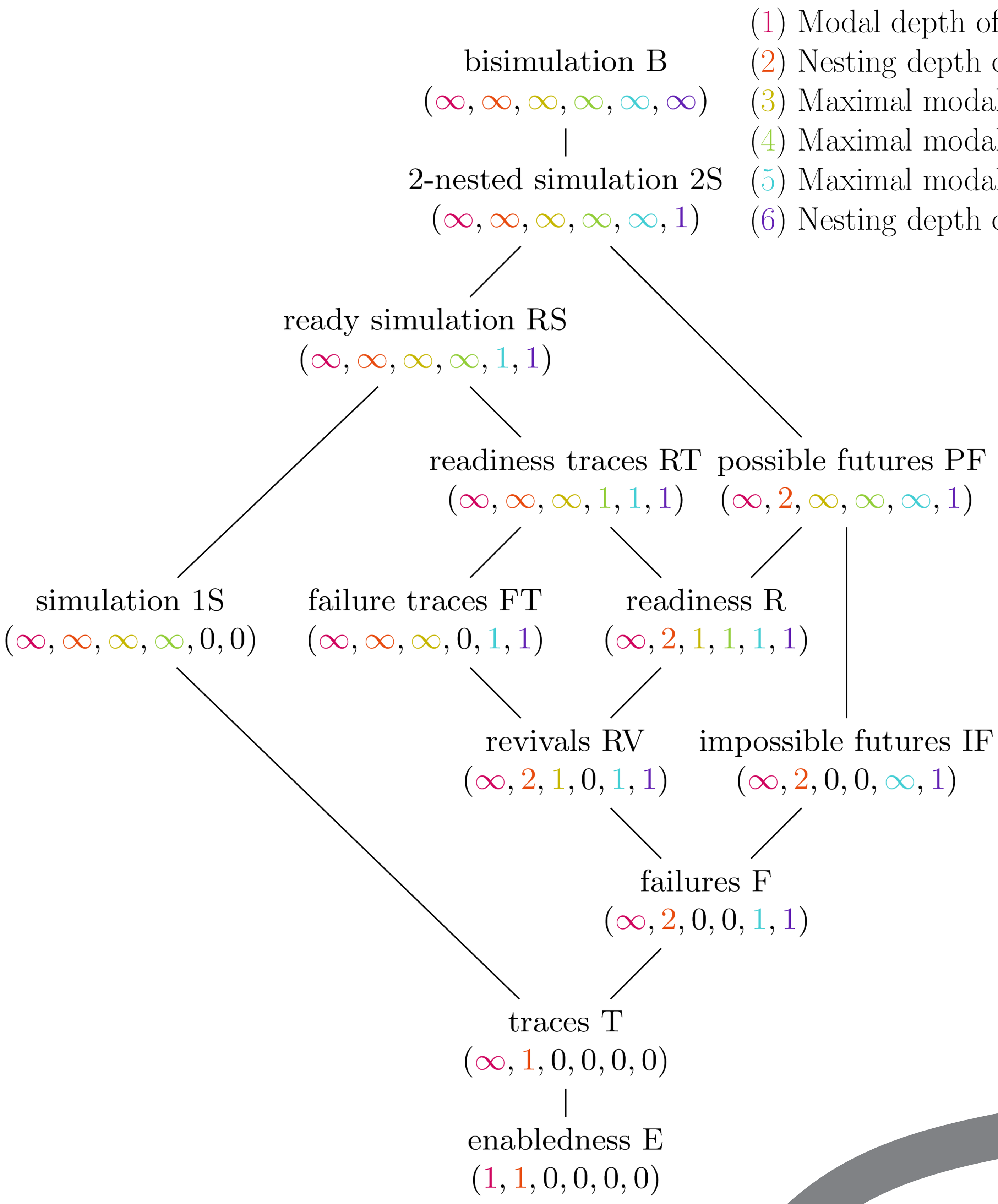
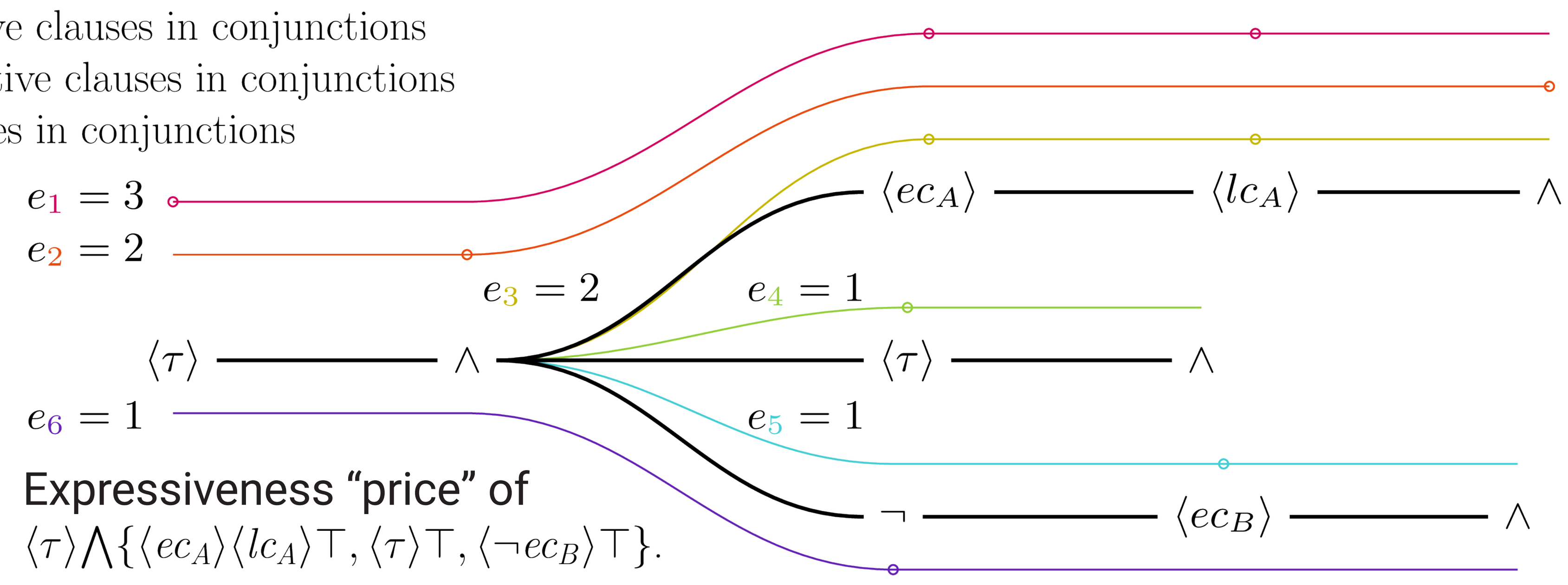
GAMES TO DECIDE ALL BEHAVIORAL EQUIVALENCES AT ONCE



(1) Modal depth of observations
(2) Nesting depth of conjunctions
(3) Maximal modal depth of deepest positive clauses in conjunctions
(4) Maximal modal depth of the other positive clauses in conjunctions
(5) Maximal modal depth of negative clauses in conjunctions
(6) Nesting depth of negations



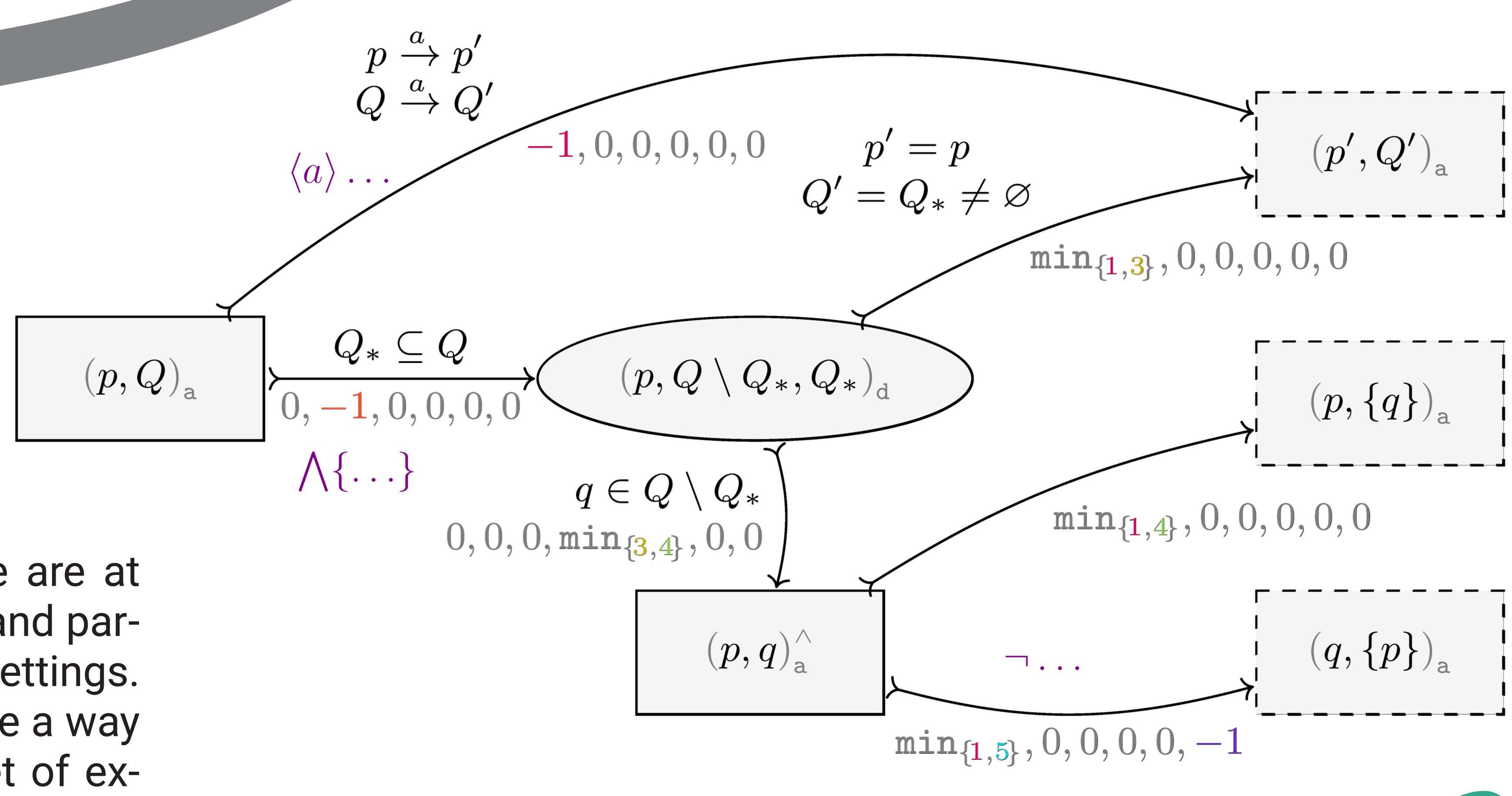
Expressiveness “price” of $\langle\tau\rangle \bigwedge \{\langle ec_A\rangle\langle lc_A\rangle\top, \langle\tau\rangle\top, \langle\neg ec_B\rangle\top\}$.

Our work adapts **van Glabbeek's linear-time–branching-time spectrum** of equivalences for algorithmic treatment: We count how much **expressiveness** observations (i.e. Hennessy–Milner logic formulas) use. Processes are equivalent w.r.t. one notion if they cannot be told apart by observations below the **notion's expressiveness bound**.

QUANTIFYING (IN-)EQUIVALENCE

EQUIVALENCES MATTER

Notions of behavioral equivalence are at the **heart of program semantics**—and particularly tricky in concurrent settings. There are lots of them... We provide a way to determine those most fitting for a set of example systems. This **makes it much easier to pick the right equivalence notions** for specific modelling and verification tasks.

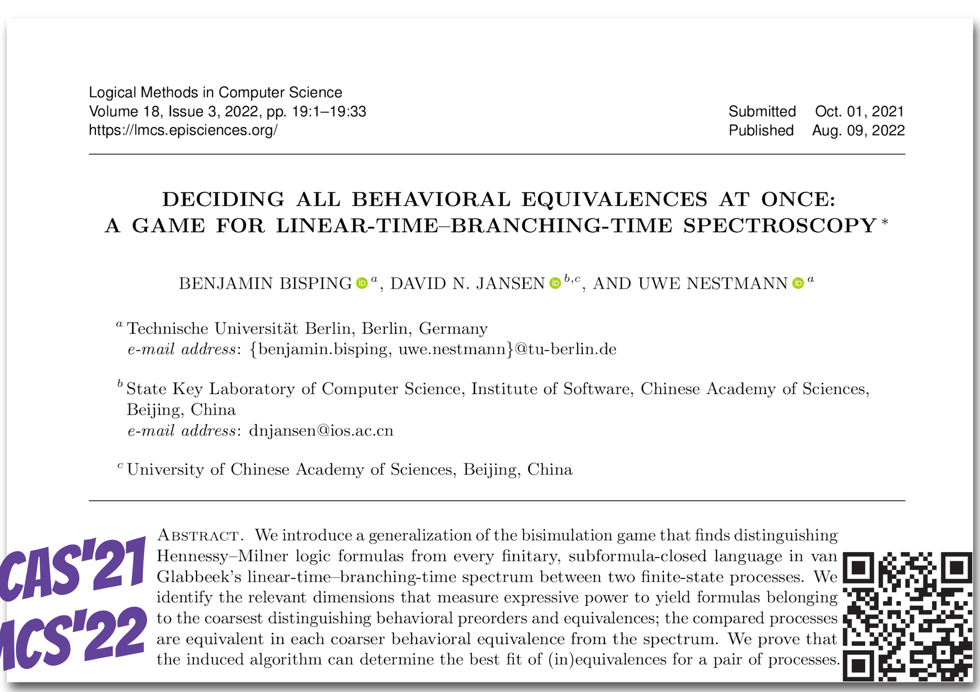


SPECTROSCOPY ENERGY GAME

We **generalize the Bisimulation game**: Attacker moves correspond to a wide set of formulas that are true for the left process. Defender moves may outmaneuver the attacker if the observation also is possible for one process of a **set of processes** on the right. The subset construction allows to also cover trace equivalences. The attacker must **pay with energies** if they want to use bigger parts of HML (an thus finer equivalences) for the distinction.

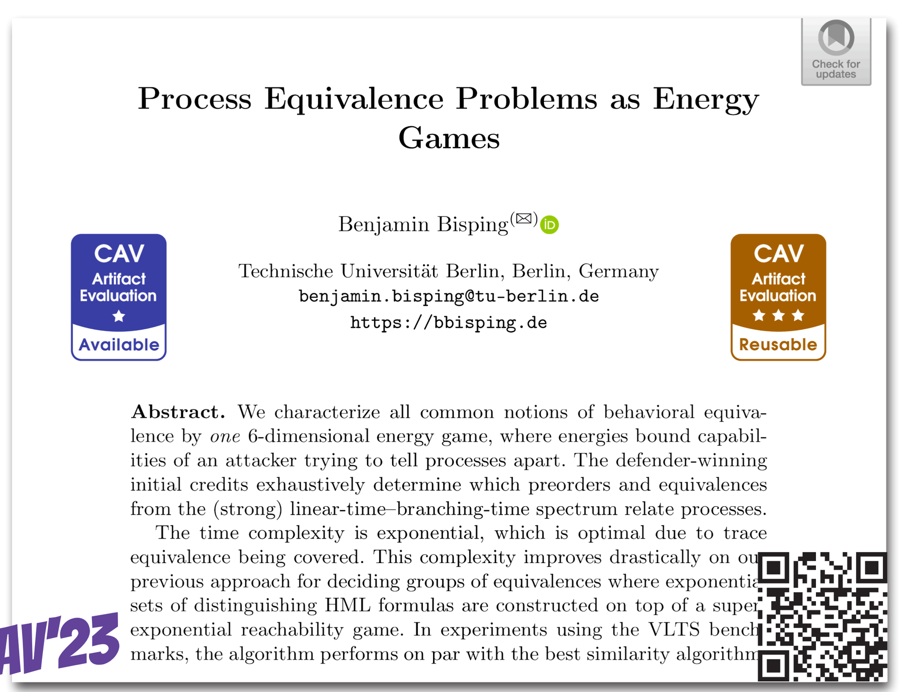
TOOL SUPPORT

TACAS'21 LMCS'22

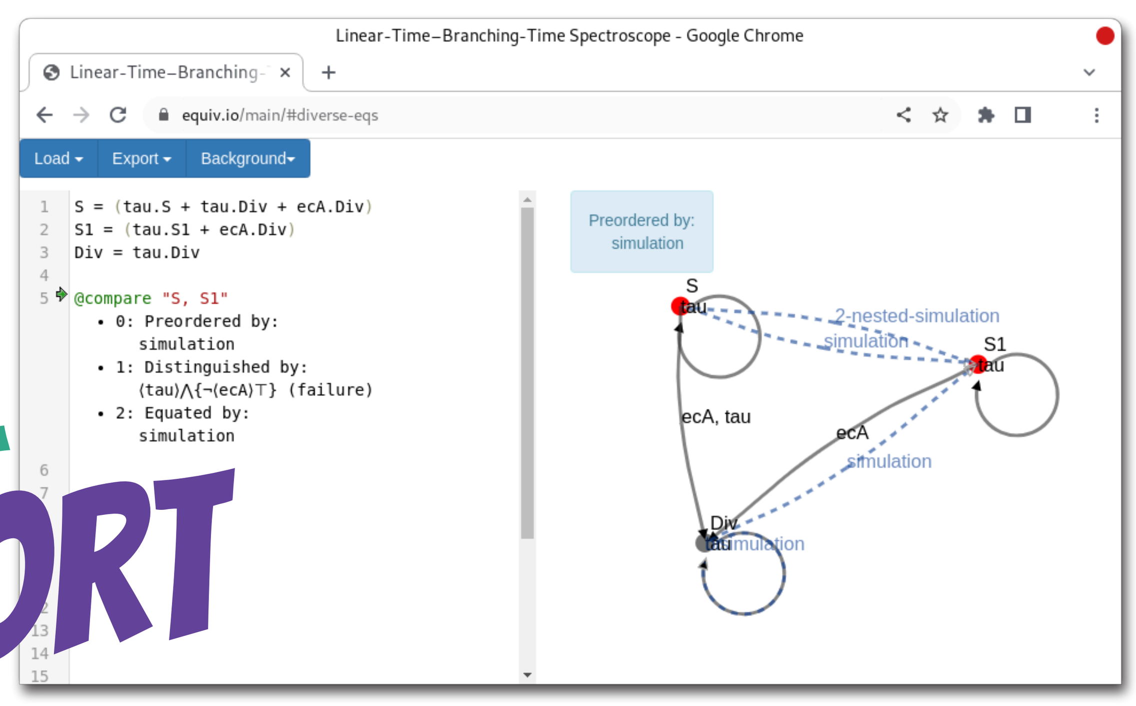


We explain the **“equivalence spectroscopy problem“** and our general approach.

CAV'23



We adapt **energy games** to solve the spectroscopy problem **more efficiently**.



Our **browser tool** allows to exhaustively consider equivalences for small example systems.

NEXT: David N. Jansen and Benjamin Bisping will present a way to **extend the approach to the weak spectrum** of equivalences that account for silent steps (e.g. branching bisimilarity, contrasimilarity).

TOOL, SOURCE, PAPERS & TALKS AVAILABLE FROM:

https://**equiv.io**

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