Progress in modelling through distributed collaboration

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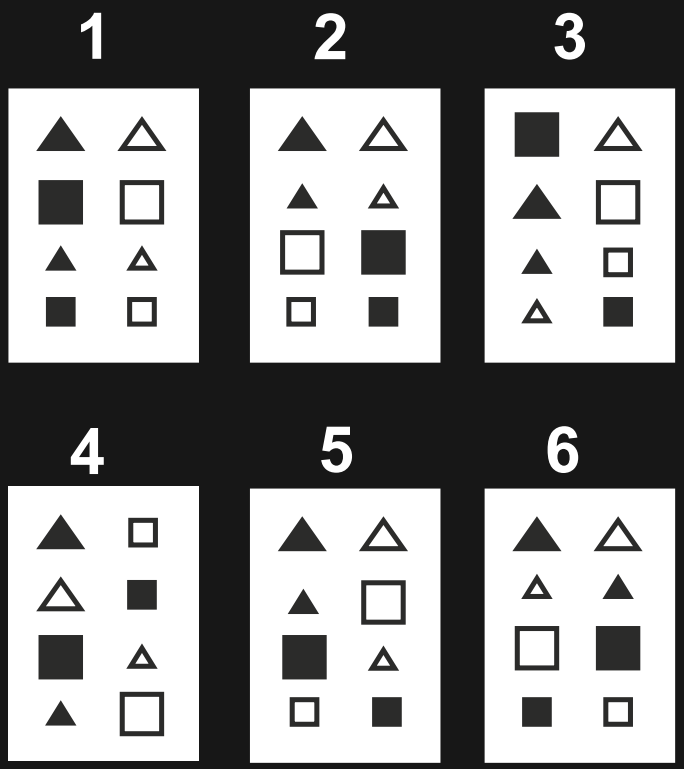
Formal modelling in psychology is failing to live up to its potential due to a lack of effective collaboration.

catlearn: Free and open-source tools for distributed collaboration.

A formal model unambiguously specifies transformations from independent variables to dependent variables.

Wills & Pothos (2012)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2
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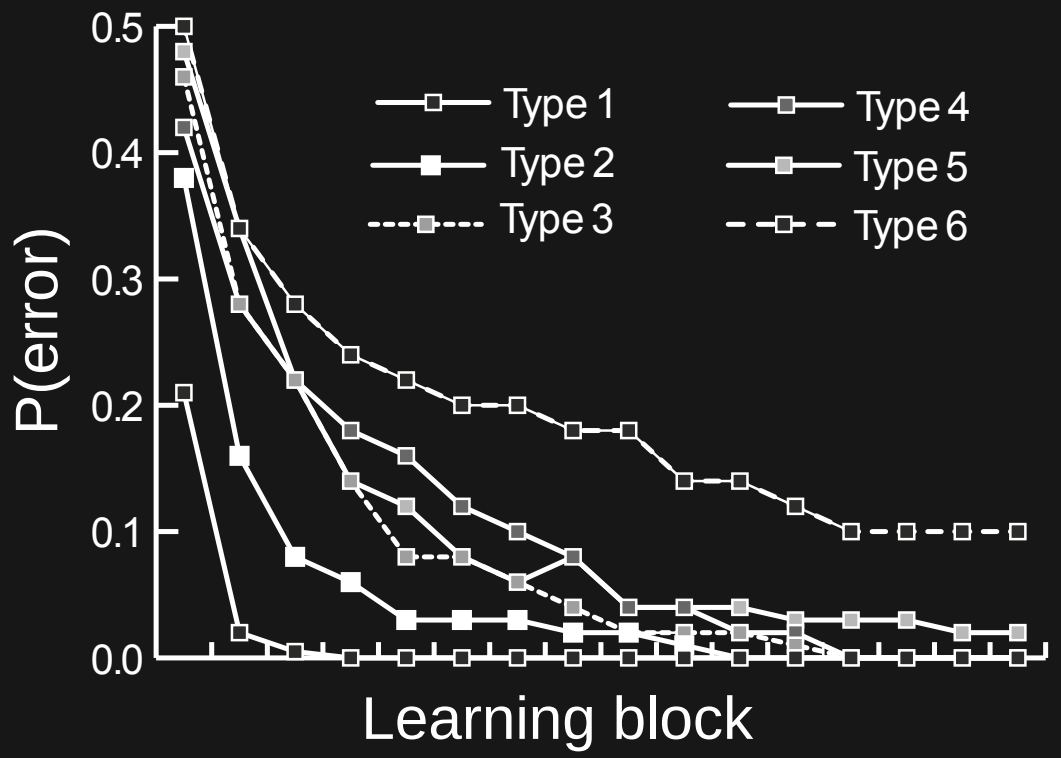
0.5
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P(error)
Type 1
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Learning block

Formal models are specified mathematically.

- Rescorla-Wagner (1972)
- ALCOVE (Kruschke, 1992)
- DRC (Coltheart et al., 2001)

Formal models allow unambiguous comparison of the relative adequacy of theories.

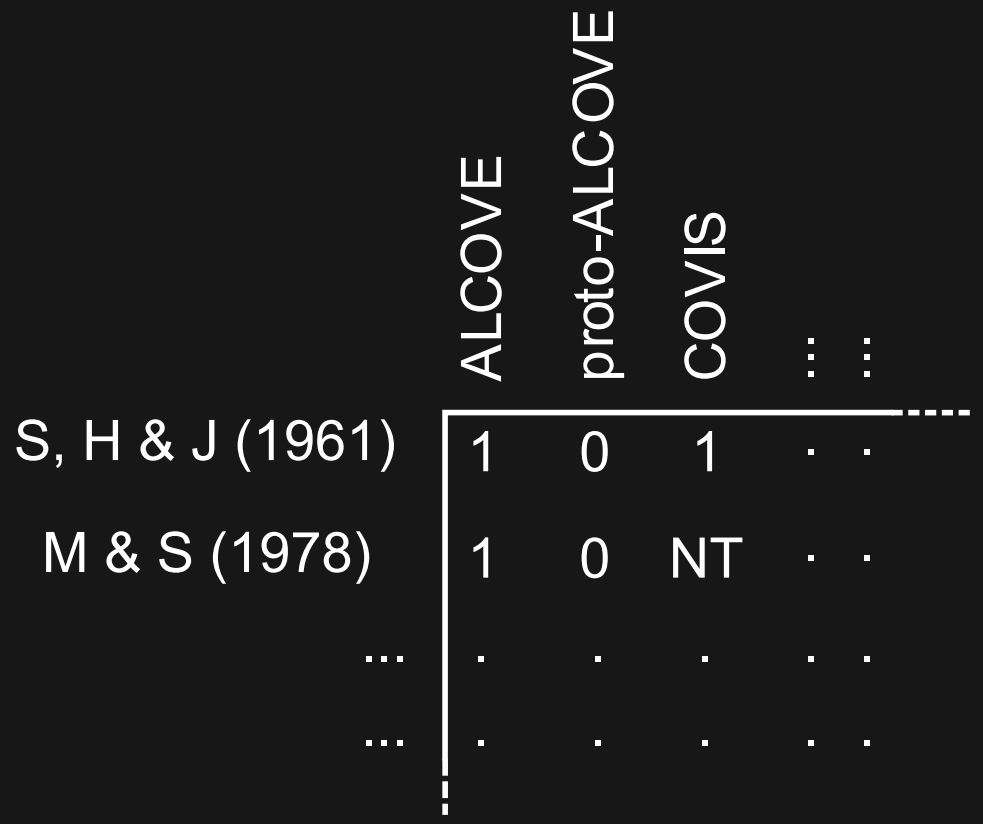
Little progress so far … because the comparisons have been too narrow.

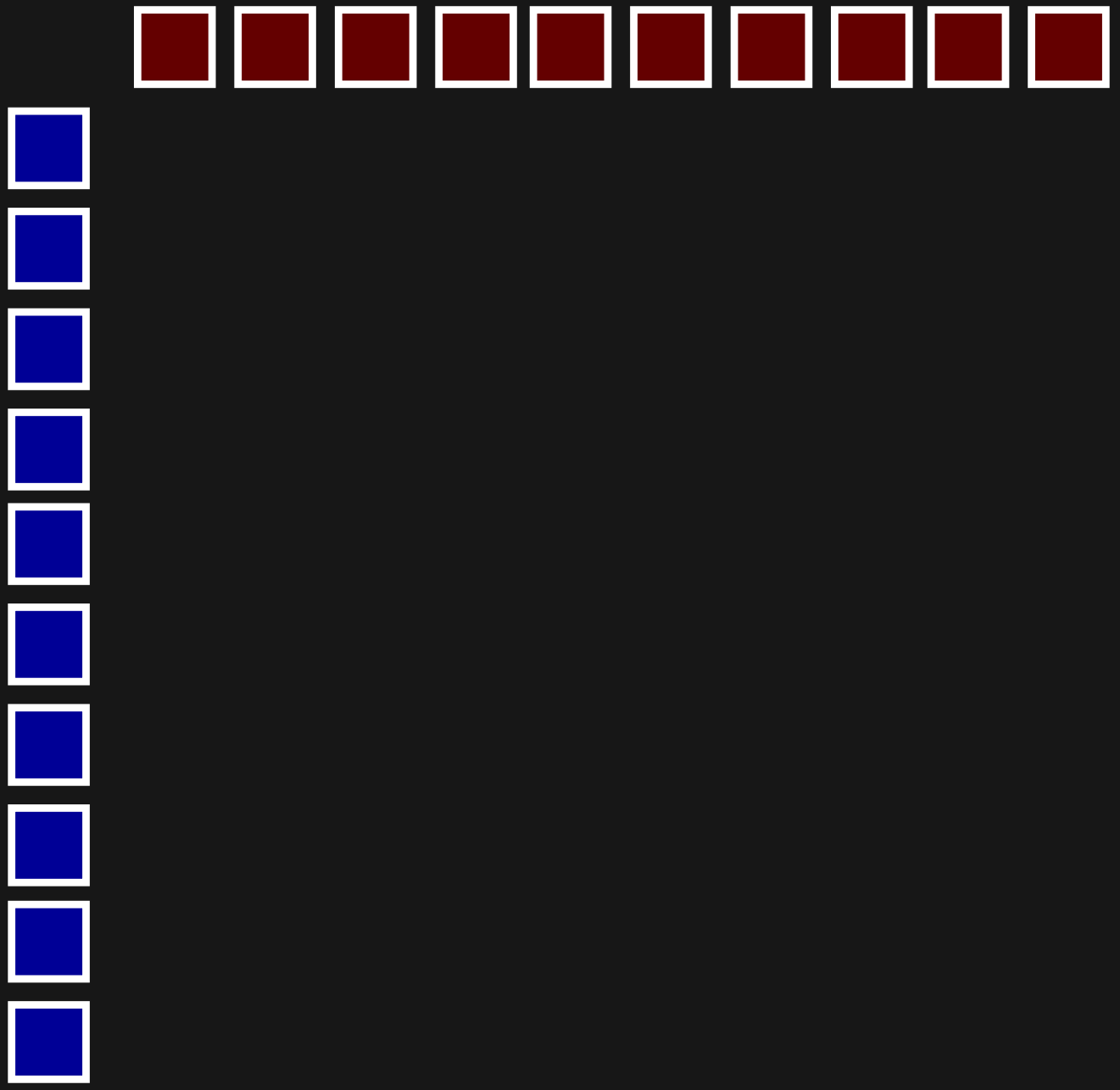
Wills & Pothos (2012)

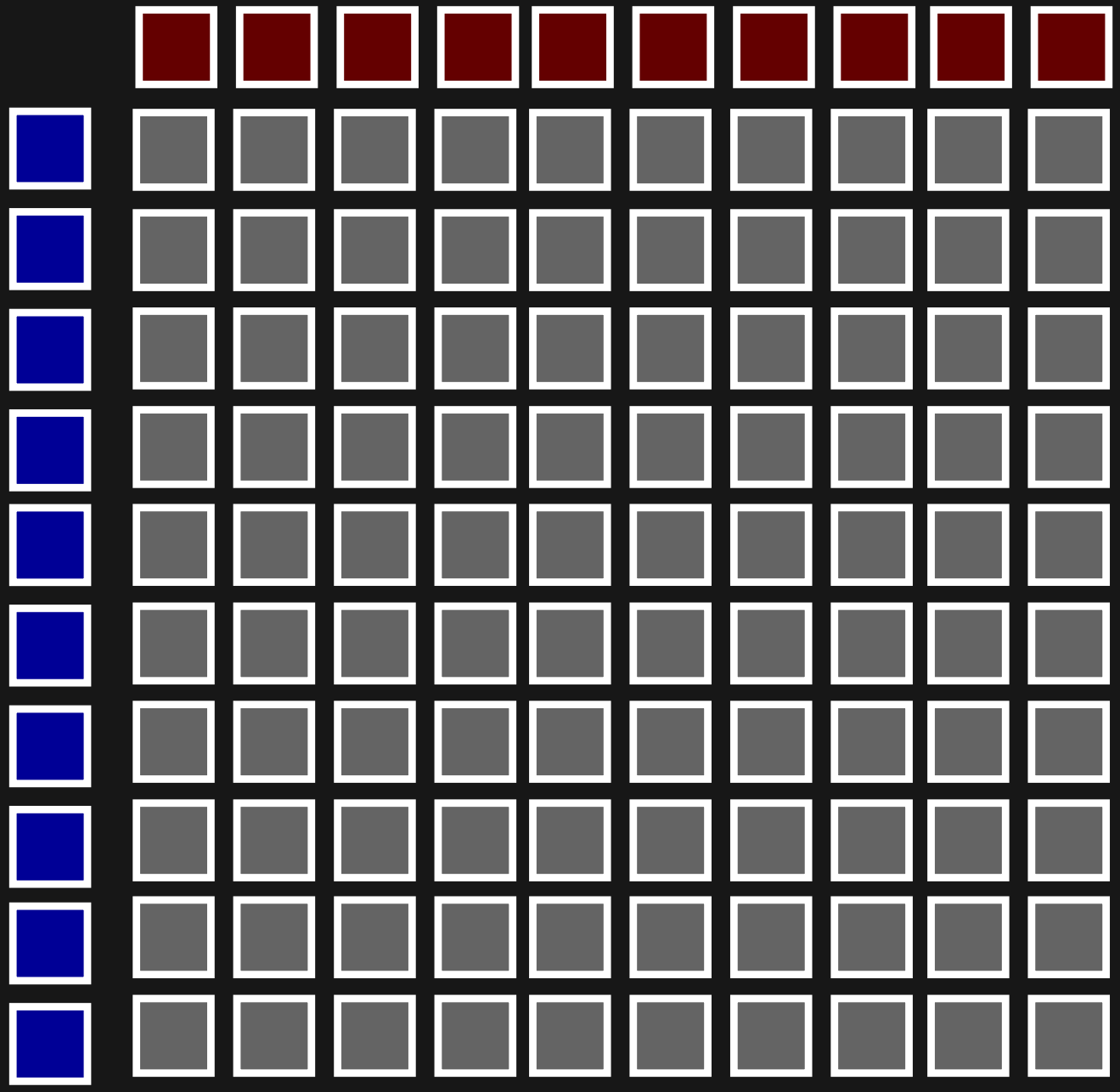
Compare models across a much broader set of phenomena (Wills & Pothos, 2012).

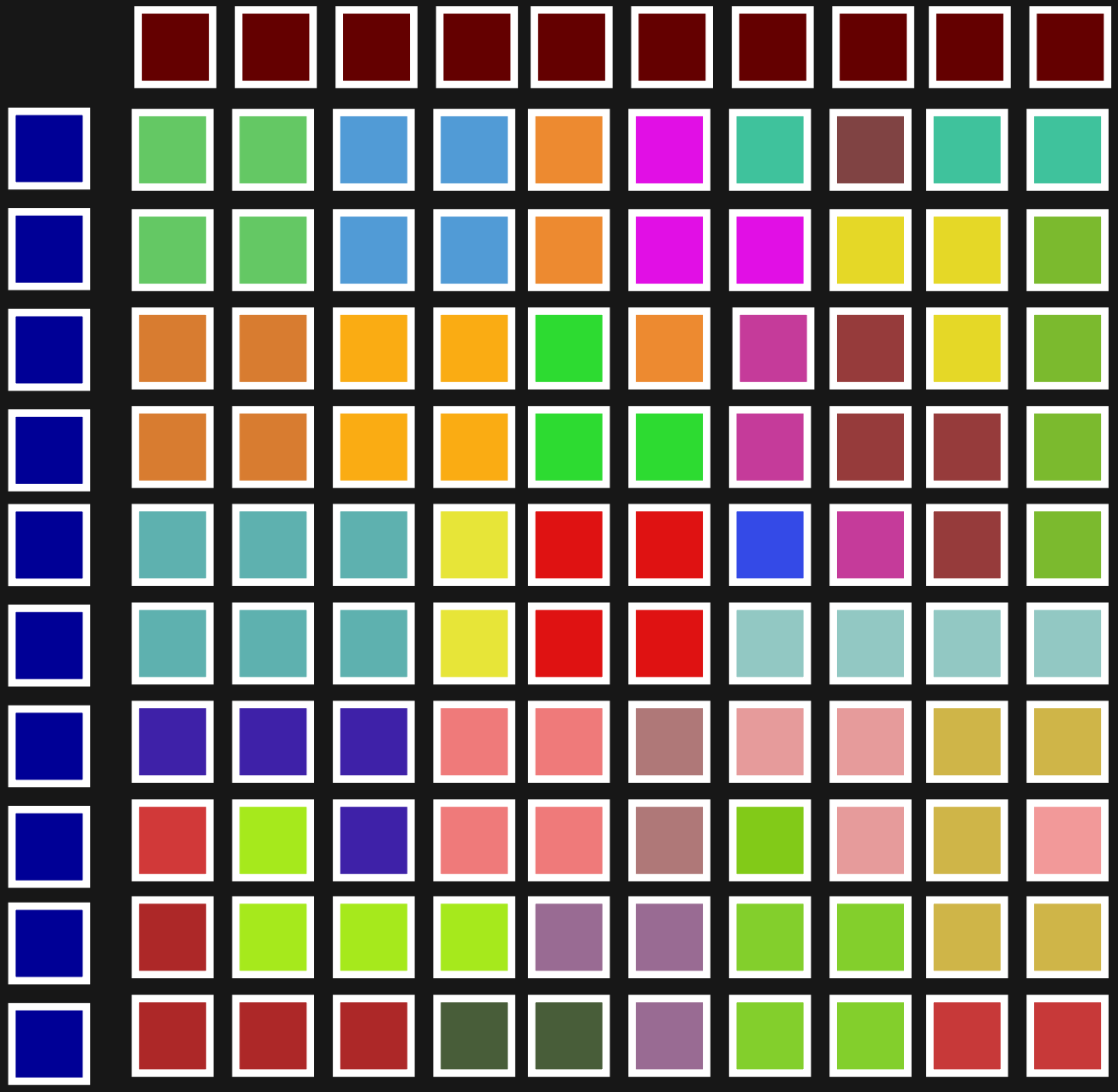
Unachievable by any individual or small group.

Framework for efficient distributed collaboration has been lacking.


ALCOVE
proto-ALCOVE
COVIS
S, H & J (1961)
1 0 1
M & S (1978)
1 0 NT







- Web of science:
  - Medin & Schaffer (1978)
  - Kruschke (1992)
  - 300+ results

Canonical **I**ndependently **R**eplicated **P**henomenon

Modelling non-real results:

- wastes time.
- distorts relative adequacy assessments.

Restrict relative adequacy comparisons to independently replicated phenomena.

Attempts to replicate are rare, and often unsuccessful.

What counts as a replication?

- As close to direct as the literature will allow.
- Ordinal success.
- Boundary conditions.

CIRP separate empirical phenomena from interpretations.

Model implementations are often not publicly available.

This leads to a substantial waste of effort … but **catlearn** is beginning to change this.

ALCOVE, COVIS, DIVA, Rescorla-Wagner

catlearn

http://catlearn.r-forge.r-project.org/

Framework for distributed collaboration in the formal modelling of psychological processes.

Why R?

- non-linear optimization
- familiar environment
- easy to learn
- integrated documentation

Slow?

- often instantaneous
- Model implementations can be compiled for speed (e.g. C++, FORTRAN)

catlearn

http://catlearn.r-forge.r-project.org/

catlearn is a documented open archive of

- Model implementations (as stateful list processors)
- CIRP
- Simulations

Efficient progress in the formal modelling of psychological processes requires a technical framework for distributed collaboration.

catlearn provides a free open-source framework.

Collaboration and cultural change.

Acknowledgements

Charlotte Edmunds, Garrett Honke, Angus Inkster, Garret O’Connell, Stuart Spicer.

Further reading

Wills, A.J., O'Connell, G., Edmunds, C.E.R., & Inkster, A.B. (2017). Progress in modeling through distributed collaboration: Concepts, tools, and category-learning examples. *Psychology of Learning and Motivation.*

Coming in Oct 2017: **catlearn** v. 0.5. ATRIUM, Bush-Mosteller, MB/MF, and much more!

Installation instructions: http://catlearn.r-forge.r-project.org/