

Symposium on Algorithmic Governance • Ottawa • 2019-04-23&24



HUMAN-CENTRED AUTOMATION

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LICENSES
Text & diagrams : CC-by v4.0
Software : Apache 2.0 & AGPL 3.0

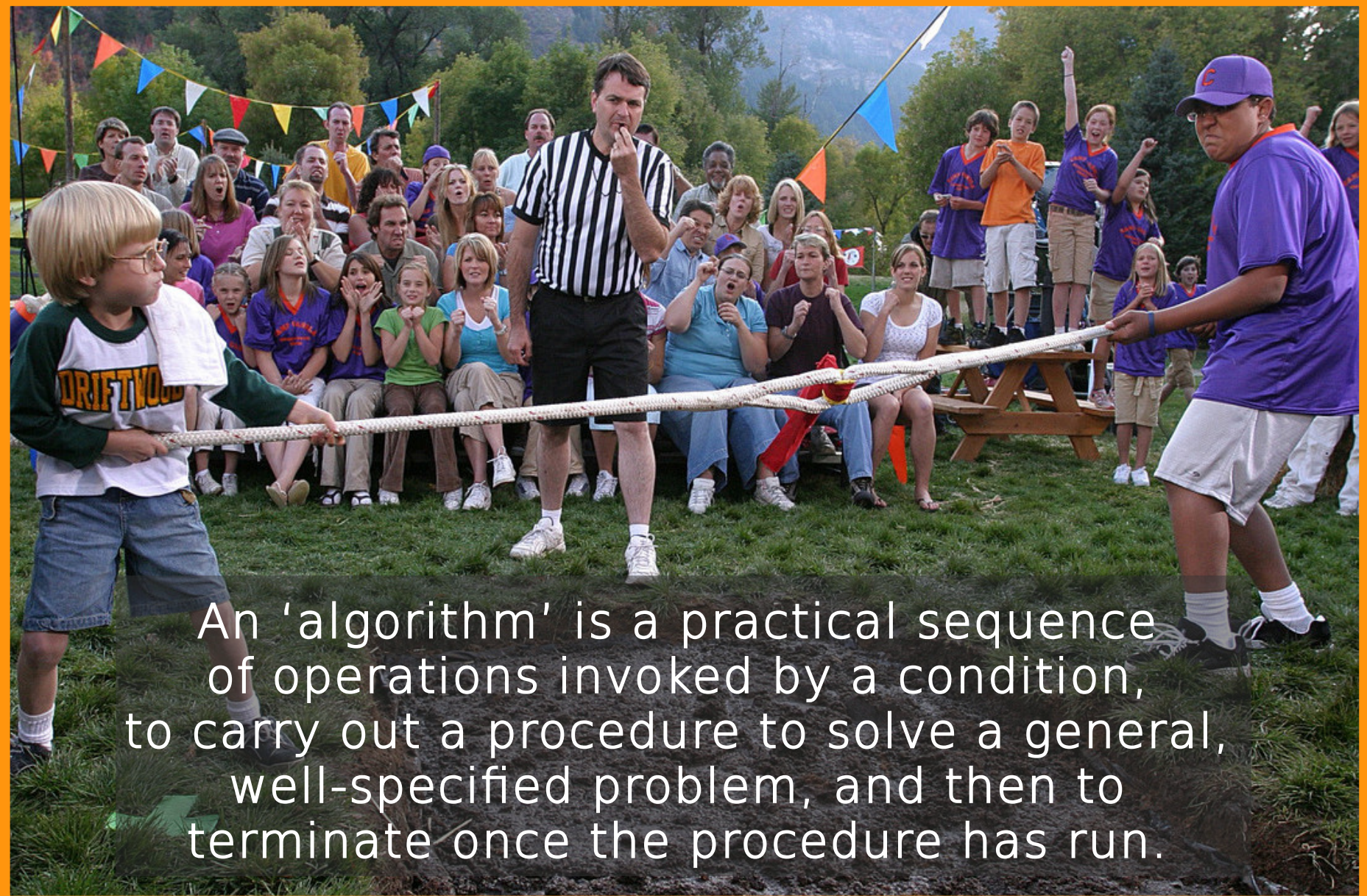
Human-Computer Interaction



Human-Rope Interaction



Human-Algorithm Interaction



An 'algorithm' is a practical sequence of operations invoked by a condition, to carry out a procedure to solve a general, well-specified problem, and then to terminate once the procedure has run.

Human-Computer Interaction



Human-Human Interaction Through Algorithms

A 'rule' is a normative precept by which repeated behaviour is guided through authority, agreement or preference.

A positive 'algorithm' implements a normative 'rule'.



An 'algorithm' is a practical sequence of operations invoked by a condition, to carry out a procedure to solve a general, well-specified problem, and then to terminate once the procedure has run.

Human-Human Interaction Through Algorithms

Operations Managers

Algorithm Managers



It's all fun and games.

Human-Human Interaction Through Algorithms

Payroll Officers
& Employees

Pay Modernization
Project Team



Until somebody gets hurt.

Human-Human Interaction Through Algorithms

On-Board Flight Crew

Auto-Pilot Design Crew



Or worse.

Demo: Base HST Rates in a Simple Algorithm

Xalgorithms - Rule writing demo.



```
Y88b d88P      888      d8b 888 888
Y88b d88P      888      Y8P 888 888
Y88o88P      888      888 888
Y888P      8888b. 888 .d88b. .d88b. 888d888 888 888888 88888b. 88888b.d88b. .d8888b
d888b      "88b 888 d88P"88b d88""88b 888P" 888 888 888 "88b 888 "888 "88b 88K
d88888b .d888888 888 888 888 888 888 888 888 888 888 888 888 888 "Y8888b.
d88P Y88b 888 888 888 Y88b 888 Y88..88P 888 888 Y88b. 888 888 888 888 888 X88
d88P Y88b "Y888888 888 "Y88888 "Y88P" 888 888 "Y888 888 888 888 888 888 88888P'
      888
      Y8b d88P
      "Y88P"

Simple Rule Demo - 2018-11-27
```

Play (k)

0:05 / 6:48

Scroll for details

19.78



<https://www.youtube.com/watch?v=pcoWgOYvbbk&t=2s>


Or... <https://tinyurl.com/yym4pgwd>

Demo: Base HST Rates in a Simple Algorithm


```
EXECUTE: TAX
# no expectations exist, dumping tables
table:provincial_vat
 0 | region:      CA-NL | GST:      5 | PST:      10 |
 1 | region:      CA-PE | GST:      5 | PST:      10 |
 2 | region:      CA-NS | GST:      5 | PST:      10 |
 3 | region:      CA-NB | GST:      5 | PST:      10 |
 4 | region:      CA-QC | GST:      5 | PST:      10 |
 5 | region:      CA-ON | GST:      5 | PST:       8 |
 6 | region:      CA-MB | GST:      5 | PST:       8 |
 7 | region:      CA-SK | GST:      5 | PST:       5 |
 8 | region:      CA-AB | GST:      5 | PST:       0 |
 9 | region:      CA-BC | GST:      5 | PST:       7 |
10 | region:      CA-YT | GST:      5 | PST:       0 |
11 | region:      CA-NT | GST:      5 | PST:       0 |
```

```
timing
> load: 45ms (45878921ns)
> populate_context: 5ms (5925713ns)
> execute: 10ms (10862385ns)
> execute > step0: 9ms (9166118ns)
> load_expected: 0ms (241340ns)

[success] Total time: 2 s, completed 1-
[rflec0280001-lib-rules-int-scala]$
```






Thanks to Ryan Fleck
A Free/Libre Programmer



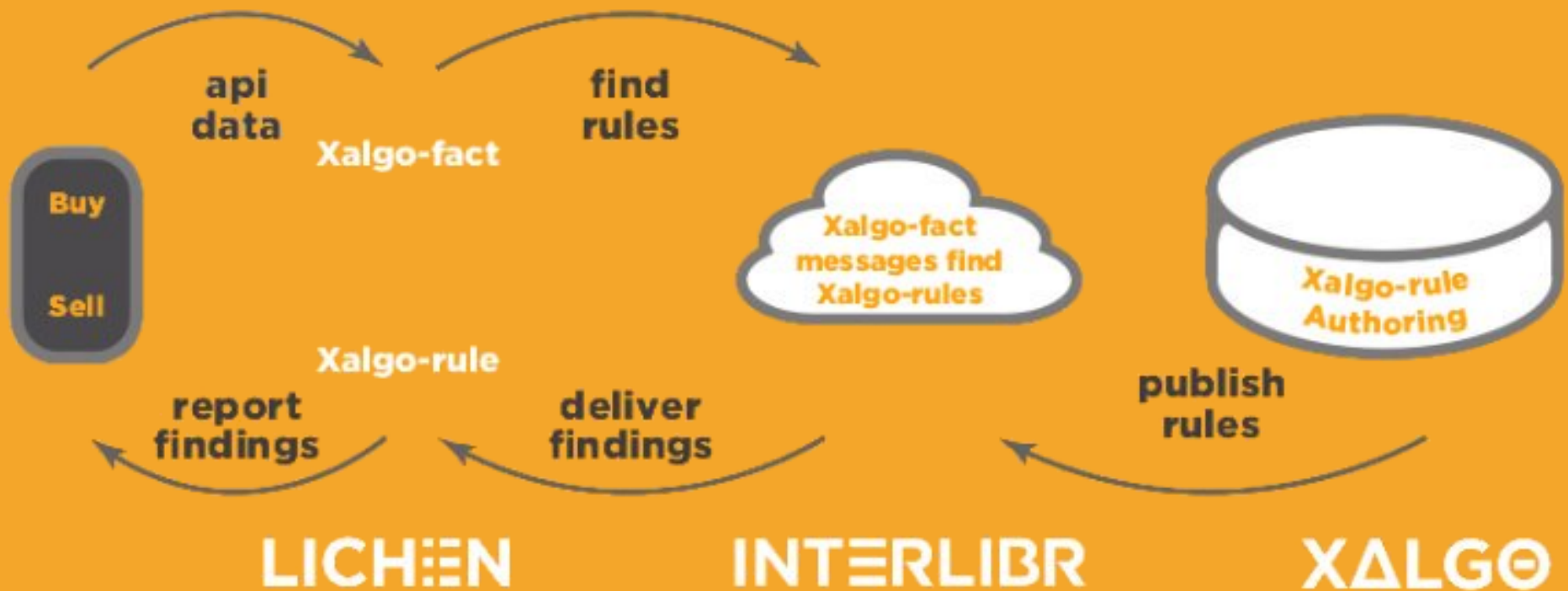
Ryan Fleck • 2nd
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AN INTERNET OF RULES

An “Internet of Rules”



Freedom + Accessibility

FREE SOFTWARE DEFINITION

Freedom 0: Freedom to run the program for any purpose.

Freedom 1: Freedom to study how the program works, and adapt it to one's needs.

Freedom 2: Freedom to copy and redistribute the program

Freedom 3: Freedom to improve the program, and release any modified versions.

PRINCIPLES FOR ACCESSIBLE ALGORITHMS

Principle 1: Algorithms are declarative.

Principle 2: Algorithms embody patterns.

Principle 3: Algorithms are published.

Principle 4: Algorithms are simple.

Declarative. Published. **Patterned.** Simple.

Simplification/Scalability Through “Rule Patterns”

Canada: CS Group 303 Annual Rates of Pay

```
· WHEN envelope:type == 'payment_authorization';  
· WHEN envelope:parties.supplier.industry.list_id == 'ISIC';  
· WHEN envelope:parties.supplier.industry.value == 'S9420';  
· WHEN item:classification.list_name == 'UNSPSC';  
· WHEN item:classification.value == '81111***';  
· WHEN item:quantity.value > 0;  
· REQUIRE ca..payroll:cs-group303_base-pay_by_contract:0.1.0  
· REQUIRE ca..payroll:cs-group303_base-pay_by_years-service:0.1.0  
· ASSEMBLE employees_base-pay  
· COLUMNS FROM table:cs-group303_base-pay_by_contract  
· ...
```

Quebec: Border Retail Gas Tax Reduction

```
· WHEN envelope:type == 'invoice';  
· WHEN envelope:parties.supplier.industry.list_id == 'ISIC';  
· WHEN envelope:parties.supplier.industry.value == 'G4711';  
· WHEN item:classification.list_name == 'UNSPSC';  
· WHEN item:classification.value == '506505';  
· WHEN item:quantity.value > 0;  
· REQUIRE ca.qc.tax:supplier_distances:0.1.0  
· REQUIRE ca.qc.tax:reductions_by_distance:0.1.0  
· ASSEMBLE sellers_reductions  
· COLUMNS FROM table:reductions_by_distance  
· ...
```


Freedom + Accessibility

Freedom 3: Freedom to improve the program, and release modified versions.

Most Famous Case:

April 16, 2013: Thomas Herndon (UMass grad student) showed that top economists Reinhart & Rogoff's 2010 "Growth in a Time of Debt" omitted 5 of 19 countries, and used wrong data for another. They neglected to drag their Excel formula down five more cells.

Who Rules? The Algorithm Manager or the Operations Manager?	
Source: Potvin, J. 2019 (Forthcoming). An Internet of Rules. Doctoral dissertation. Département des sciences administratives (gestion de projects / project management), Université du Québec (campus outaouais). <jpotvin@xalgorithms.org> 819-593-5983	
Operations Manager Agency is Prioritized	Algorithm Manager Agency is Prioritized
Empowering Statement	Empowering Statement
To the extent the algorithm is not fulfilling a given requirement, the operations manager: <ul style="list-style-type: none"> ◦ <i>can</i> ◦ <i>should</i> ◦ <i>must</i> ...over-ride the algorithm and take control.	To the extent the operations manager is not fulfilling a given requirement, the algorithm manager: <ul style="list-style-type: none"> ◦ <i>can</i> ◦ <i>should</i> ◦ <i>must</i> ...over-ride the operations manager and take control.
Constraining Statement	Constraining Statement
To the extent the algorithm is fulfilling a given requirement, the operations manager: <ul style="list-style-type: none"> ◦ <i>cannot</i> ◦ <i>should not</i> ◦ <i>must not</i> ...over-ride the algorithm to take control.	To the extent the operations manager is fulfilling a given requirement, the algorithm manager: <ul style="list-style-type: none"> ◦ <i>cannot</i> ◦ <i>should not</i> ◦ <i>must not</i> ...over-ride the operations manager to take control.
Delegating Statement	Delegating Statement
The algorithm manager <i>may</i> voluntarily delegate control to the operations manager: <ul style="list-style-type: none"> ◦ <i>pro-actively</i> ◦ <i>upon request</i> 	The operations manager <i>may</i> voluntarily delegate control to the algorithm manager: <ul style="list-style-type: none"> ◦ <i>pro-actively</i> ◦ <i>upon request</i>
Criteria for Intervention or Delegation	
Potential criteria that could be applied to justify a reversal of agency in any of the above contexts: <ul style="list-style-type: none"> ◦ <i>better attainment criterion</i> ◦ <i>effectiveness criterion</i> ◦ <i>efficiency criterion</i> ◦ <i>informational or sequential criterion (in order to proceed)</i> ◦ <i>pre-emption of conflict with higher priority rules criterion (necessity; cross-boundary; mandated)</i> 	

This table re-frames, adapts and extends work by constitutional lawyer Dr. Ken Endo, 1994. *The Principle of Subsidiarity: From Johannes Althusius to Jacques Delors*. 北大法学論集, 44(6), 652–553. (See pp. 637, 641, 642) [https://eprints.lib.hokudai.ac.jp/dspace/bitstream/2115/15558/1/44\(6\)_p652-553.pdf](https://eprints.lib.hokudai.ac.jp/dspace/bitstream/2115/15558/1/44(6)_p652-553.pdf)

Who Rules?

The Algorithm Manager or the Operations Manager?

**Prioritize
Operations Manager Agency**

EMPOWERING STATEMENT

To the extent the algorithm is not fulfilling a given requirement, the operations manager:

**can
should
must**

...over-ride the algorithm manager and take control.

**Prioritize
Algorithm Manager Agency**

EMPOWERING STATEMENT

To the extent the operations manager is not fulfilling a given requirement, the algorithm manager:

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...over-ride the operations manager and take control.

Who Rules?

The Algorithm Manager or the Operations Manager?

**Prioritize
Operations Manager Agency**

CONSTRAINING STATEMENT

To the extent the operations manager is fulfilling a given requirement, the algorithm manager:

**cannot
should not
must not**

...over-ride the operations manager and take control.

**Prioritize
Algorithm Manager Agency**

CONSTRAINING STATEMENT

To the extent the algorithm manager is fulfilling a given requirement, the operations manager:

**cannot
should not
must not**

...over-ride the algorithm manager and take control.

Who Rules?

The Algorithm Manager or the Operations Manager?

**Prioritize
Operations Manager Agency**

DELEGATING STATEMENT

The operations manager may voluntarily delegate control to the algorithm manager:

**pro-actively
upon request.**

**Prioritize
Algorithm Manager Agency**

DELEGATING STATEMENT

The algorithm manager may voluntarily delegate control to the operations manager:

**pro-actively
upon request.**

Who Rules?

The Algorithm Manager or the Operations Manager?

CRITERIA FOR INTERVENTION OR DELEGATION

Potential criteria that could be applied to justify a reversal of agency in any of the above contexts:

better attainment criterion

effectiveness criterion

efficiency criterion

informational or sequential criterion
(in order to proceed)

pre-emption of conflict with higher priority rules criterion
(necessity; cross-boundary; mandated)

Algorithmic Governance



Human-Human Interaction

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THANK YOU

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