.11.0, pytask 0.4.0rc2, pluggy 1.3.0
Root: /mnt/econ/epp/example
Collected 2 tasks.

┌───────────────────────────────────────────────────────────┬─────────┐
│ Task                                                      │ Outcome │
├───────────────────────────────────────────────────────────┼─────────┤
│ task_clean_data.py::task_clean_data                       │ .       │
│ task_plot_life_expectancy.py::task_plot_life_expectancy   │ .       │
└───────────────────────────────────────────────────────────┴─────────┘

──────────────────────────────────────────────────────────────────────────────────────
┌──────────── Summary ────────────┐
│ 2  Collected tasks              │
│ 2  Succeeded          (100.0%)  │
└─────────────────────────────────┘
────────────────────────────── Succeeded in 1.22 seconds ──────────────────────────────
(epp) → example
```

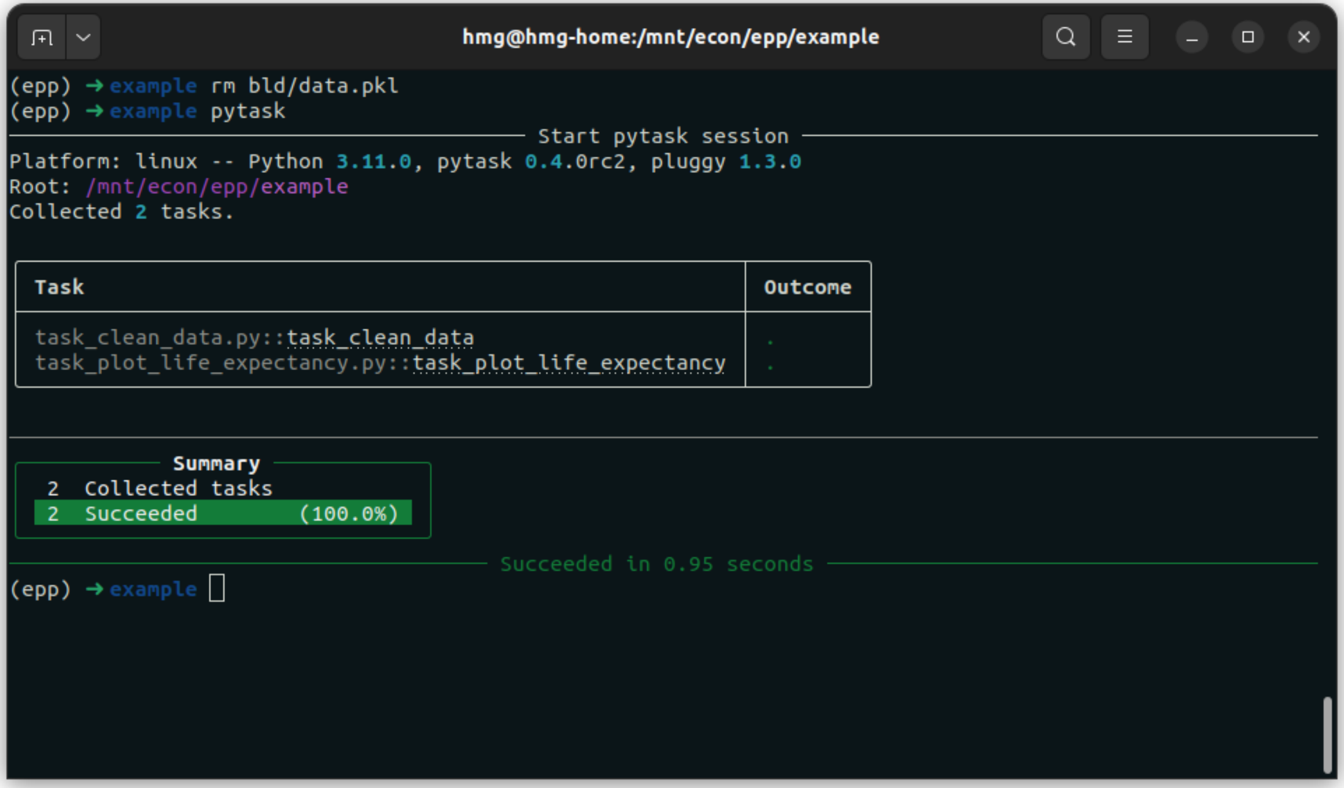
Delete plot and run again



hmg@hmg-home:/mnt/econ/epp/example

```
(epp) ➜ example rm bld/life_expectancy.svg
(epp) ➜ example pytask
─────────────────────────── Start pytask session ───────────────────────────
Platform: linux -- Python 3.11.0, pytask 0.4.0rc2, pluggy 1.3.0
Root: /mnt/econ/epp/example
Collected 2 tasks.

┌──────────────────────────────────────────────────┬────────┐
│ Task                                             │ Outcome│
├──────────────────────────────────────────────────┼────────┤
│ task_plot_life_expectancy.py::task_plot_life_expectancy │ .  │
└──────────────────────────────────────────────────┴────────┘

─────────────────────────────────────────────────────────────────────────────
┌──────────────── Summary ────────────────┐
│  2  Collected tasks                      │
│  1  Succeeded                  (50.0%)   │
│  1  Skipped because unchanged  (50.0%)   │
└──────────────────────────────────────────┘
──────────────────────── Succeeded in 0.87 seconds ─────────────────────────
(epp) ➜ example
```

Delete cleaned data and run again



```
(epp) ➜ example rm bld/data.pkl
(epp) ➜ example pytask
──────────────────────────── Start pytask session ────────────────────────────
Platform: linux -- Python 3.11.0, pytask 0.4.0rc2, pluggy 1.3.0
Root: /mnt/econ/epp/example
Collected 2 tasks.

┌─────────────────────────────────────────────────────────┬──────────┐
│ Task                                                    │ Outcome  │
├─────────────────────────────────────────────────────────┼──────────┤
│ task_clean_data.py::task_clean_data                     │ .        │
│ task_plot_life_expectancy.py::task_plot_life_expectancy │ .        │
└─────────────────────────────────────────────────────────┴──────────┘

──────────────────────────────────────────────────────────────────────────────
┌──────────── Summary ─────────────┐
│  2  Collected tasks              │
│  2  Succeeded          (100.0%)  │
└──────────────────────────────────┘
──────────────────────── Succeeded in 0.95 seconds ───────────────────────────
(epp) ➜ example
```