

# **Effective Programming Practices for Economists**

## **Reproducible Research**

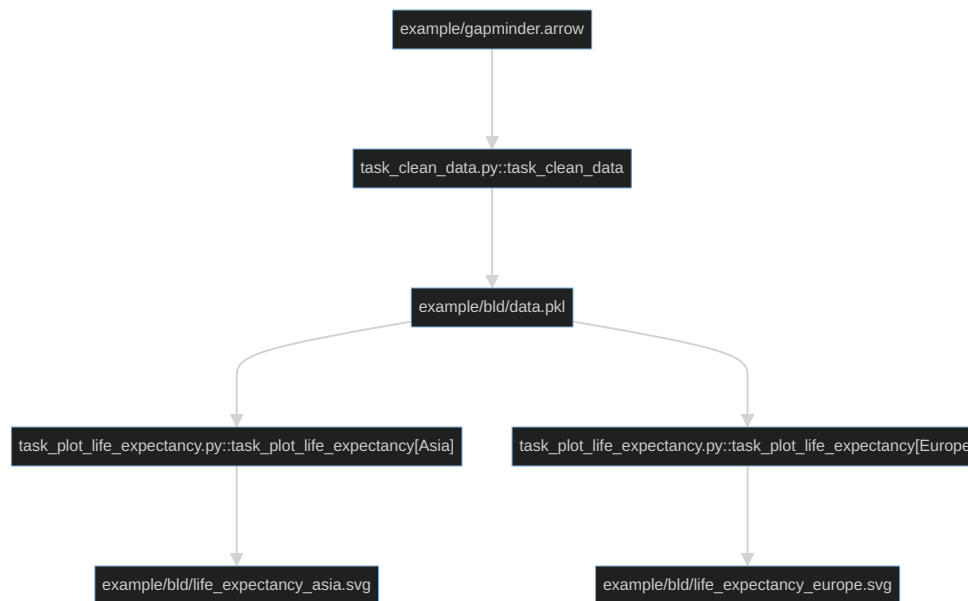
### **Re-using pytask functions**

Janoś Gabler and Hans-Martin von Gaudecker

# 1 tasks, 2 products



# 2 tasks, 1 product each



# Contents of task\_plot\_life\_expectancy.py

```
BLD = Path(__file__).parent / "bld"

products = {
    "Asia": BLD / "life_expectancy_asia.svg",
    "Europe": BLD / "life_expectancy_europe.svg"
}

def task_plot_life_expectancy(
    data_file=BLD / "data.pkl",
    produces=products,
):
    df = pd.read_pickle(data_file)
    for region, fig_file in produces.items():
        fig = _plot_life_expectancy(df[df["continent"] == region])
        fig.write_image(fig_file)
```

# Contents of task\_plot\_life\_expectancy.py

```
from pytask import task

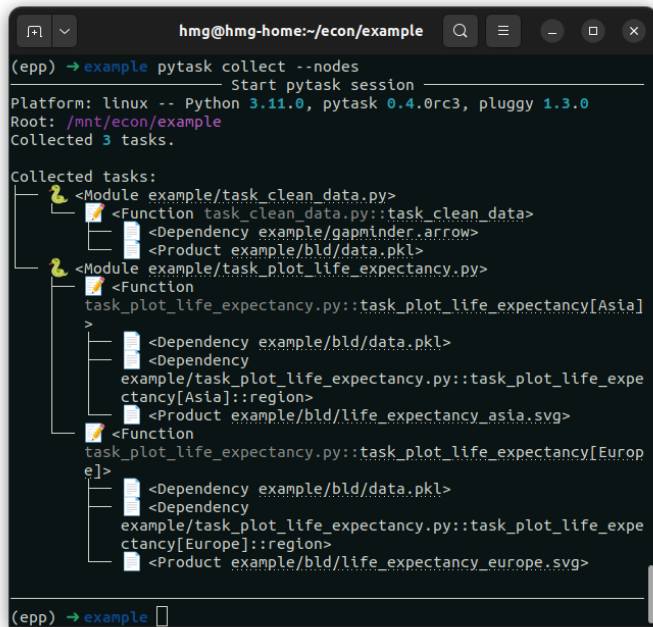
BLD = Path(__file__).parent / "bld"

for region in ("Asia", "Europe"):

    @task(id=region)
    def task_plot_life_expectancy(
        data_file=BLD / "data.pkl",
        produces=BLD / f"life_expectancy_{region.lower()}.svg",
        region=region,
    ):
        df = pd.read_pickle(data_file)
        fig = _plot_life_expectancy(df[df["continent"] == region])
        fig.write_image(produces)
```

# Verify Dependency graph (DAG, tree)

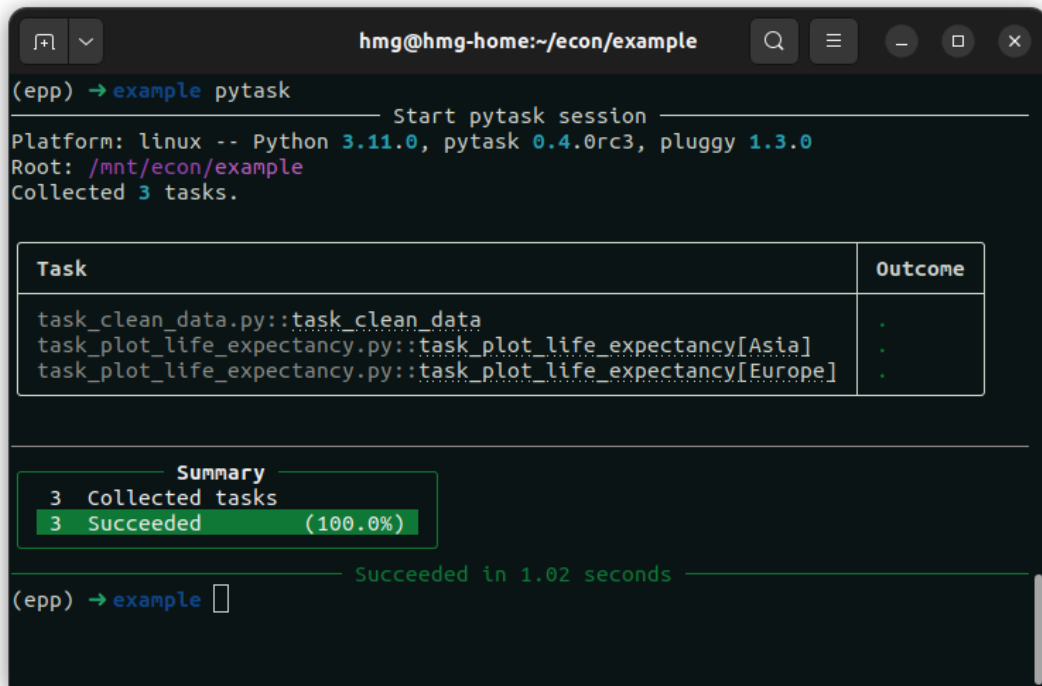
- Inspect function signatures to build a dependency graph
- Tasks for each region appear
- Additional dependency: **region** variable (ignore for now)



```
hmg@hmg-home:~/econ/example
(epp) → example pytask collect --nodes
Start pytask session
Platform: linux -- Python 3.11.0, pytask 0.4.0rc3, pluggy 1.3.0
Root: /mnt/econ/example
Collected 3 tasks.

Collected tasks:
├── <Module example/task_clean_data.py>
│   ├── <Function task_clean_data.py::task_clean_data>
│   │   ├── <Dependency example/gapminder.arrow>
│   │   └── <Product example/bld/data.pkl>
│   └── <Module example/task_plot_life_expectancy.py>
│       ├── <Function task_plot_life_expectancy.py::task_plot_life_expectancy[Asia]>
│       │   ├── <Dependency example/bld/data.pkl>
│       │   ├── <Dependency example/task_plot_life_expectancy.py::task_plot_life_expectancy[Asia]:region>
│       │   └── <Product example/bld/life_expectancy_asia.svg>
│       └── <Function task_plot_life_expectancy.py::task_plot_life_expectancy[Europe]>
│           ├── <Dependency example/bld/data.pkl>
│           ├── <Dependency example/task_plot_life_expectancy.py::task_plot_life_expectancy[Europe]:region>
│           └── <Product example/bld/life_expectancy_europe.svg>
└──
```

# Run pytask



A terminal window titled 'hmg@hmg-home:~/econ/example' showing the execution of 'pytask'. The prompt is '(epp) → example'. The output indicates a successful start of a pytask session on a Linux platform with Python 3.11.0, pytask 0.4.0rc3, and pluggy 1.3.0. It reports that 3 tasks were collected. A table lists the tasks and their outcomes, all of which succeeded. A summary box shows '3 Succeeded (100.0%)'. The total execution time was 1.02 seconds. The prompt returns to '(epp) → example'.

```
(epp) → example pytask
```

Start pytask session

Platform: linux -- Python 3.11.0, pytask 0.4.0rc3, pluggy 1.3.0  
Root: /mnt/econ/example  
Collected 3 tasks.

Task	Outcome
task_clean_data.py::task_clean_data	•
task_plot_life_expectancy.py::task_plot_life_expectancy[Asia]	•
task_plot_life_expectancy.py::task_plot_life_expectancy[Europe]	•

Summary

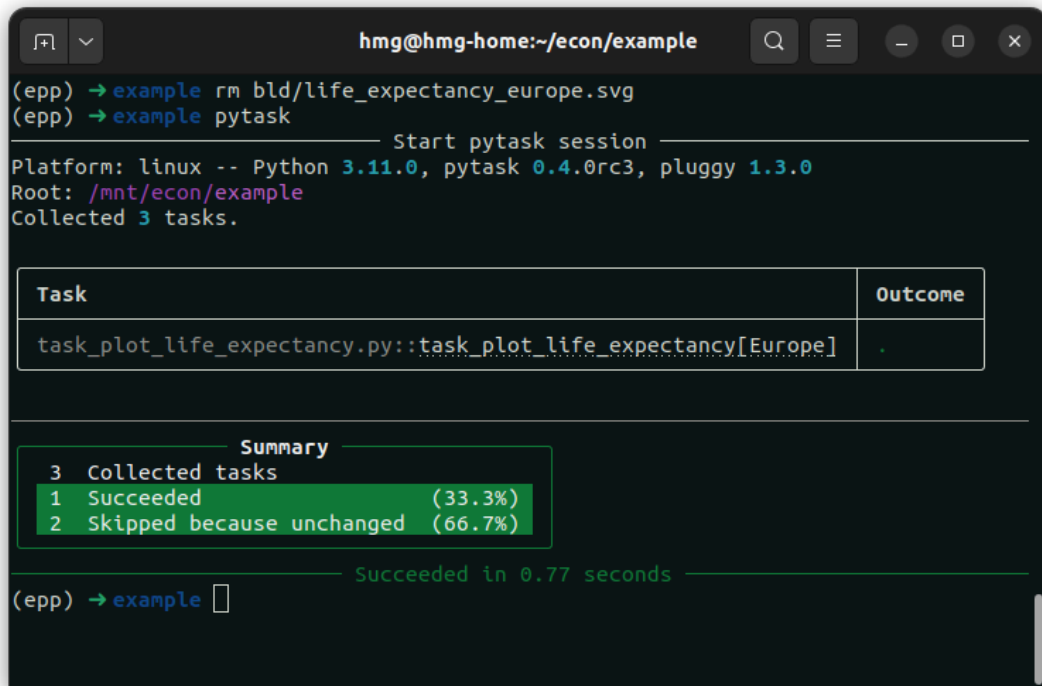
3 Collected tasks

3 Succeeded (100.0%)

Succeeded in 1.02 seconds

```
(epp) → example
```

# Delete plot and run again



```
hmg@hmg-home:~/econ/example
(epp) → example rm bld/life_expectancy_europe.svg
(epp) → example pytask

----- Start pytask session -----
Platform: linux -- Python 3.11.0, pytask 0.4.0rc3, pluggy 1.3.0
Root: /mnt/econ/example
Collected 3 tasks.



| Task                                                            | Outcome |
|-----------------------------------------------------------------|---------|
| task_plot_life_expectancy.py::task_plot_life_expectancy[Europe] | .       |



----- Summary -----
3 Collected tasks
1 Succeeded (33.3%)
2 Skipped because unchanged (66.7%)

----- Succeeded in 0.77 seconds -----
(epp) → example
```

# Looping over tasks

- Define your function as usual, but within a loop body
- Set an id based on the running variable(s) via `@task(id=running_var)`
- Set path arguments based on running variable
- Could pass other Python objects, like running variable itself



# Looping over tasks or over products?

- Whatever makes your project structure clearer!
- Same style of graphs based on the same dataset: Probably loop over products
- Model specifications: Loop over tasks
- Long running tasks: Loop over tasks
- Looping over tasks yields more granular structure