Entity Resolution with Evolving Rules

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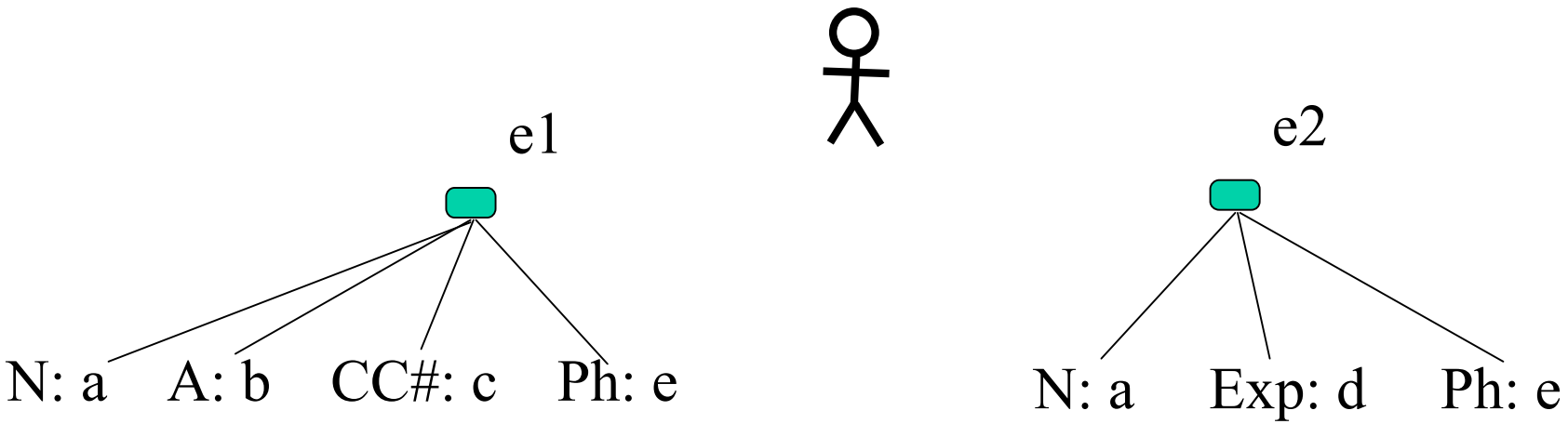
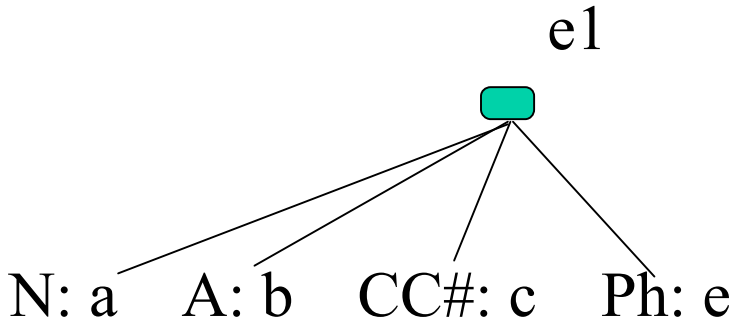
Stanford University

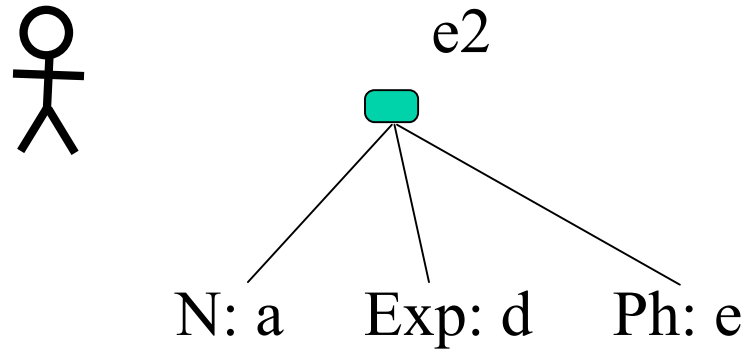
Entity Resolution



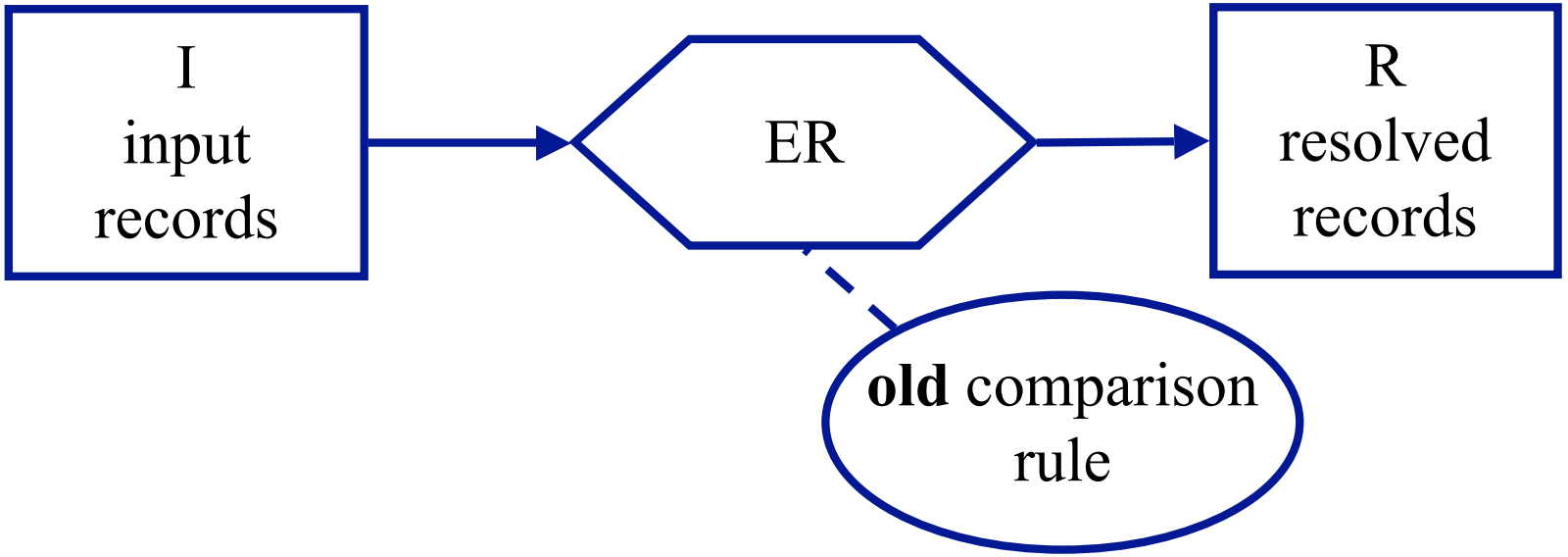
Applications

- comparison shopping
- mailing lists
- classified ads
- customer files
- counter-terrorism

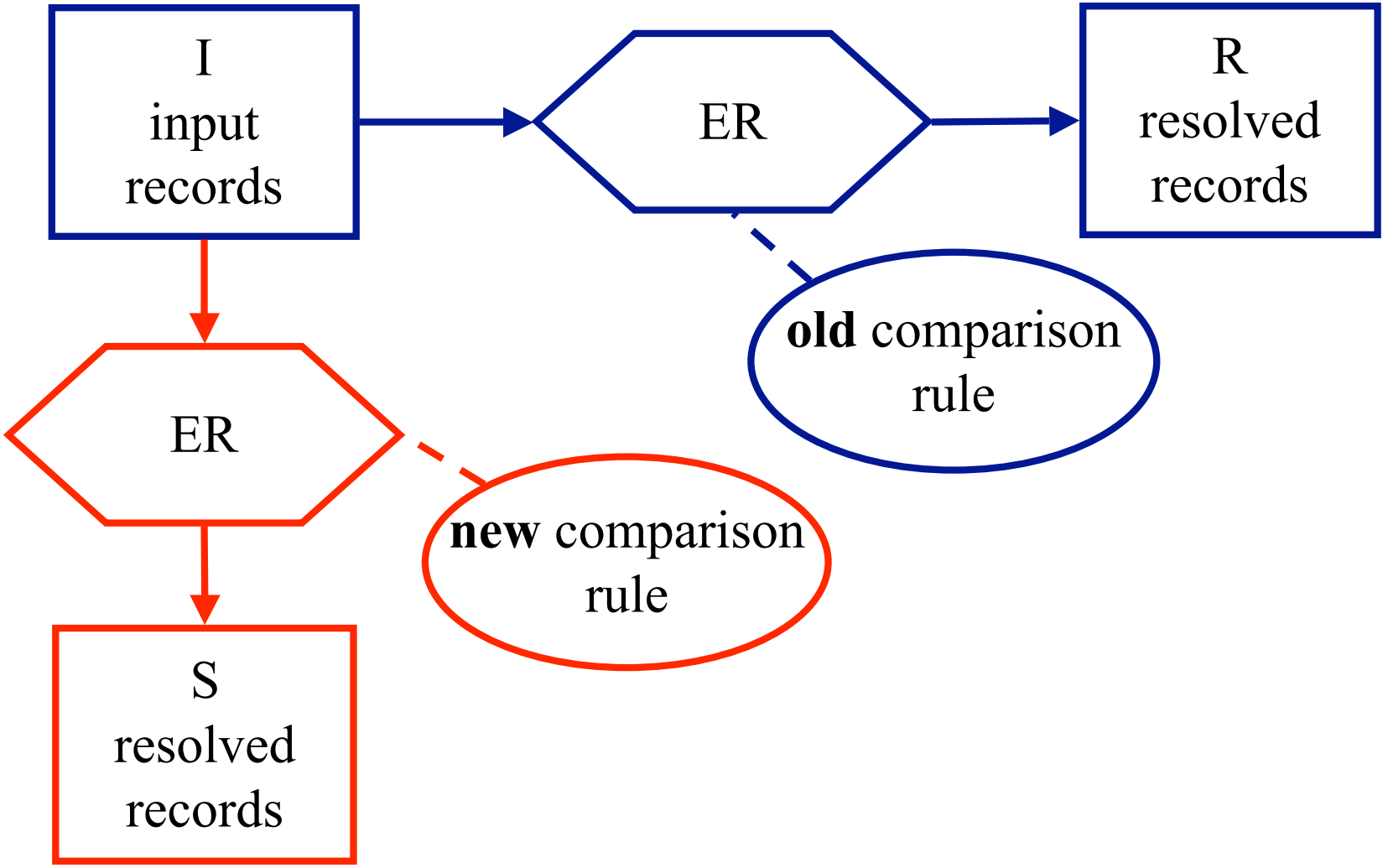




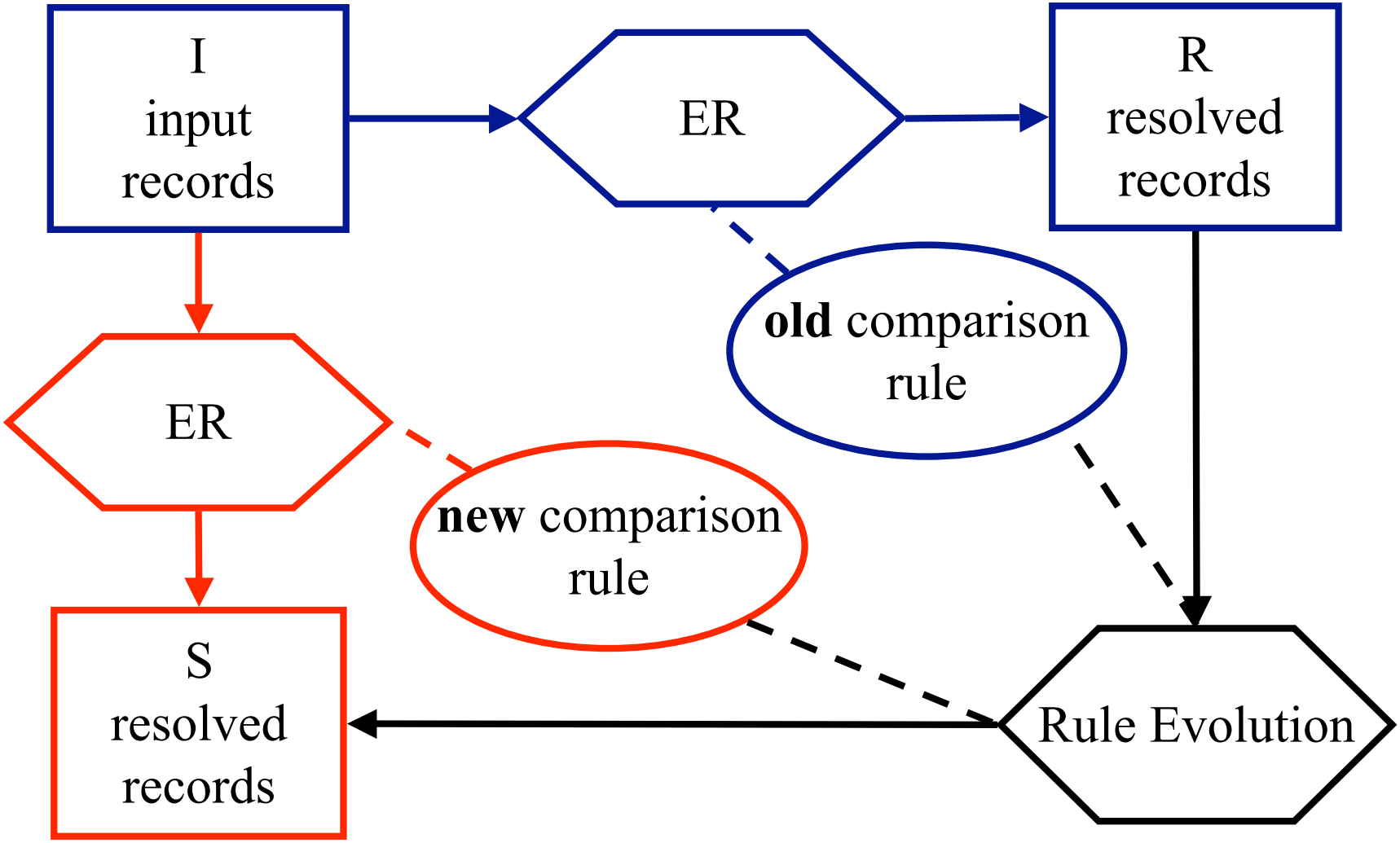
Evolving Rules



Evolving Rules

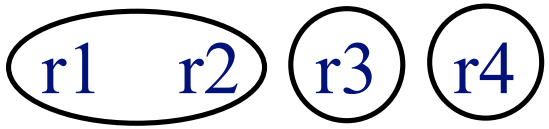


Evolving Rules



Example

Record	Name	Zip	Phone
r1	John	54321	123
r2	John	54321	987
r3	John	11111	987
r4	Bob	null	121

N & Z  (6 comps)

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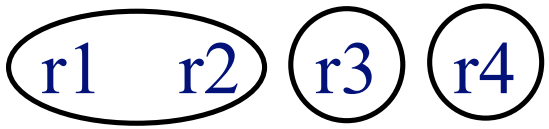
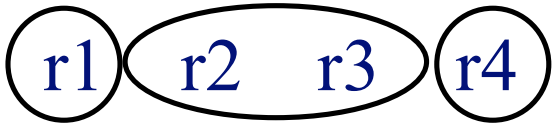
N & Z 

(6 comps)

N & P 

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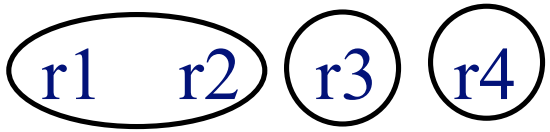
Rule Evolution

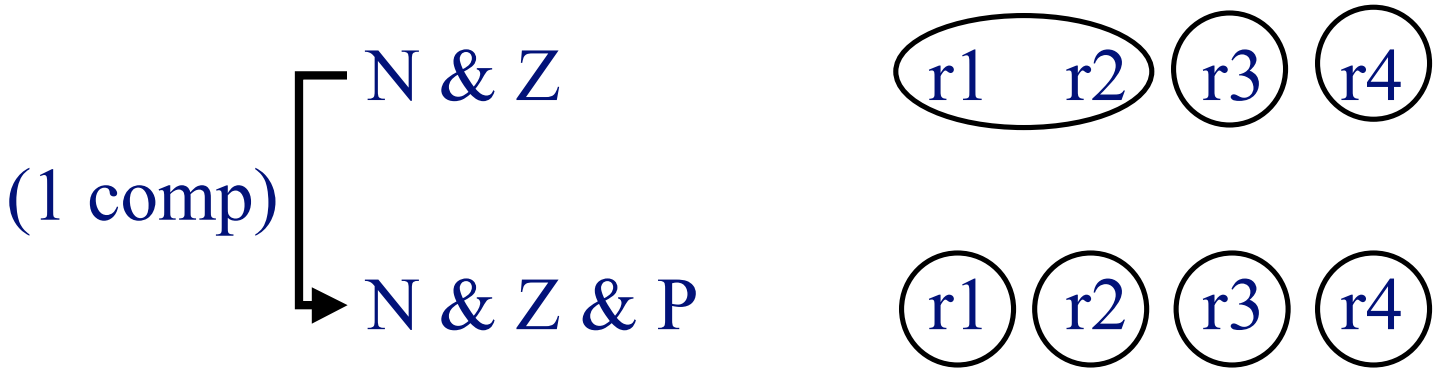
N & Z



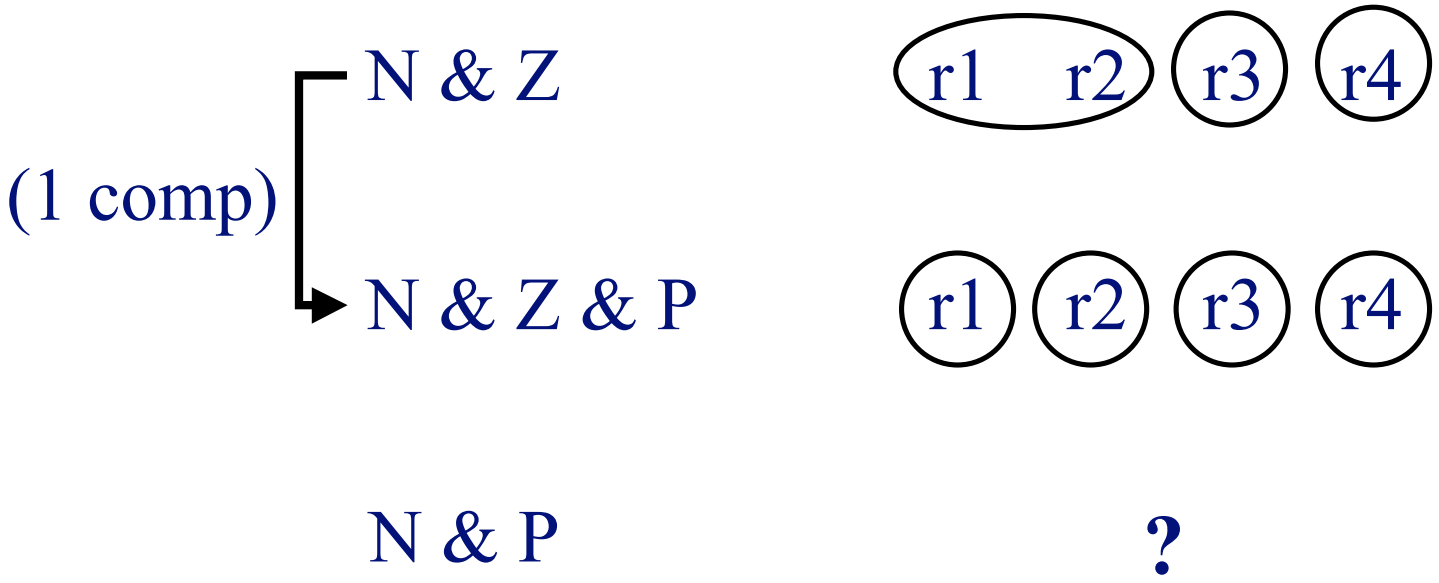
N & Z & P

r1 r2 r3 r4

Rule Evolution



Rule Evolution

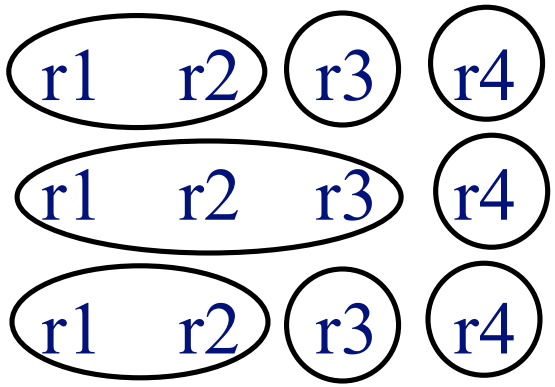


Materialization

N & Z

N

Z



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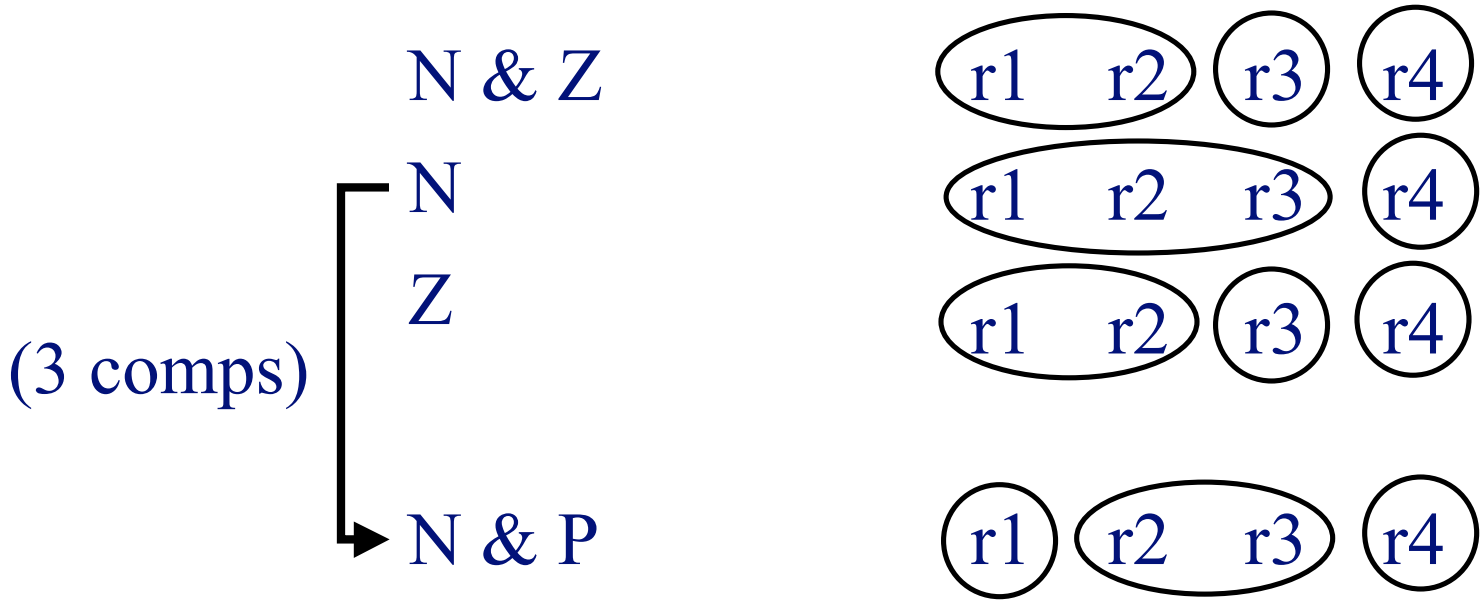
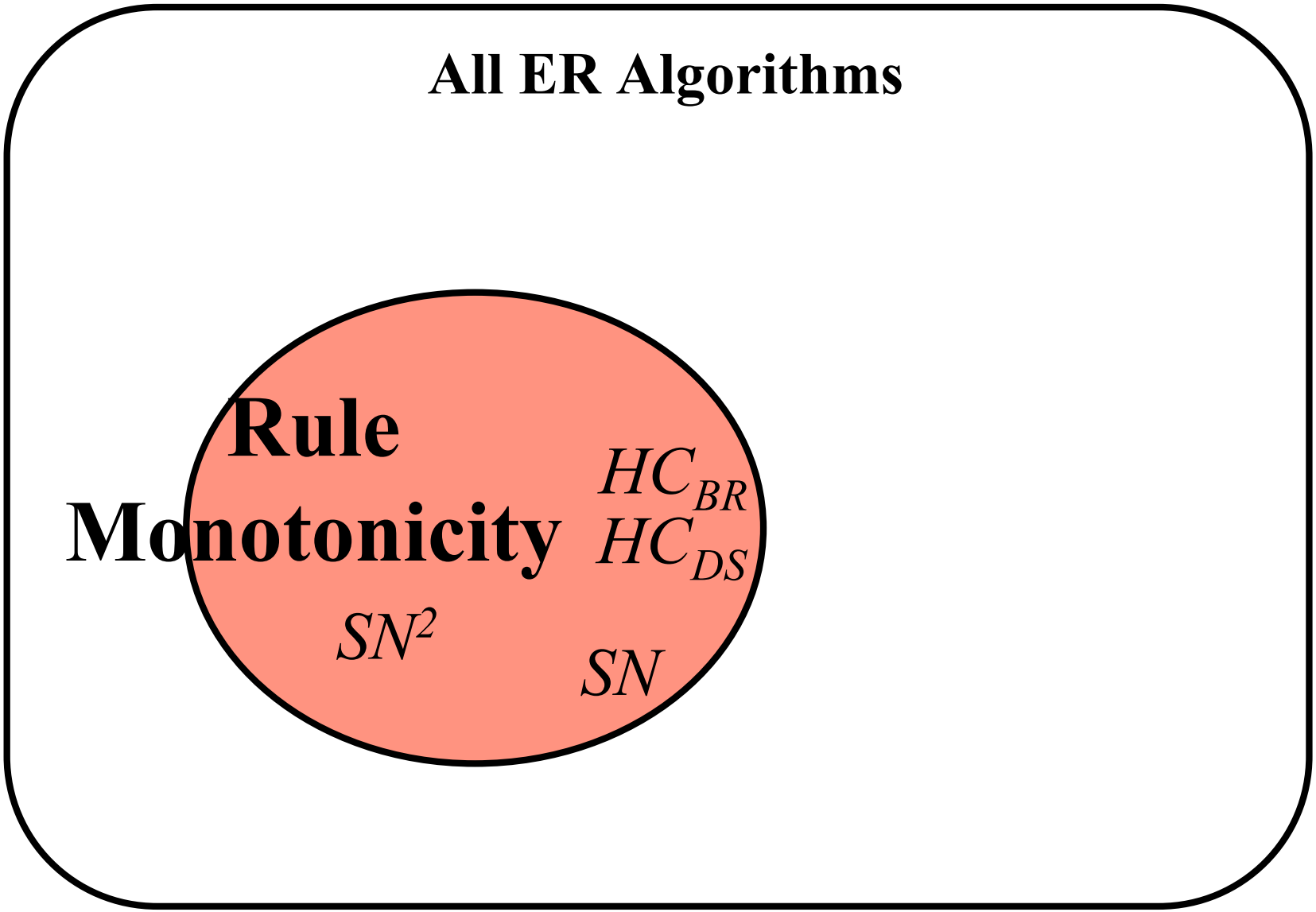
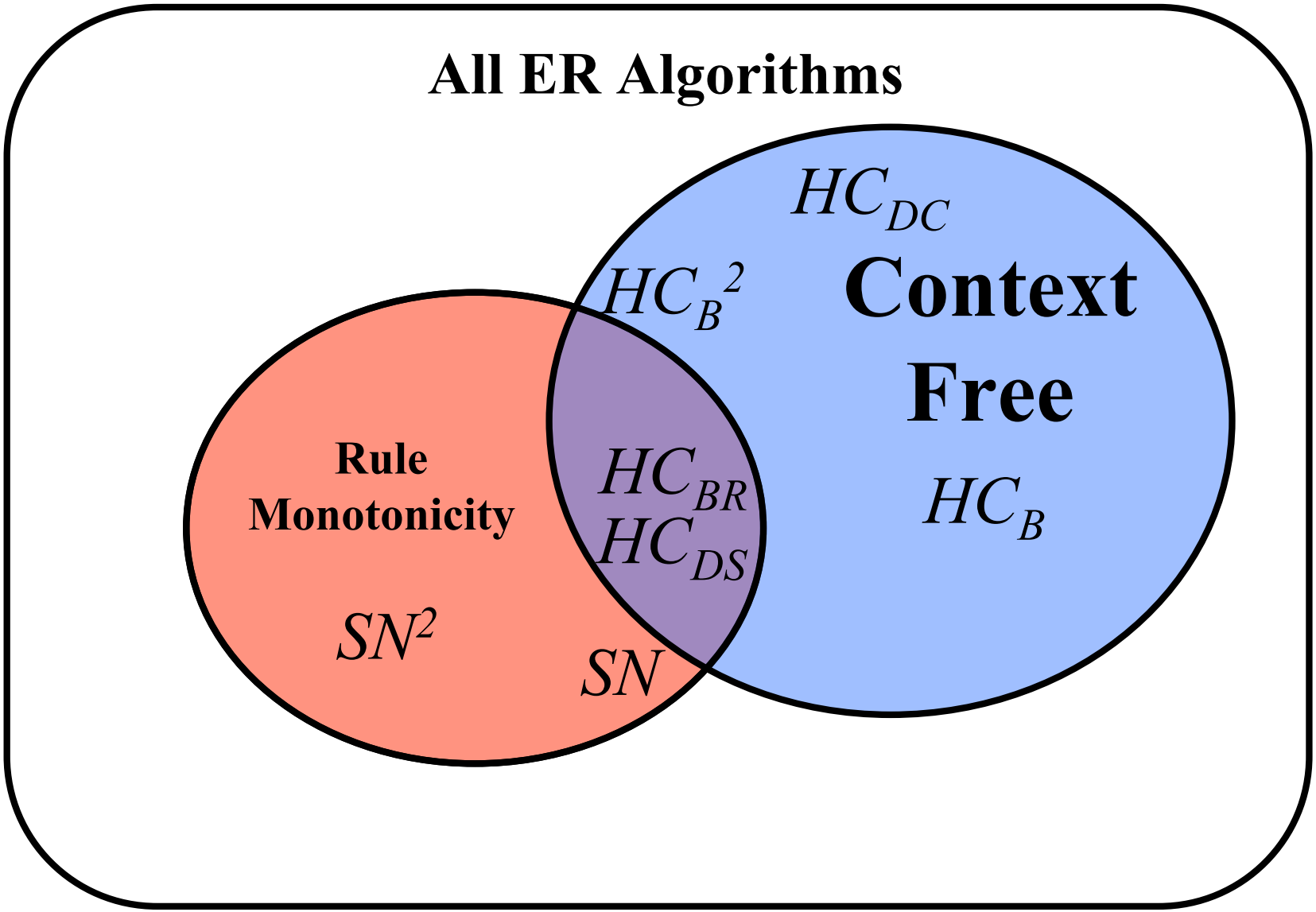
Materialization



All ER Algorithms


All ER Algorithms
Rule Monotonicity
HC_{BR}
HC_{DS}
SN^2
SN


All ER Algorithms
HC_{DC}
$HC_B{}^2$
Context
Free
HC_B
Rule
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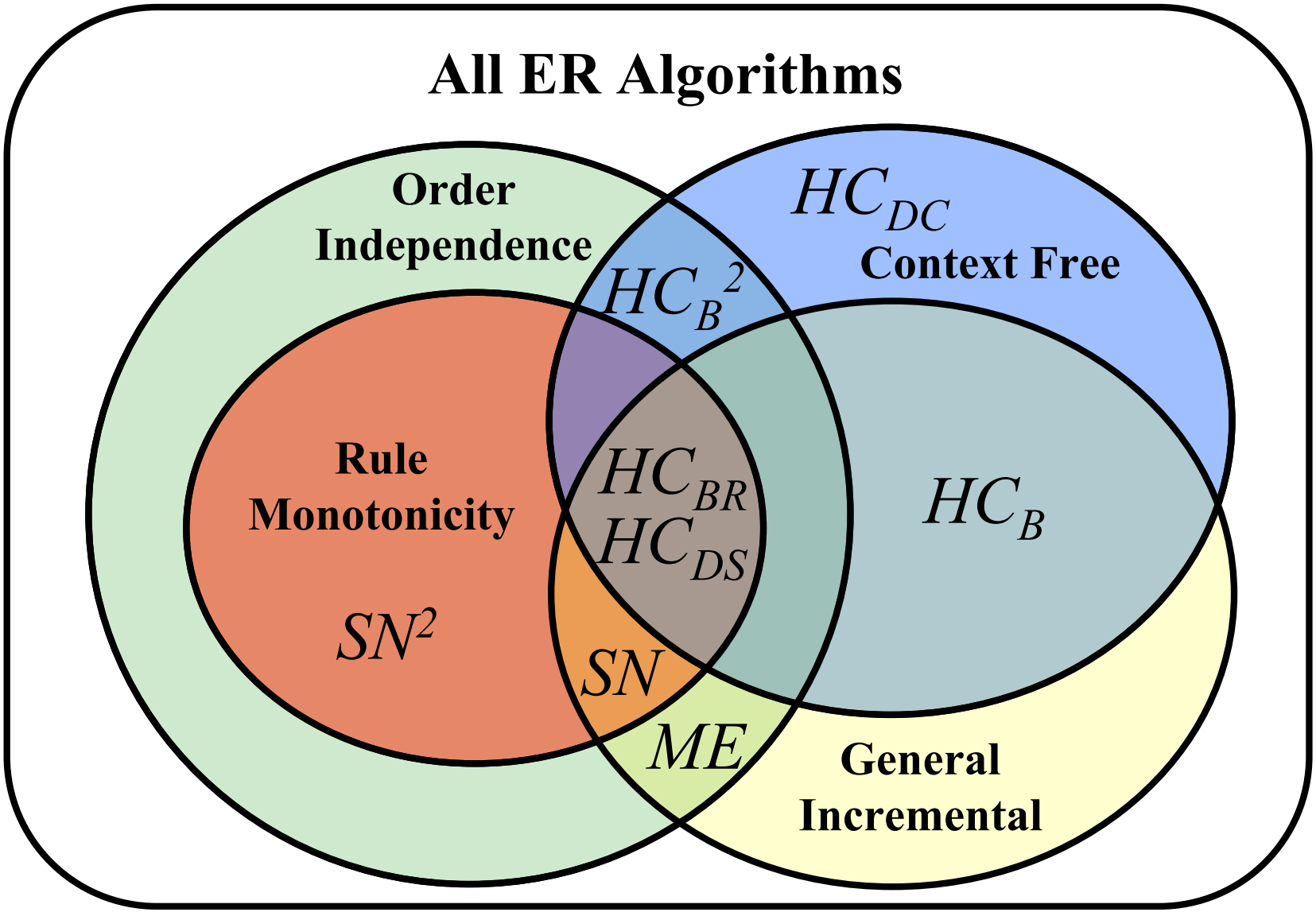
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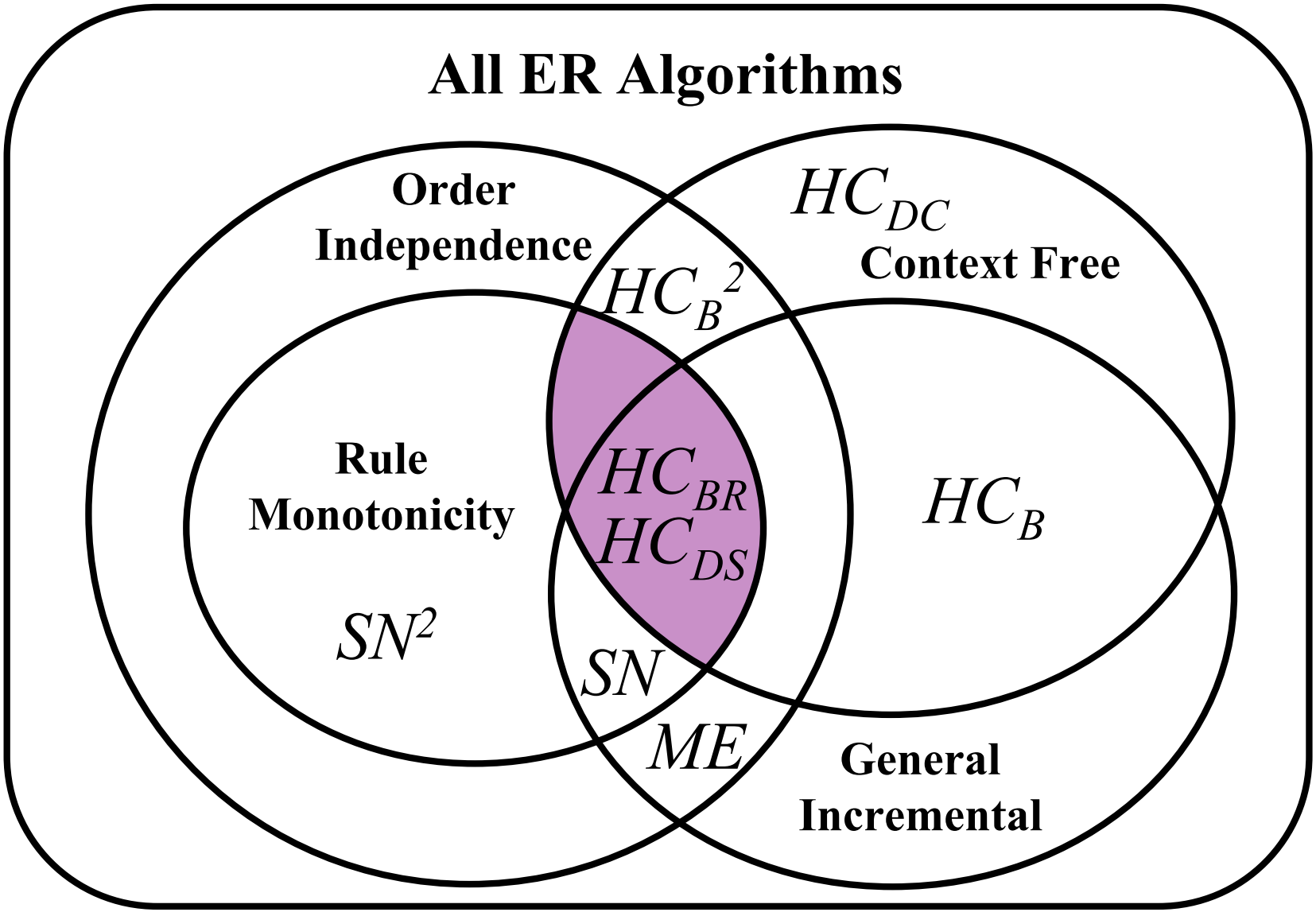
General Incremental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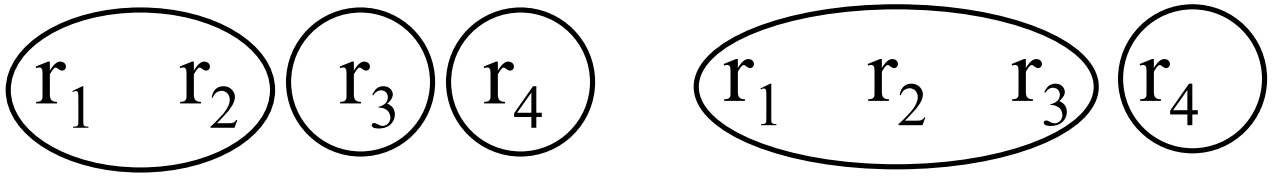
Strictness

- $B1 \leq B2$

  e.g., $N\&Z \leq N$

Domination

- ER result 1 $\leq$ ER result 2



Domination

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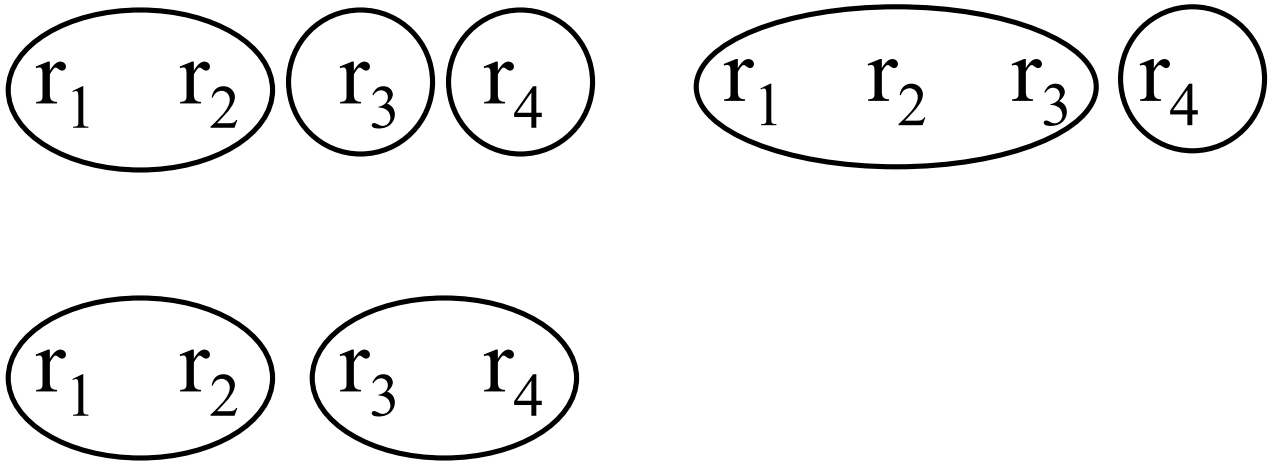

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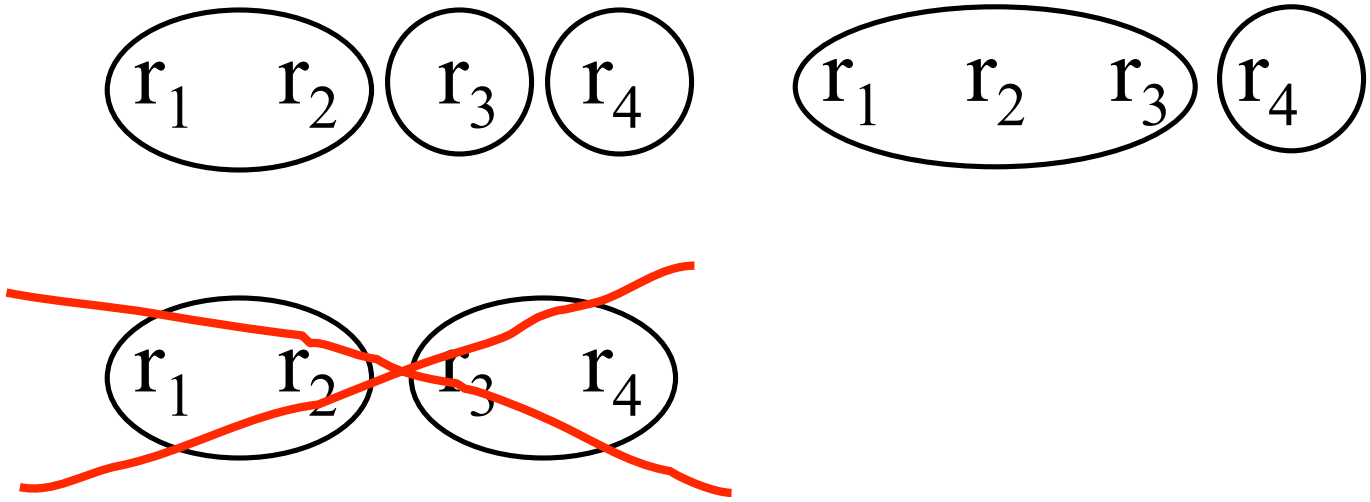

Definition: Rule Monotonicity (RM)

- If B1 $\leq$ B2

  Then ER(R, B1) $\leq$ ER(R, B2)

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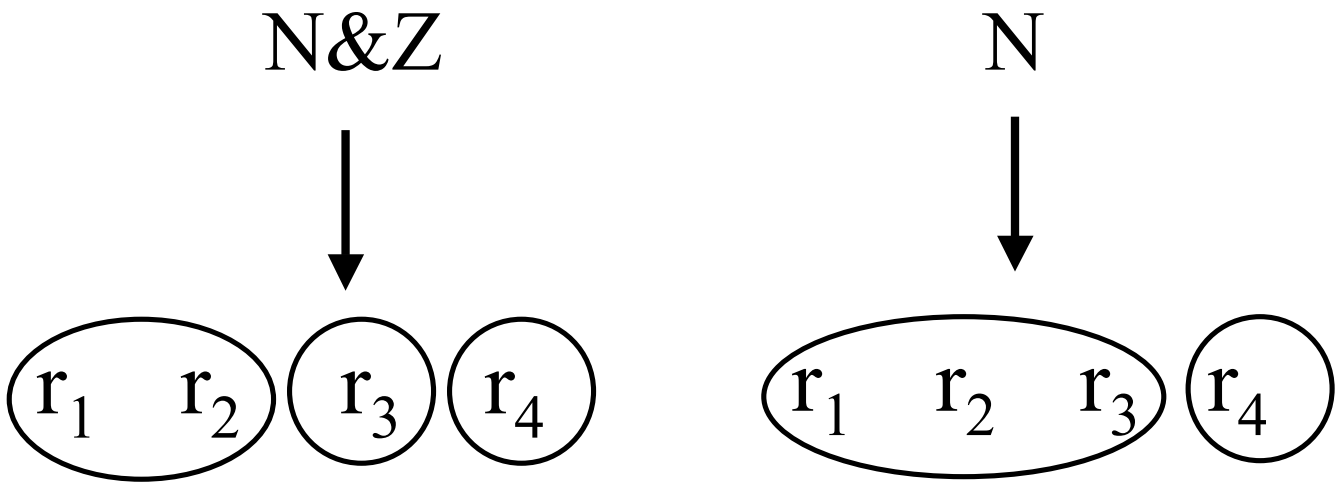

Definition: Context Free (CF)

- If $ER(R1 \cup R2, B) \leq \{R1, R2\}$

  Then $ER(R1 \cup R2, B)$

  $= ER(R1, B) \cup ER(R2, B)$

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r_1 r_2 r_3 r_4

Definition: Context Free (CF)

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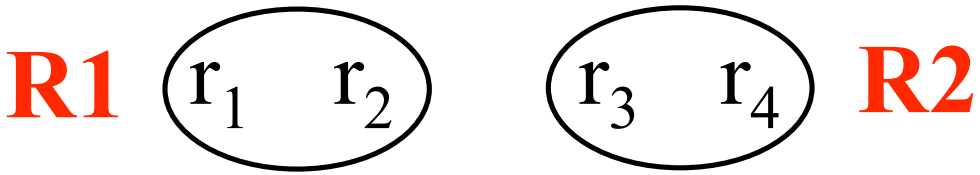

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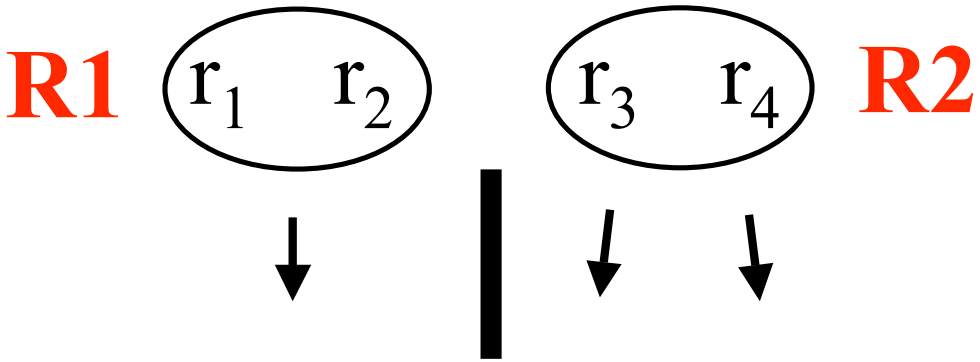

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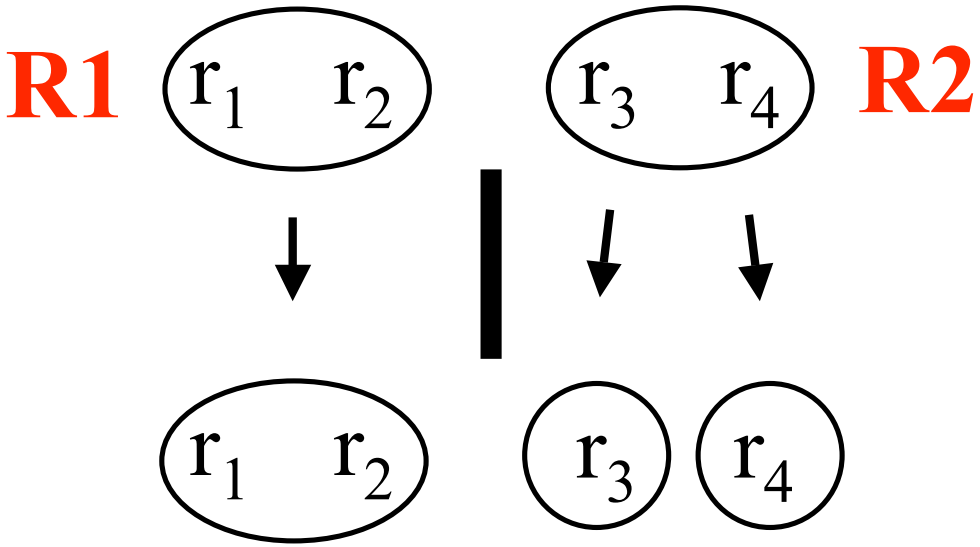
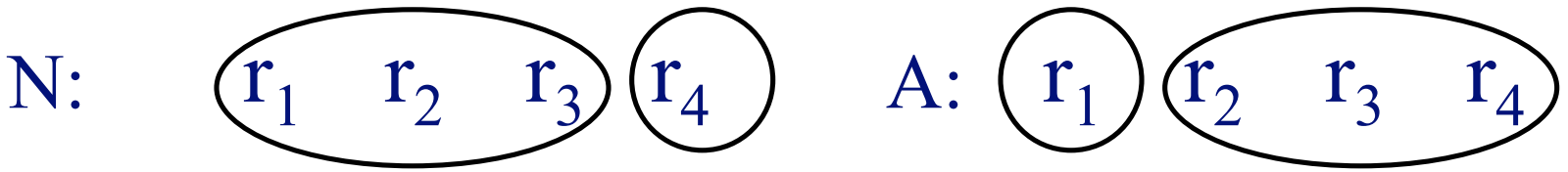


Algorithm exploiting RM & CF

N & A & Z => N & A & P



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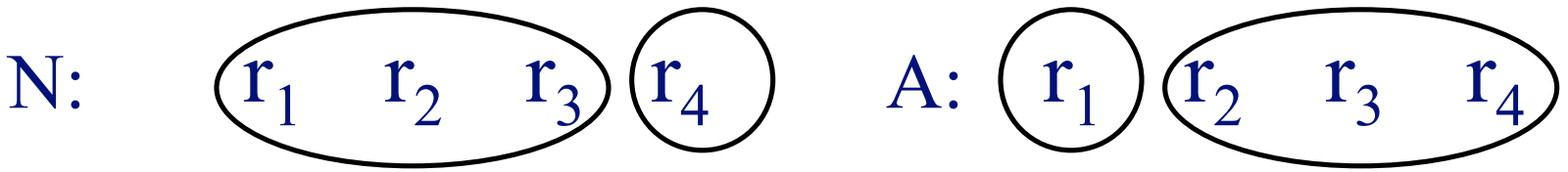

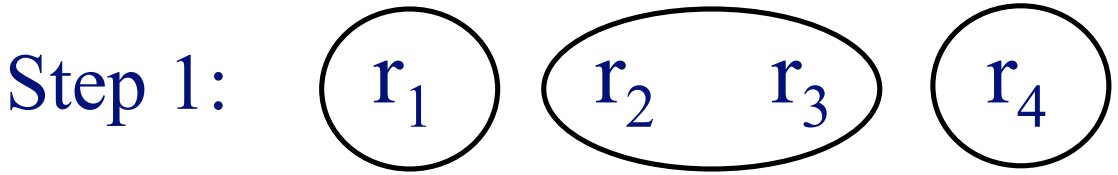

(Rule Monotonicity)

Algorithm exploiting RM & CF

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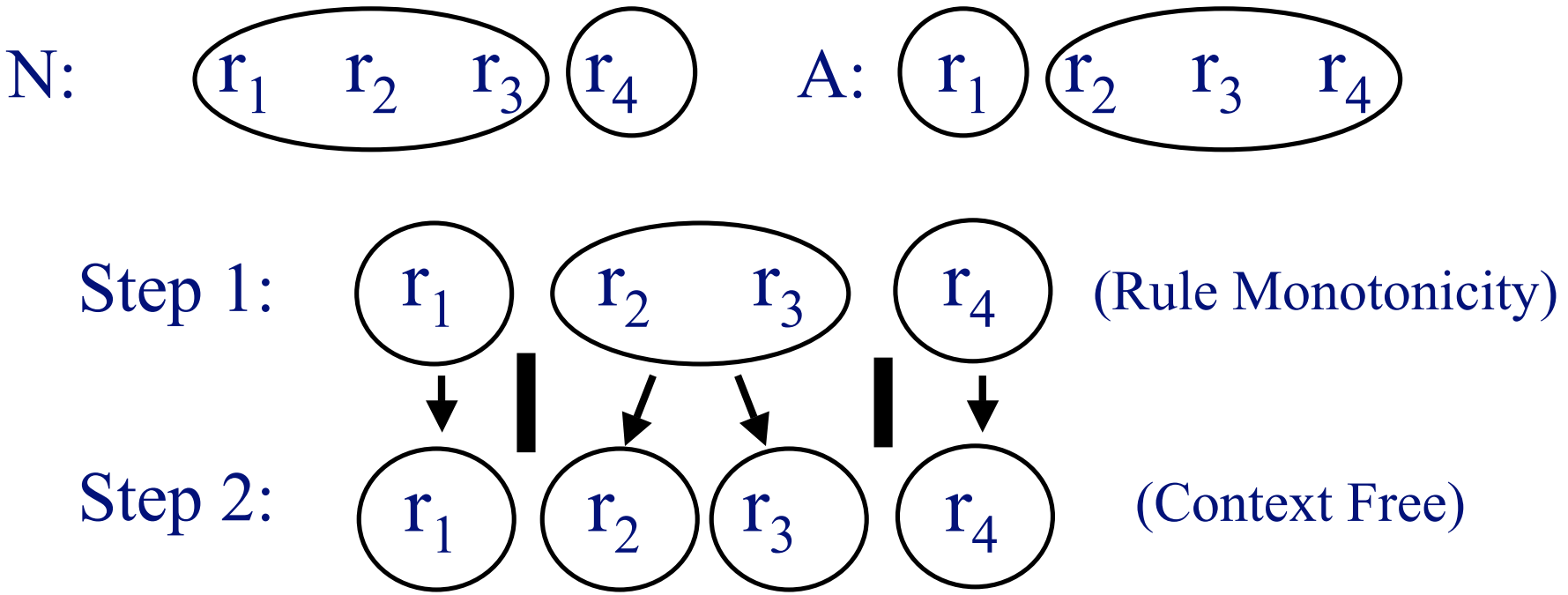

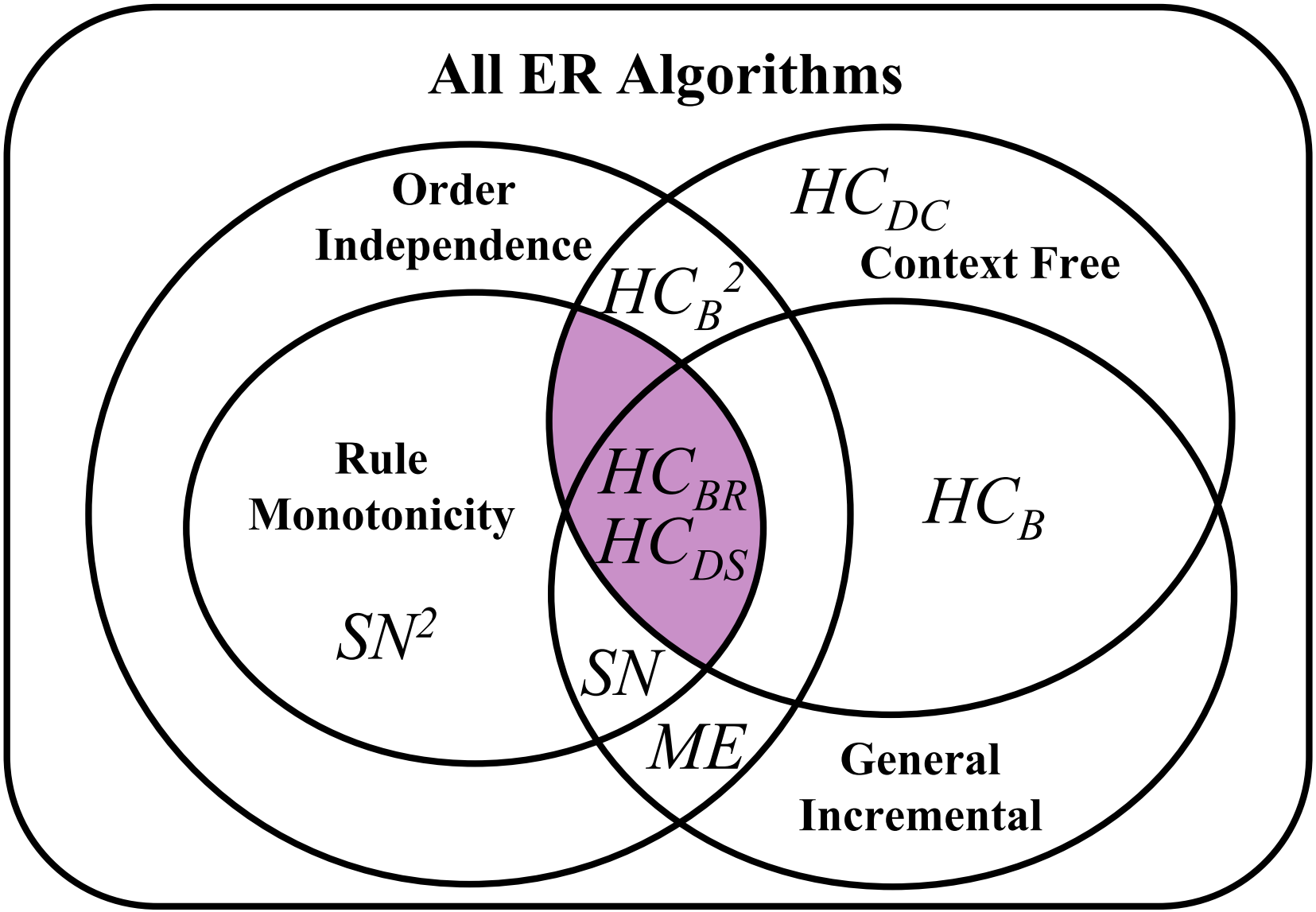
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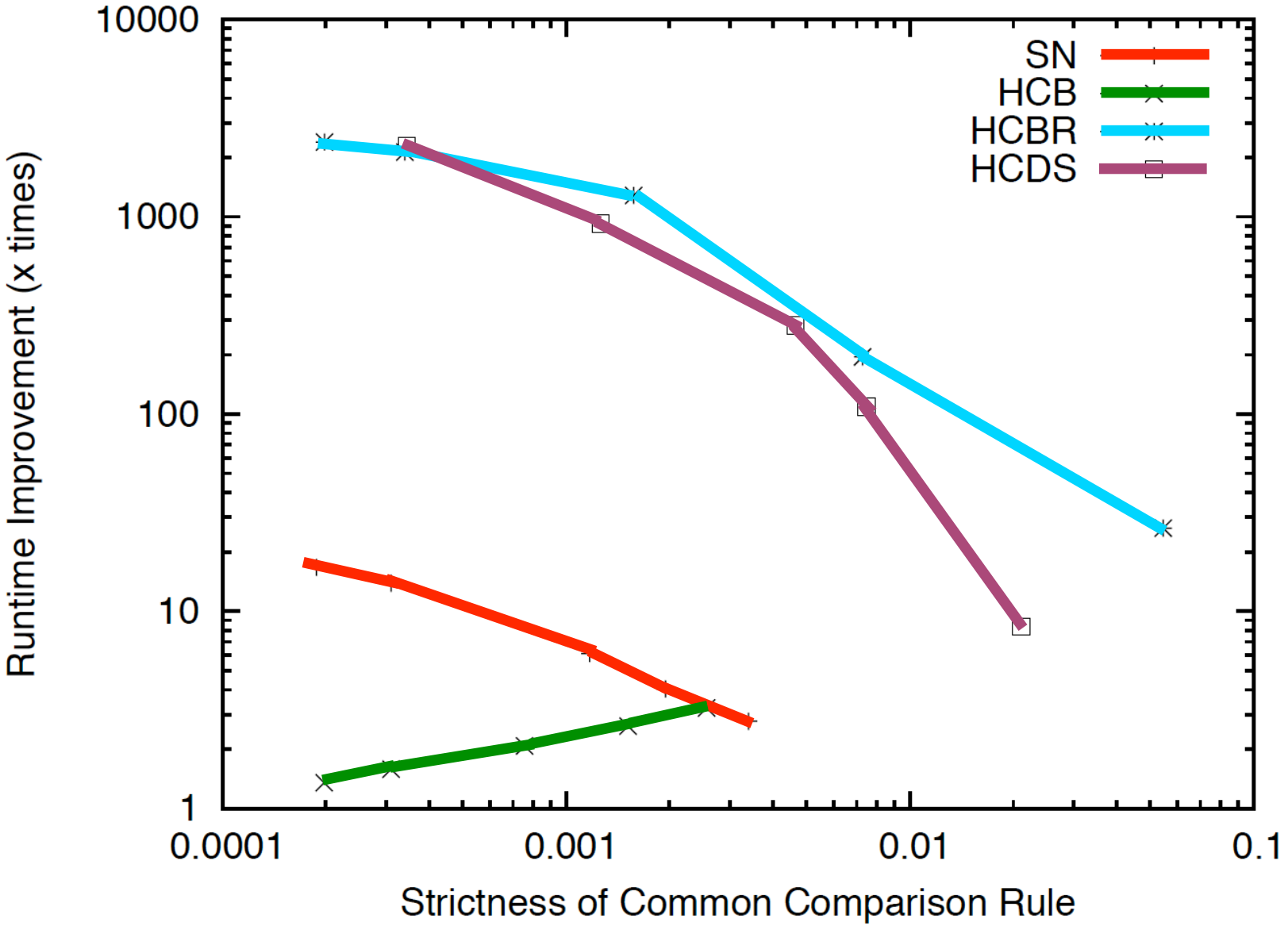
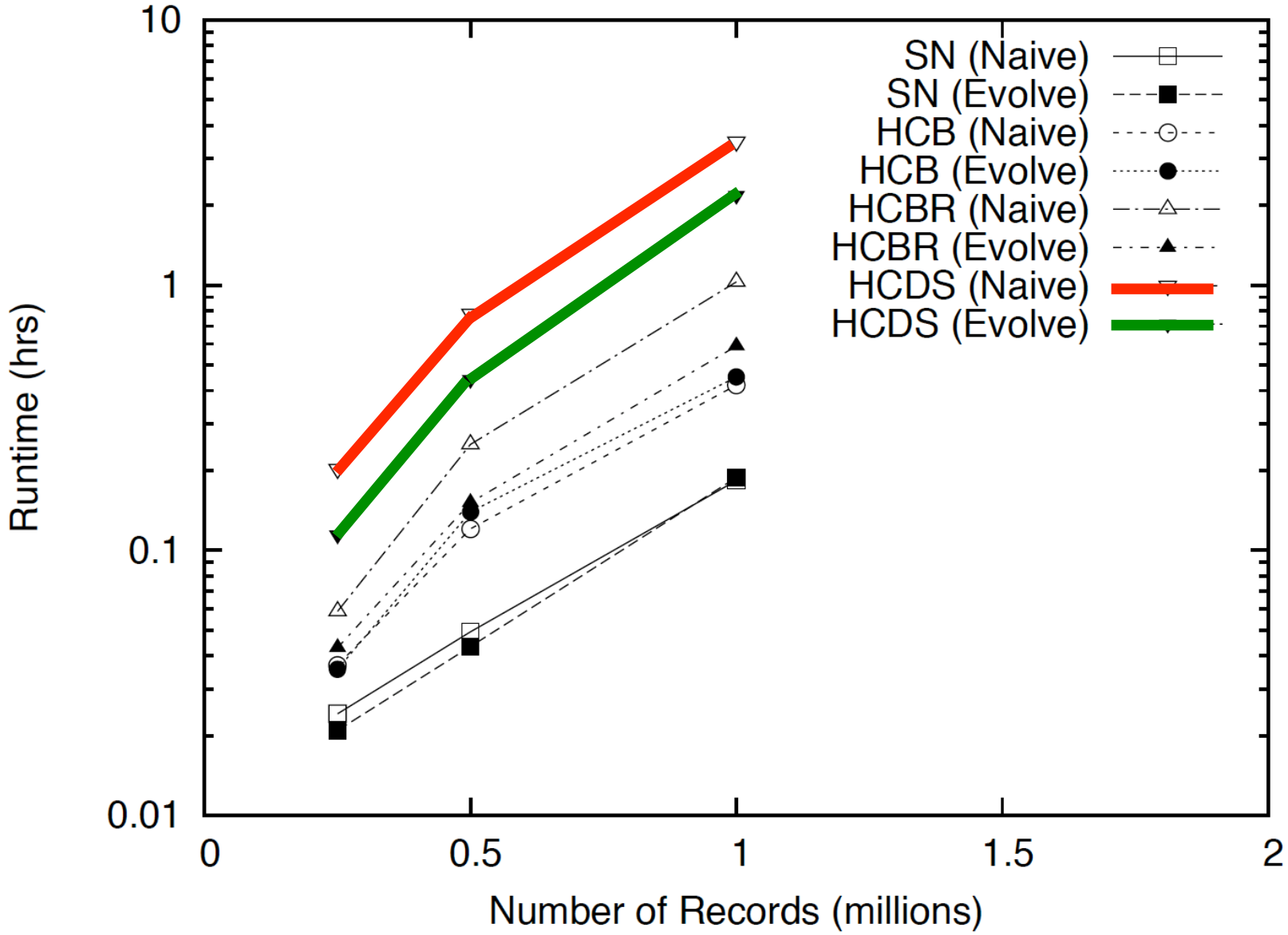
ER models

- Match-based clustering
- Distance-based clustering

Rule Evolution Speedup



Total Runtime



Conclusion

- Proposed a rule evolution framework that exploits ER properties and materialization
- Showed that rule evolution can significantly enhance the runtime of the naive approach

Thanks!