Restricted Chase Termination

You Want More than Fairness

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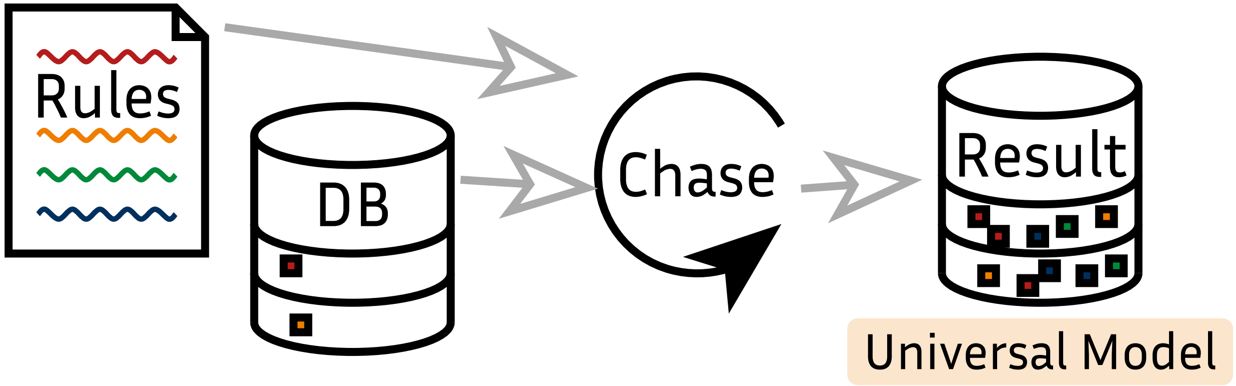
TECHNISCHE UNIVERSITÄT DRESDEN International Center for Computational Logic Inria

Chase Crash Course



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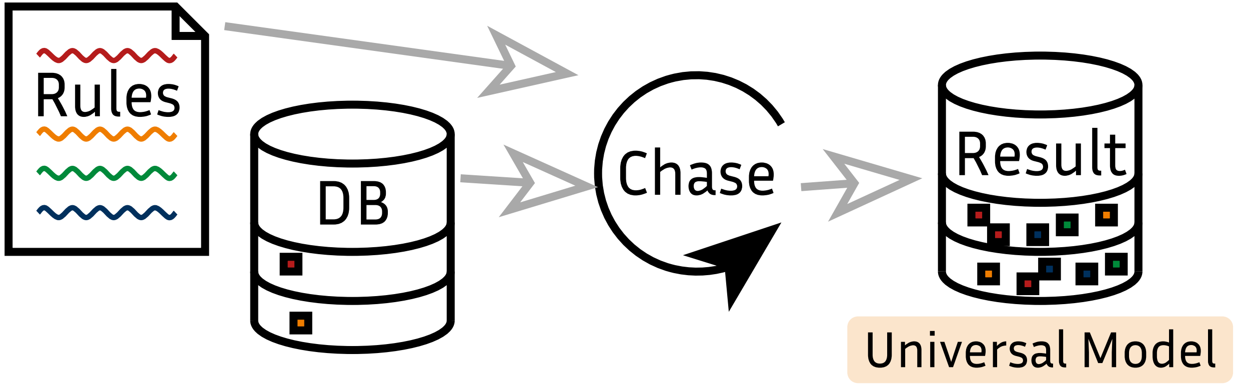

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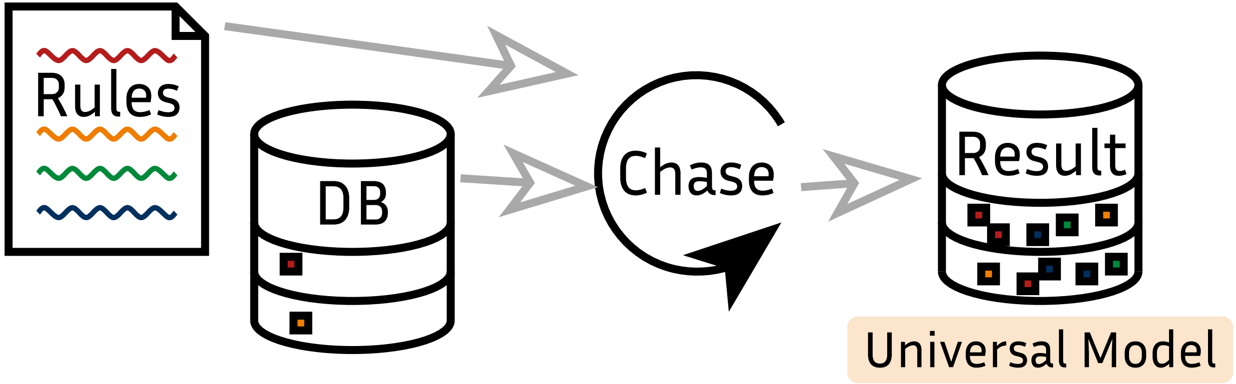
Chase Crash Course



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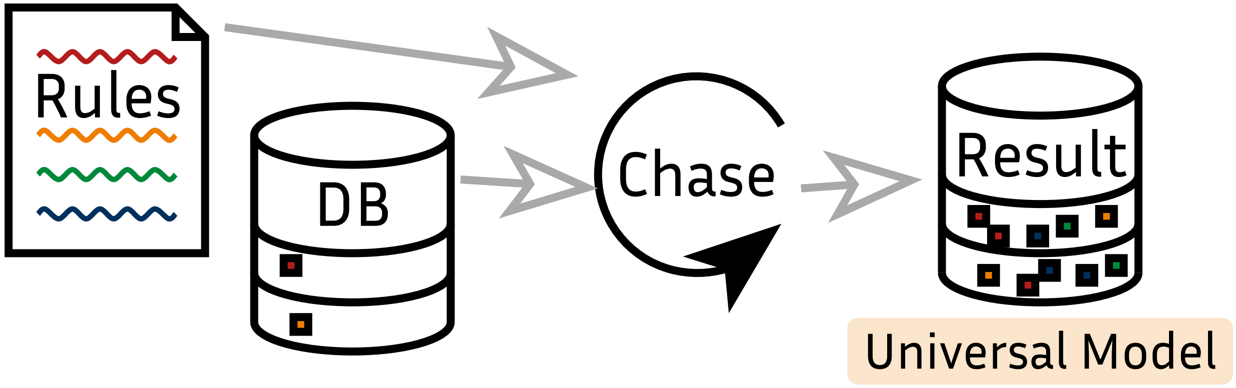

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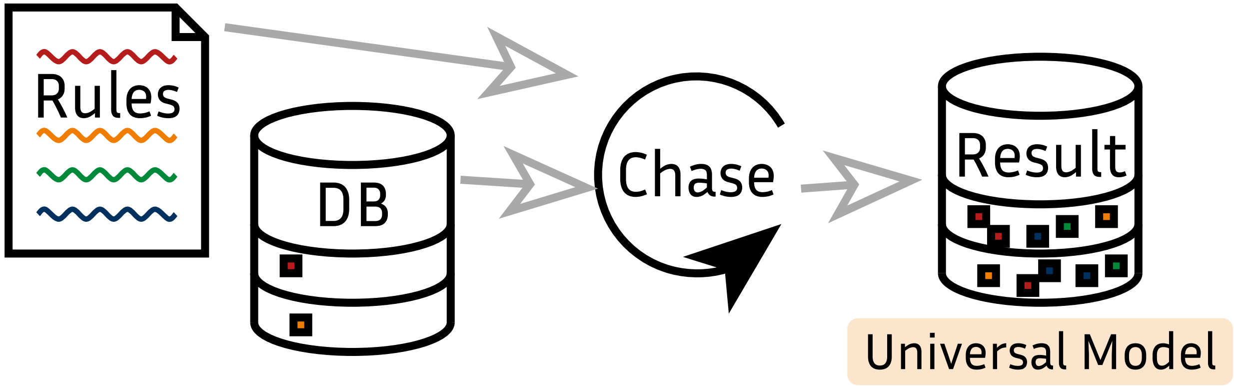
Step 1: $R(c, n_1)$, $B(n_1)$

Chase Crash Course



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Step 2: $A(n_1)$; Step 3: $R(n_1, c)$

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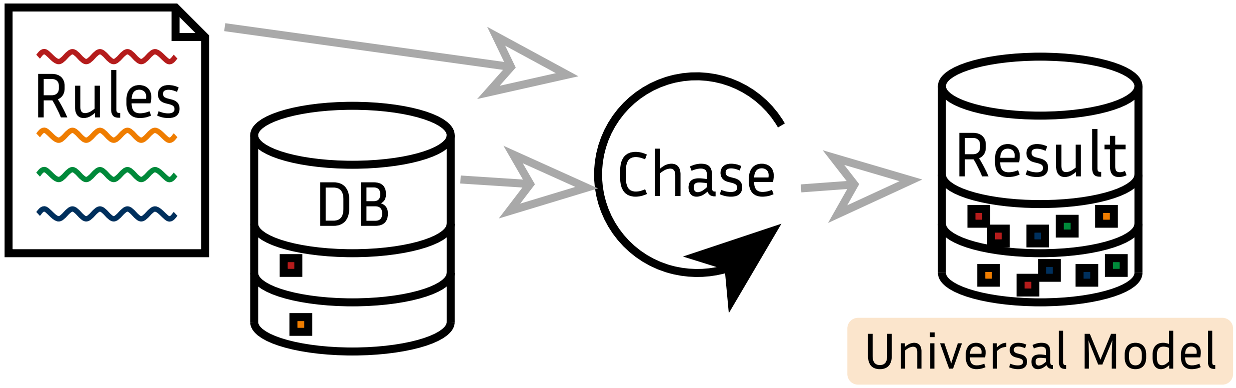

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Universal Models are "most general" and can answer conjunctive queries.

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Step N: $\mathrm{R}(n_1, c)$ (due to Fairness)

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$\mathrm{CTR}_{\forall}^{r}$ is analogous for rule sets by $\forall$-quantifying over all databases.

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Σ_1^0 - Semi-Decidable Languages (e.g. Halting Problem)

Π_2^0 - Co-Semi-Decidable with Semi-Decision Oracle (e.g. Universal Halting Problem)

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Membership: Run all Chase Sequences in Parallel

Hardness: TM can be simulated with Existential Rules

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Membership: Use $\mathrm{CTK}^r_\exists$ oracle.

Hardness: (more involved)
see *(Grahne and Onet 2018)*

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Membership: Run all Chase Sequences in Parallel **?**

This does not work because of *fairness*!

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The upper bound was still unknown! (Until slide 6)

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Possible Fix: We could demand something stronger, e.g. “breadth-first”.

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This problem is Σ_1^1*-complete - first analytical hierarchy level - beyond infinitely many Turing jumps.* (Harel 1986)

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Run visiting the desig. state infinitely often **iff** infinite fair chase sequence.

Hence: Complement of $\mathrm{CTK}_{\forall}^{r}$ is in Σ_1^1; therefore $\mathrm{CTK}_{\forall}^{r}$ is in Π_1^1.

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Idea: With emergency brakes, we can force the chase to terminate after finitely many steps. If the designated state is visited, we create a new brake.

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Membership: Similar to $\mathrm{CTK}_{\forall}^{r}$ case using universal non-recurrence.

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Summing up...

Fairness makes Chase Termination highly Undecidable.

Stricter, finitely verifiable conditions could solve this (e.g. breadth-first).

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📢 *Talk to me about Lean and Typst* 🤓

References

Carral D, Dragoste I, Krötzsch M (2017) Restricted Chase (Non)Termination for Existential Rules with Disjunctions. In: Sierra C (ed) Proceedings of the Twenty-Sixth International Joint Conference on Artificial Intelligence, IJCAI 2017, Melbourne, Australia, August 19-25, 2017. ijcai.org, pp 922–928

Carral D, Gerlach L, Larroque L, Thomazo M (2025) Restricted Chase Termination: You Want More than Fairness. Proc ACM Manag Data 3:. https://doi.org/10.1145/3725246

References

Carral D, Larroque L, Mugnier M-L, Thomazo M (2022) Normalisations of Existential Rules: Not so Innocuous!. In: Kern-Isberner G, Lakemeyer G, Meyer T (eds) Proceedings of the 19th International Conference on Principles of Knowledge Representation and Reasoning, KR 2022, Haifa, Israel, July 31 - August 5, 2022

Gerlach L, Carral D (2023a) General Acyclicity and Cyclicity Notions for the Disjunctive Skolem Chase. In: Williams B, Chen Y, Neville J (eds) Thirty-Seventh AAAI Conference on Artificial Intelligence, AAAI 2023, Thirty-Fifth Conference on Innovative Applications of Artificial Intelligence, IAAI 2023, Thirteenth Symposium on Educational Advances in Artificial

References

Intelligence, EAAI 2023, Washington, DC, USA, February 7-14, 2023. AAAI Press, pp 6372–6379

Gerlach L, Carral D (2023b) Do Repeat Yourself: Understanding Sufficient Conditions for Restricted Chase Non-Termination. In: Marquis P, Son TC, Kern-Isberner G (eds) Proceedings of the 20th International Conference on Principles of Knowledge Representation and Reasoning, KR 2023, Rhodes, Greece, September 2-8, 2023. pp 301–310

Gerlach L, Carral D, Hecher M (2024) Finite Groundings for ASP with Functions: A Journey through Consistency. In: Proceedings of the Thirty-

References

Third International Joint Conference on Artificial Intelligence, IJCAI 2024, Jeju, South Korea, August 3-9, 2024. ijcai.org, pp 3386–3394

Gogacz T, Marcinkowski J, Pieris A (2023) Uniform Restricted Chase Termination. SIAM J Comput 52:641–683. https://doi.org/10.1137/20M1377035

Grahne G, Onet A (2018) Anatomy of the Chase. Fundam Informaticae 157:221–270. https://doi.org/10.3233/FI-2018-1627

References

Grau BC, Horrocks I, Krötzsch M, et al (2013) Acyclicity Notions for Existential Rules and Their Application to Query Answering in Ontologies. J Artif Intell Res 47:741–808. https://doi.org/10.1613/JAIR.3949

Harel D (1986) Effective transformations on infinite trees, with applications to high undecidability, dominoes, and fairness. J ACM 33:224–248. https://doi.org/10.1145/4904.4993

Ivliev A, Gerlach L, Meusel S, et al (2024) Nemo: Your Friendly and Versatile Rule Reasoning Toolkit. In: Marquis P, Ortiz M, Pagnucco M (eds) Proceedings of the 21st International Conference on Principles of

References

Knowledge Representation and Reasoning, KR 2024, Hanoi, Vietnam. November 2-8, 2024

Krötzsch M, Marx M, Rudolph S (2019) The Power of the Terminating Chase (Invited Talk). In: Barceló P, Calautti M (eds) 22nd International Conference on Database Theory, ICDT 2019, March 26-28, 2019, Lisbon, Portugal. Schloss Dagstuhl - Leibniz-Zentrum für Informatik, pp 1–17