Just tired of endless loops!

or `parallel`: Stata module for parallel computing

George G. Vega Yon[1] Brian Quistorff[2]

[1]University of Southern California
vegayon@usc.edu

[2]Microsoft AI and Research
Brian.Quistorff@microsoft.com

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Thanks to Stata users worldwide for their valuable contributions. The usual disclaimers applies.

Agenda

Motivation

What is it and how does it work

Benchmarks

Syntax and Usage

Concluding Remarks

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  - Thus having a quad-core computer can lead to a 400% speedup.

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`Parallel:`

- parallel: gen v2 = v*v
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- parallel do byobs_calc.do

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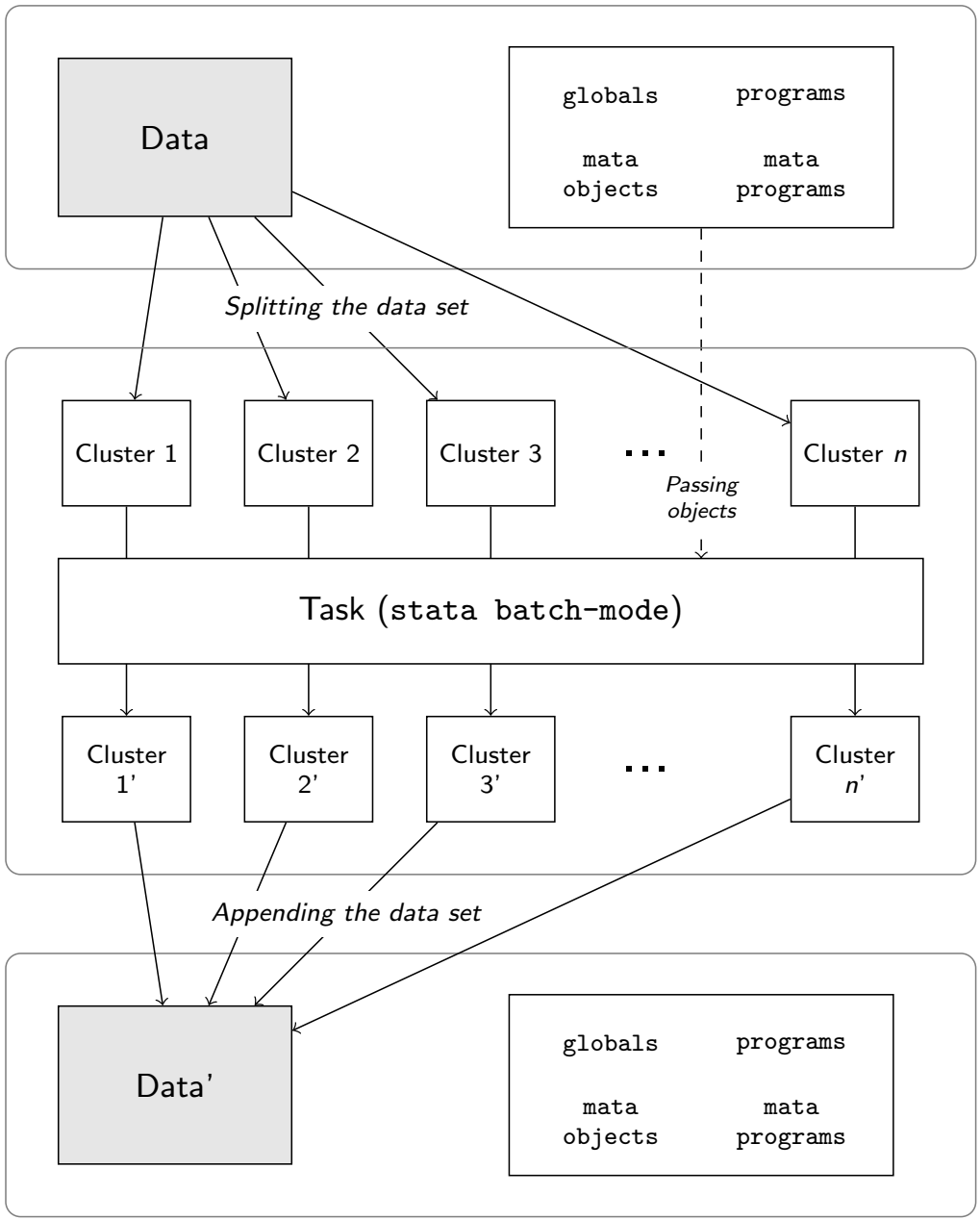
How does it work?



Starting (current) `stata` instance loaded with data plus user defined `globals`, `programs`, `mata objects` and `mata programs`

A new `stata` instance (batch-mode) for every data-clusters. Programs, globals and mata objects/programs are passed to them.

The same algorithm (task) is simultaneously applied over the data-clusters.

After every instance stops, the data-clusters are appended into one.

Ending (resulting) `stata` instance loaded with the new data.

User defined `globals`, `programs`, `mata objects` and `mata programs` remind unchanged.

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  - Table of seeds for each bootstrap resampling
  - Table of parameter values for simulations
- If the list of tasks is data-dependent then the "nodata" alternative mechanism allows for more flexibility.

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Benchmarks

Bootstrap with `parallel bs`

```
sysuse auto, clear expand 10

// Serial fashion
bs, rep($size) nodots: regress mpg weight gear foreign

// Parallel fashion parallel setclusters $number_of_clusters
parallel bs, rep($size) nodots: regress mpg weight gear foreign
```

Problem size	Serial	2 Clusters	4 Clusters
1,000	2.93s	1.62s	1.09s
	×2.69	×1.48	×1.00
2,000	5.80s	3.13s	2.03s
	×2.85	×1.54	×1.00
4,000	11.59s	6.27s	3.86s
	×3.01	×1.62	×1.00

Table: Absolute and relative computing times for each run of a basic bootstrap problem. For each given problem size, the first row shows the time in seconds, and the second row shows the relative time each method took to complete the task relative to using parallel with four clusters. Each cell represents a 1,000 runs.

Benchmarks

Simulations with `parallel sim`

```
prog def mysim, rclass
    // Data generating process
    drop _all
    set obs 1000
    gen eps = rnormal()
    gen X = rnormal()
    gen Y = X*2 + eps

    // Estimation
    reg Y X
    mat def ans = e(b)
    return scalar beta = ans[1,1]
end

// Serial fashion
simulate beta=r(beta), reps($size) nodots: mysim

// Parallel fashion
parallel setclusters $number_of_clusters
parallel sim, reps($size) expr(beta=r(beta)) nodots: mysim
```

Benchmarks

Simulations with `parallel sim (cont.)`

Problem size	Serial	2 Clusters	4 Clusters
1000	2.19s	1.18s	0.73s
	×3.01	×1.62	×1.00
2000	4.36s	2.29s	1.33s
	×3.29	×1.73	×1.00
4000	8.69s	4.53s	2.55s
	×3.40	×1.77	×1.00

Table: Absolute and relative computing times for each run of a simple Monte Carlo exercise. For each given problem size, the first row shows the time in seconds, and the second row shows the relative time each method took to complete the task relative to using parallel with four clusters. Each cell represents a 1,000 runs.

Code for replicating this is available at
`https://github.com/gvegayon/parallel`

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parallel [, by(*varlist*) programs(*namelist*) mata seeds(*string*) randtype(*random.org*|*datetime*)
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parallel bs [, expression(*exp_list*) programs(*namelist*) mata seeds(*string*)
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Additional Utilities

parallel version/clean/printlog/viewlog/numprocessors

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- Whatever StataMP does better.
- (Currently) Tasks that already take up all of RAM.

Use in other Stata modules

- EVENTSTUDY2: Perform event studies with complex test statistics
- MIPARALLEL: Perform parallel estimation for multiple imputed datasets
- Synth_Runner: Performs multiple Synthetic Control estimations for permutation testing

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