Quantitative Reductions and Vertex-Ranked Games

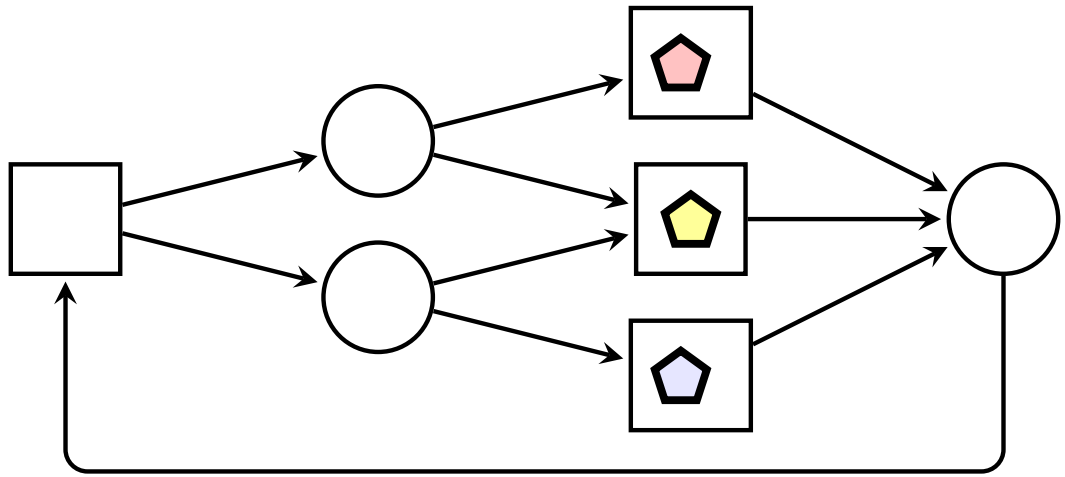
Alexander Weinert

Saarland University

September 13th, 2017

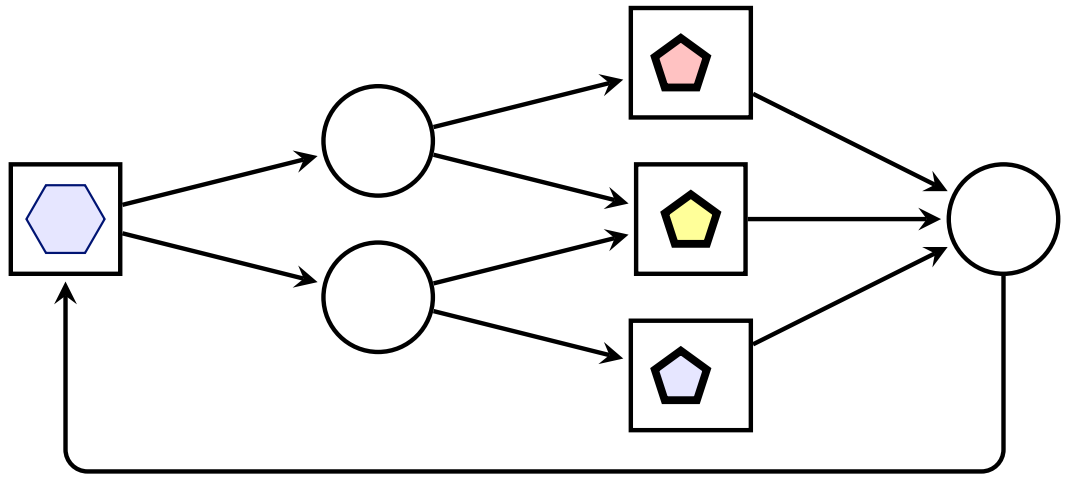
Highlights 2017 - London

Reachability Games



Winning condition: Play reaches either or or

Reachability Games



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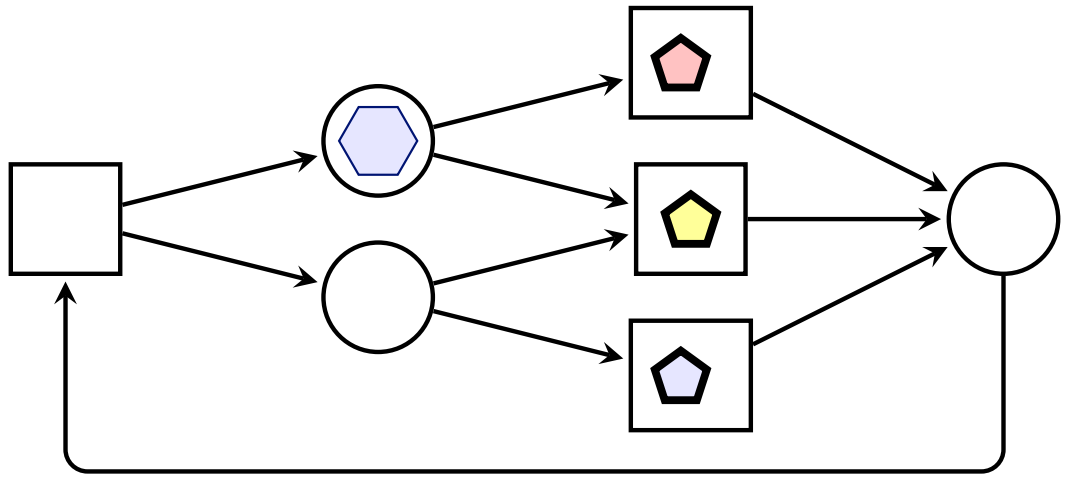

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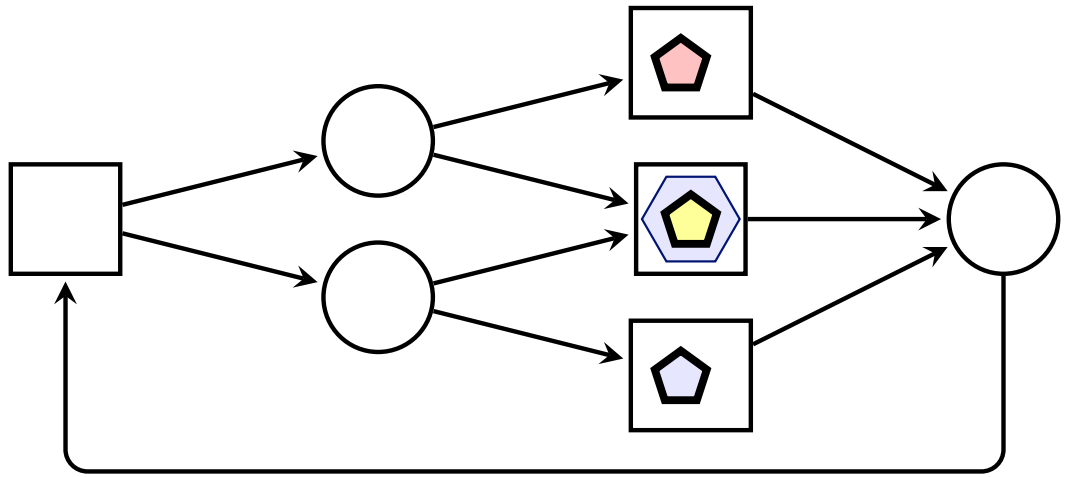

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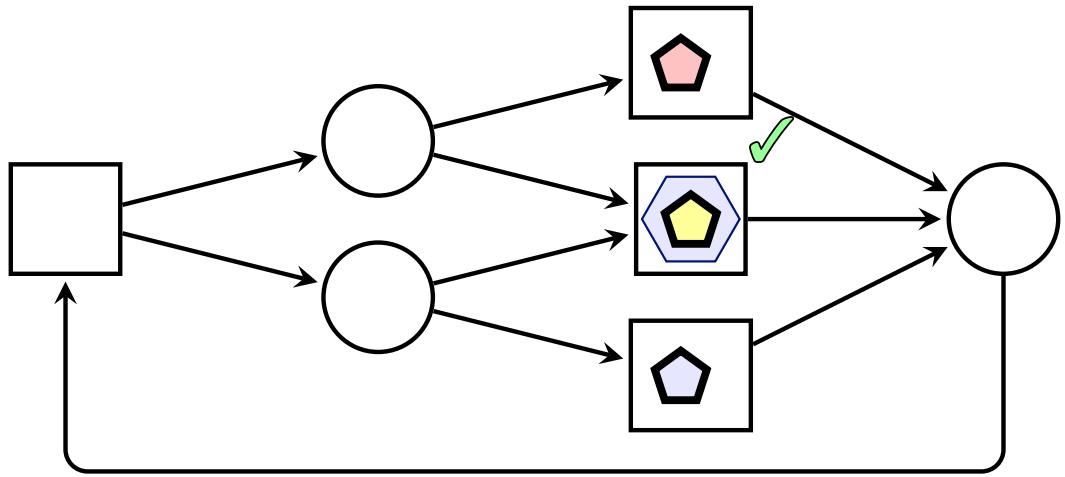

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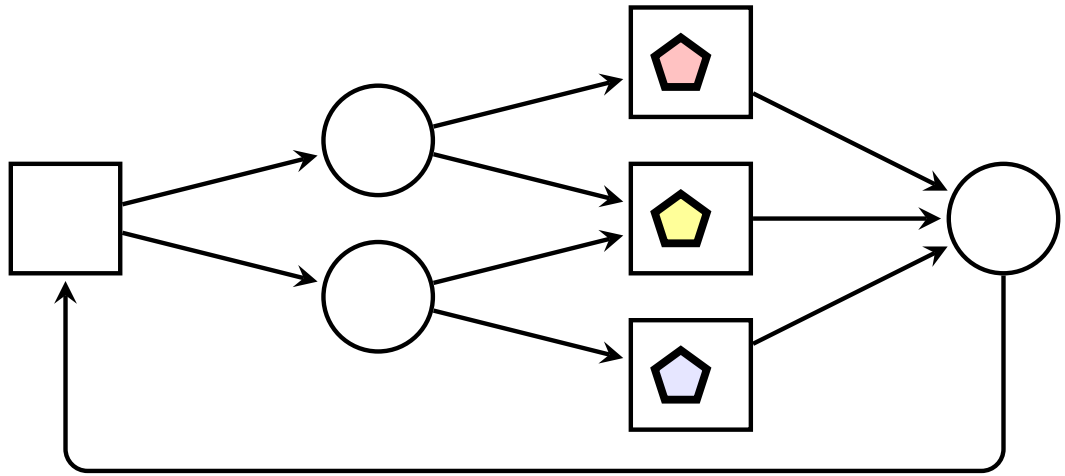
The Big Picture

Reachability

Generalized Reachability: The Problem



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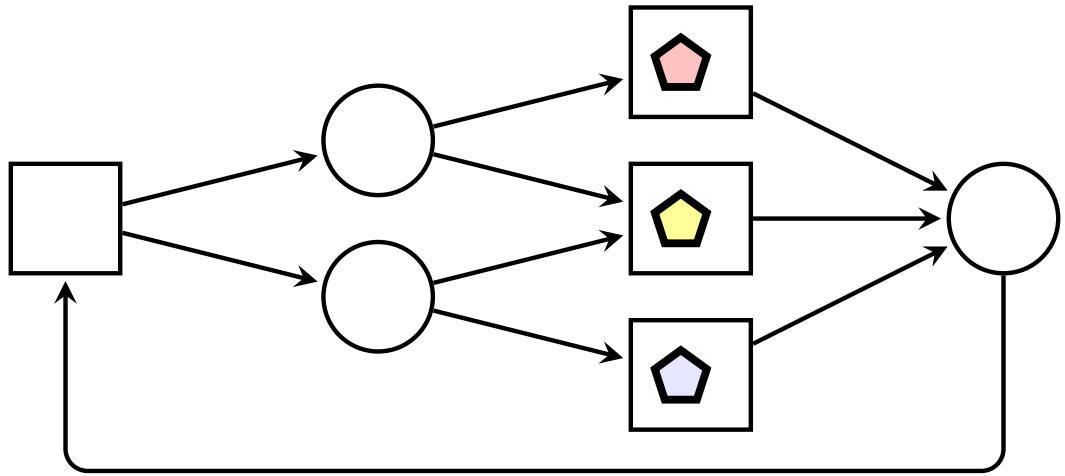
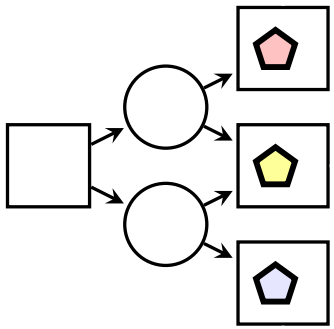


Winning condition:
Reach one from $\{$, $\}$ and one from $\{$, $\}$.

Generalized Reachability: One Solution



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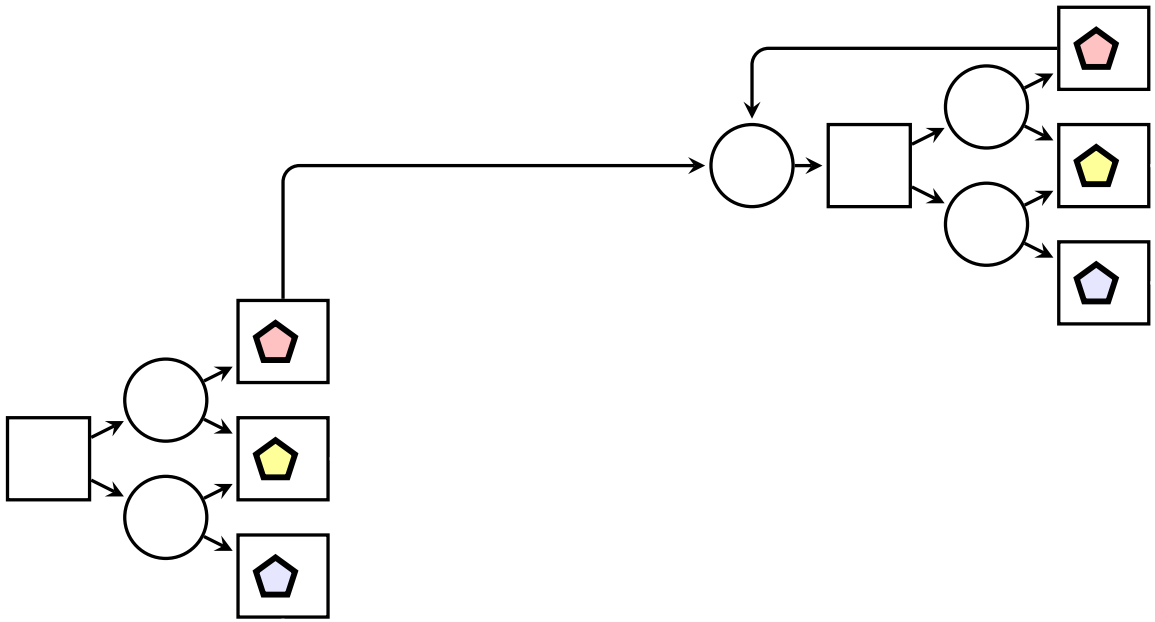

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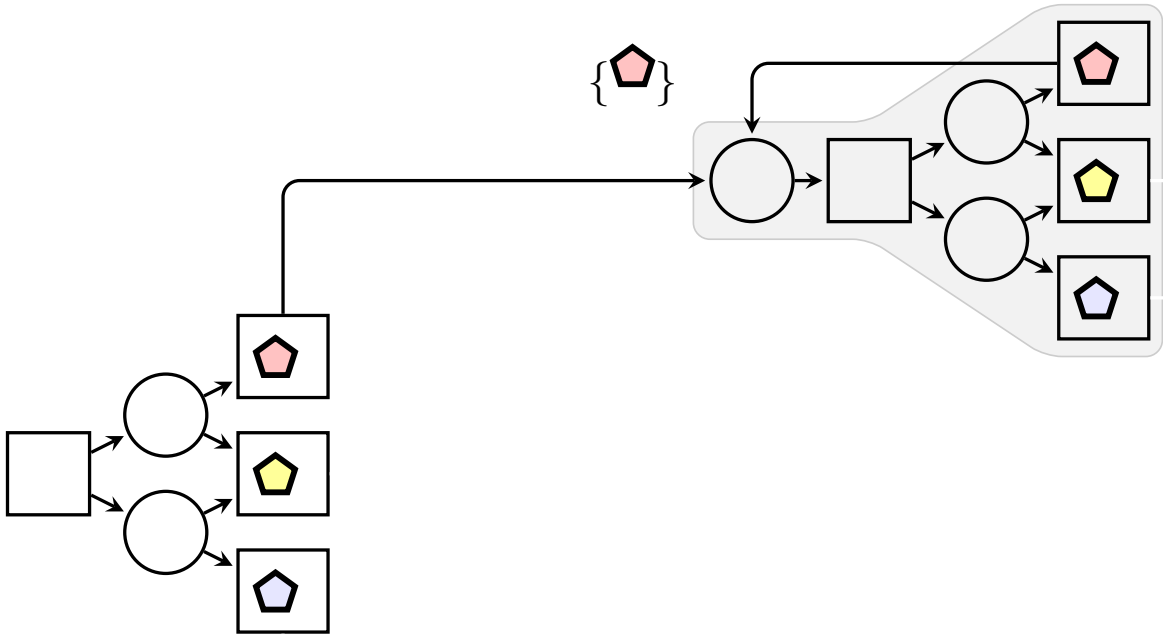

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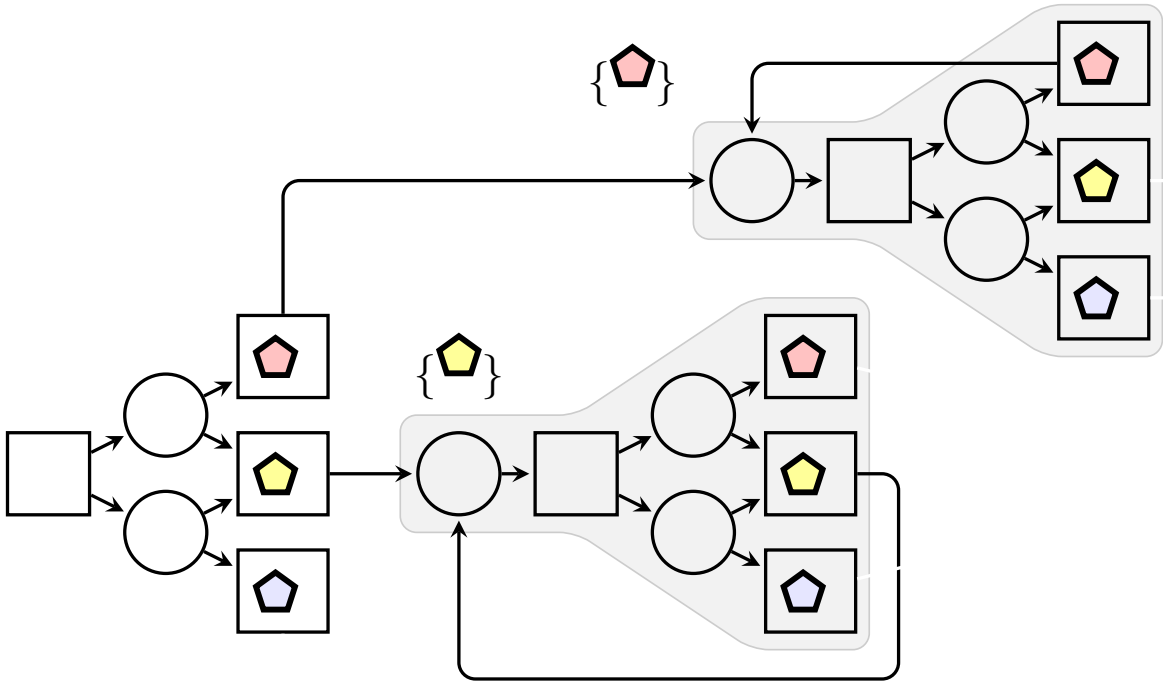

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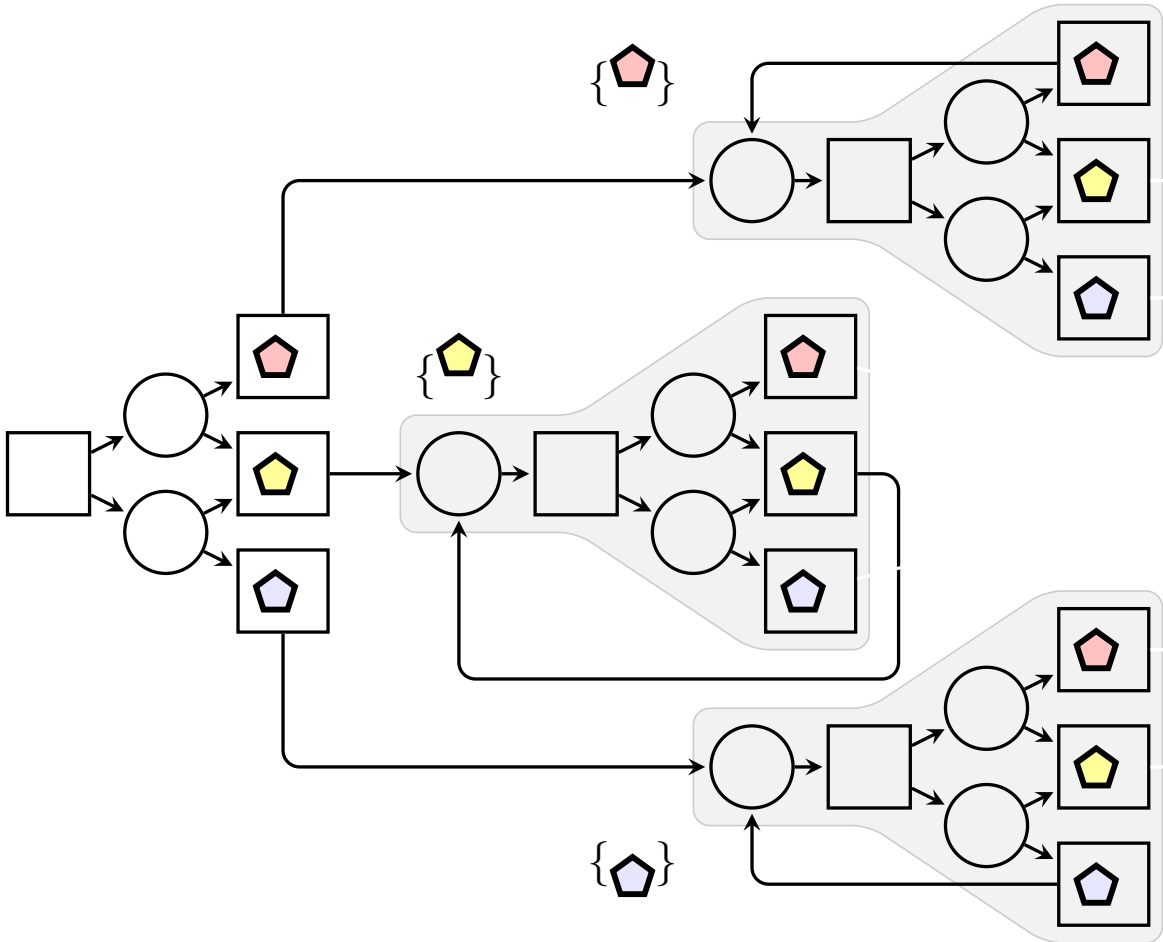

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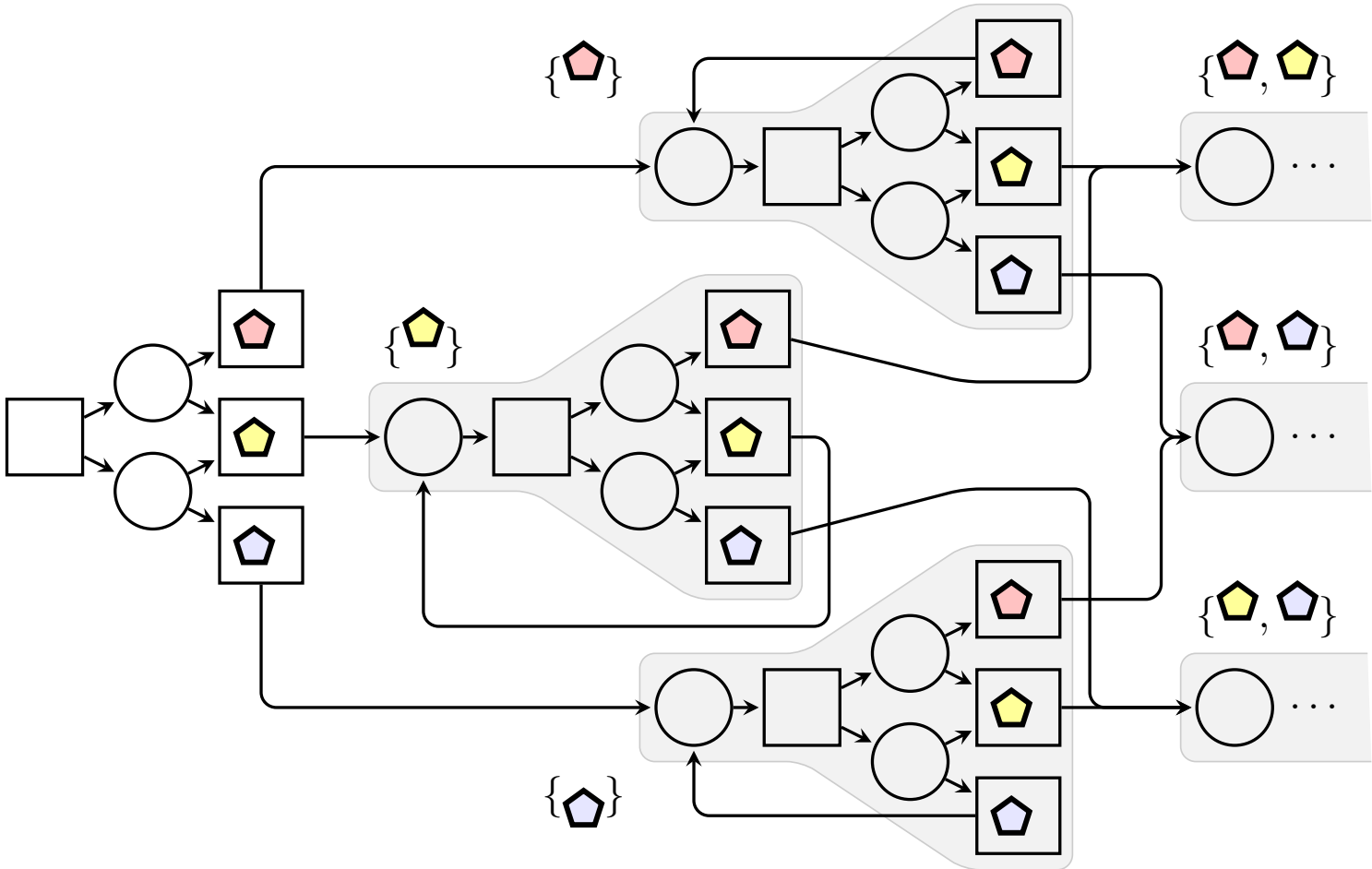

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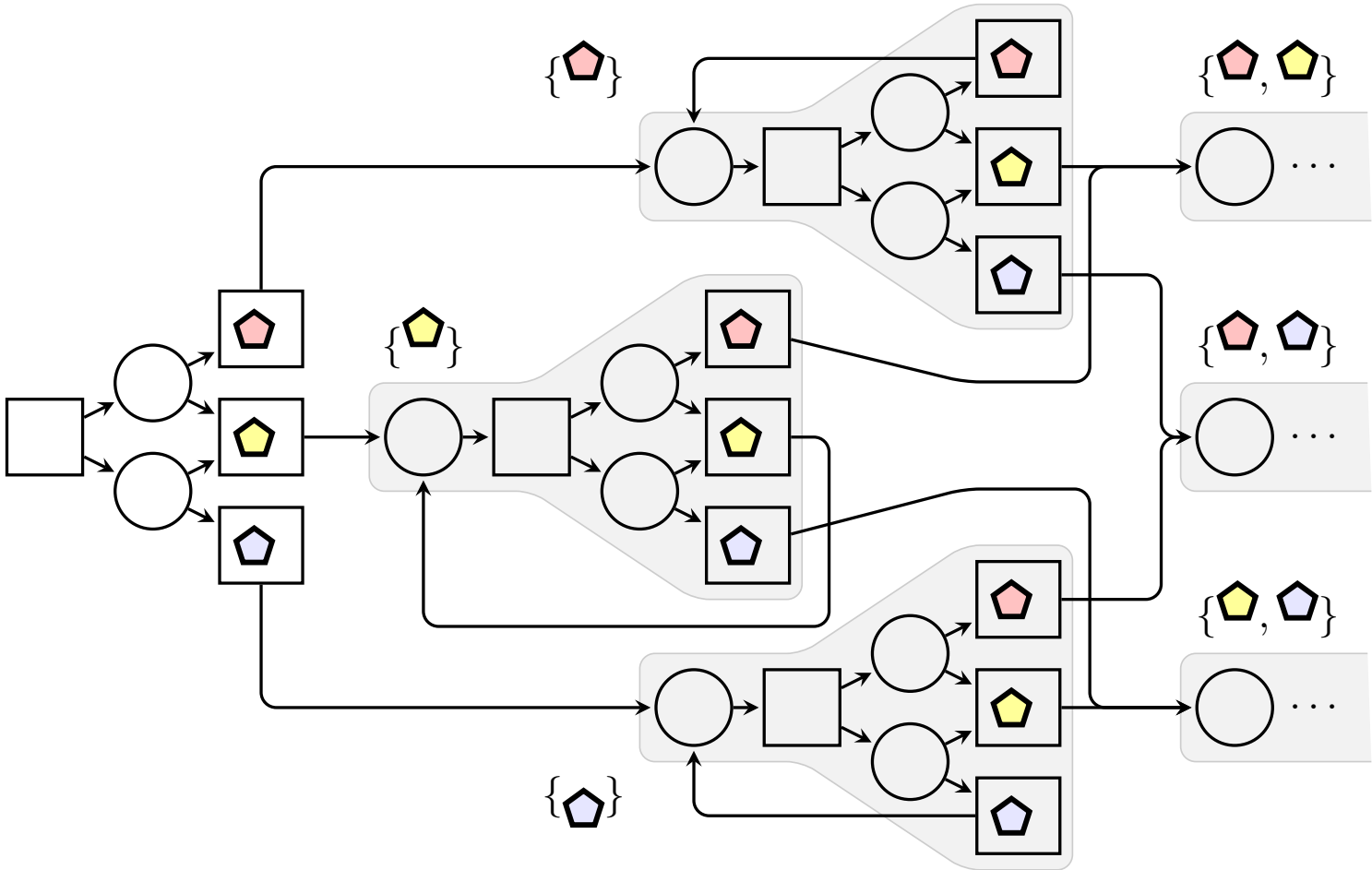
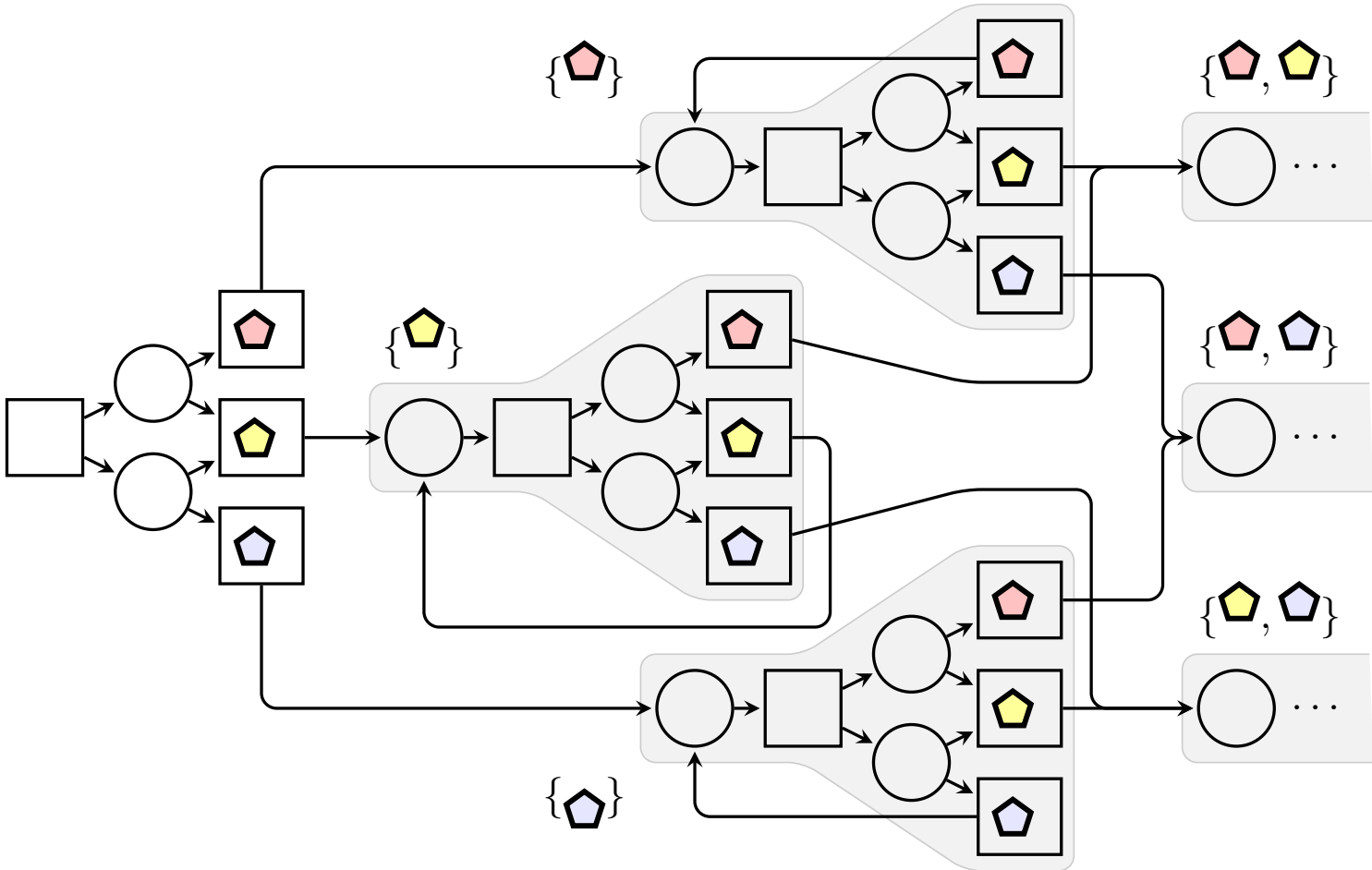


Winning condition:

Generalized Reachability: One Solution



Winning condition: Reach some memory state S with $S \cap \{\bigcirc, \bigcirc\} \neq \emptyset$ and with $S \cap \{\bigcirc, \bigcirc\} \neq \emptyset$

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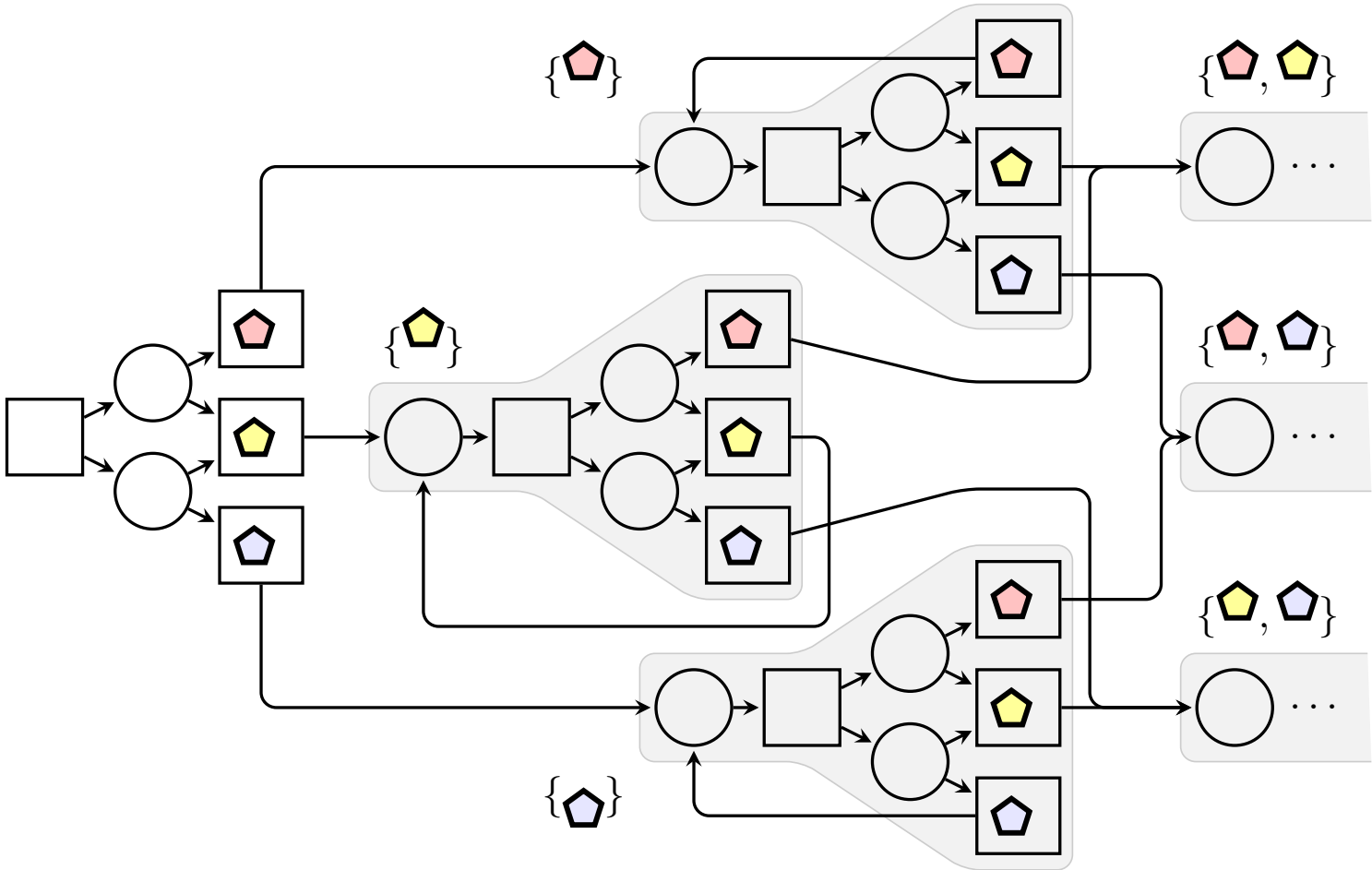

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Reachability Condition

The Big Picture

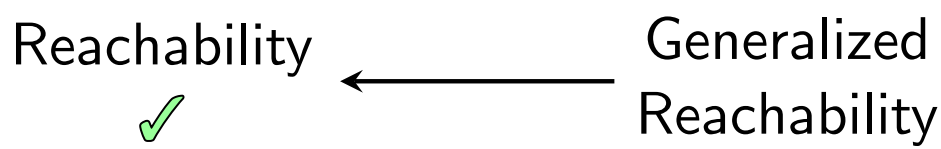
Reachability

The Big Picture

Reachability
✓

Generalized
Reachability

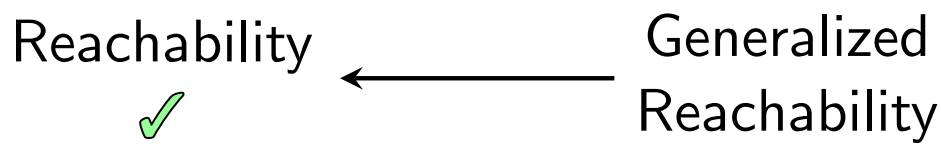
The Big Picture



The Big Picture

Quantitative

Qualitative



The Big Picture

Quantitative
Generalized
Reachability

Quantitative

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Quantitative Generalized Reachability

Assign cost to each play.

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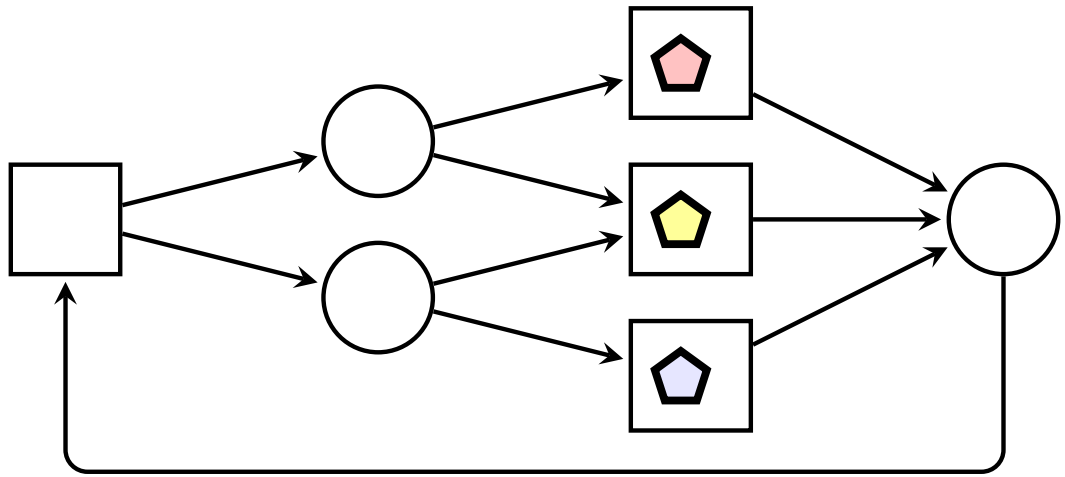

Quantitative Generalized Reachability

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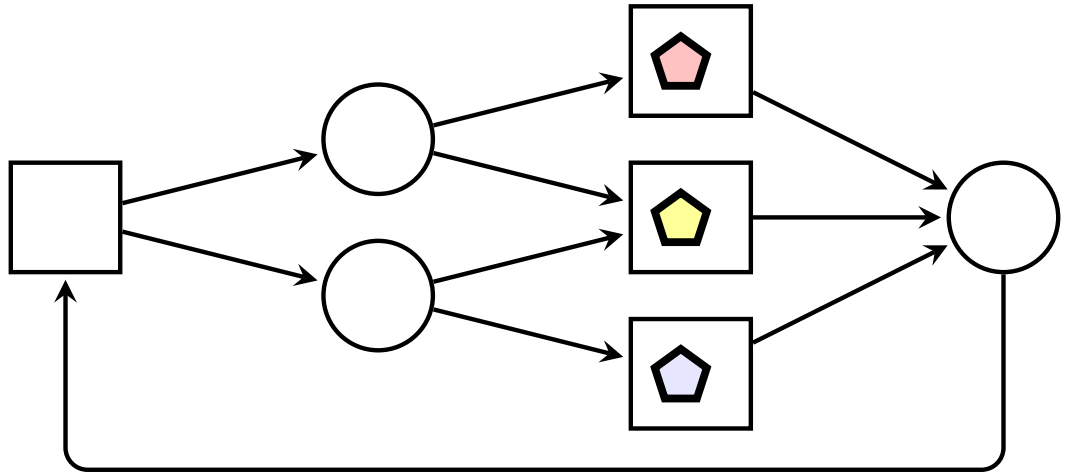

$$\mathrm{Cst}(\rho) = \begin{cases} 0 & \text{if } \{\text{🔴}, \text{🟡}\} \text{ and } \{\text{🟡}, \text{🔵}\} \text{ are visited} \\ 1 & \text{if one of them is visited} \\ 2 & \text{if neither is visited} \end{cases}$$

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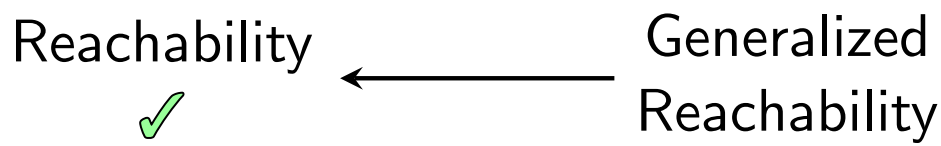
Quantitative

Qualitative



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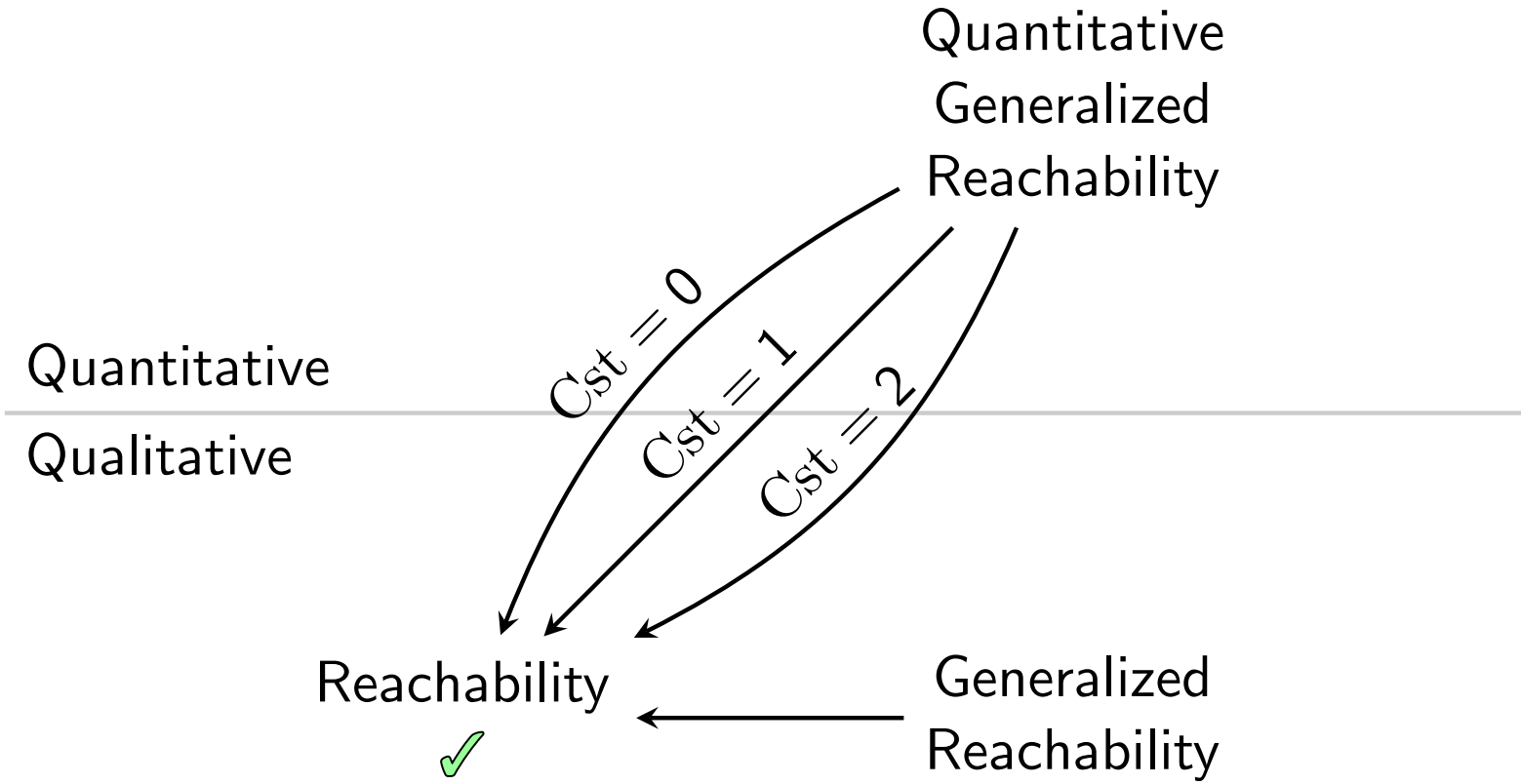

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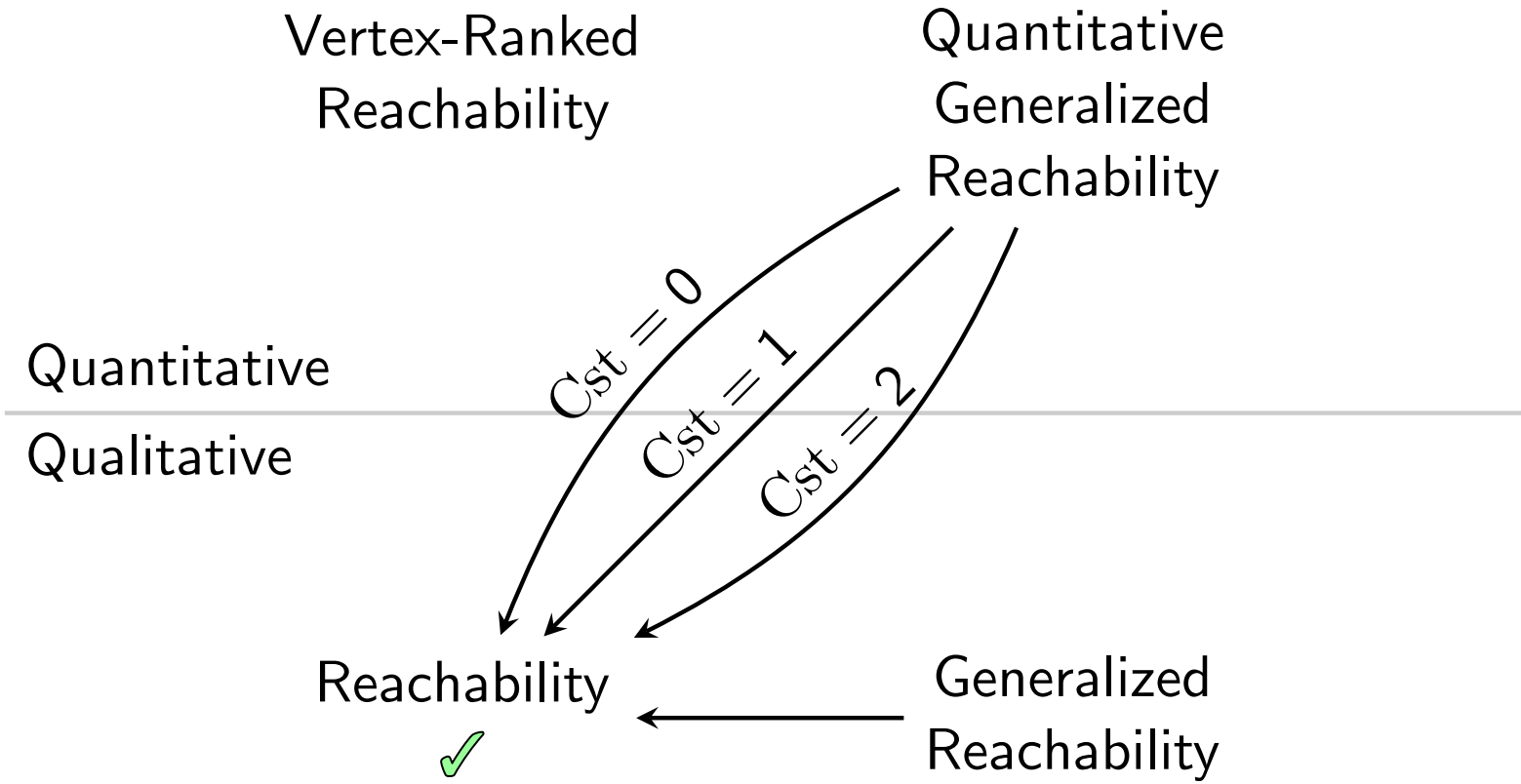

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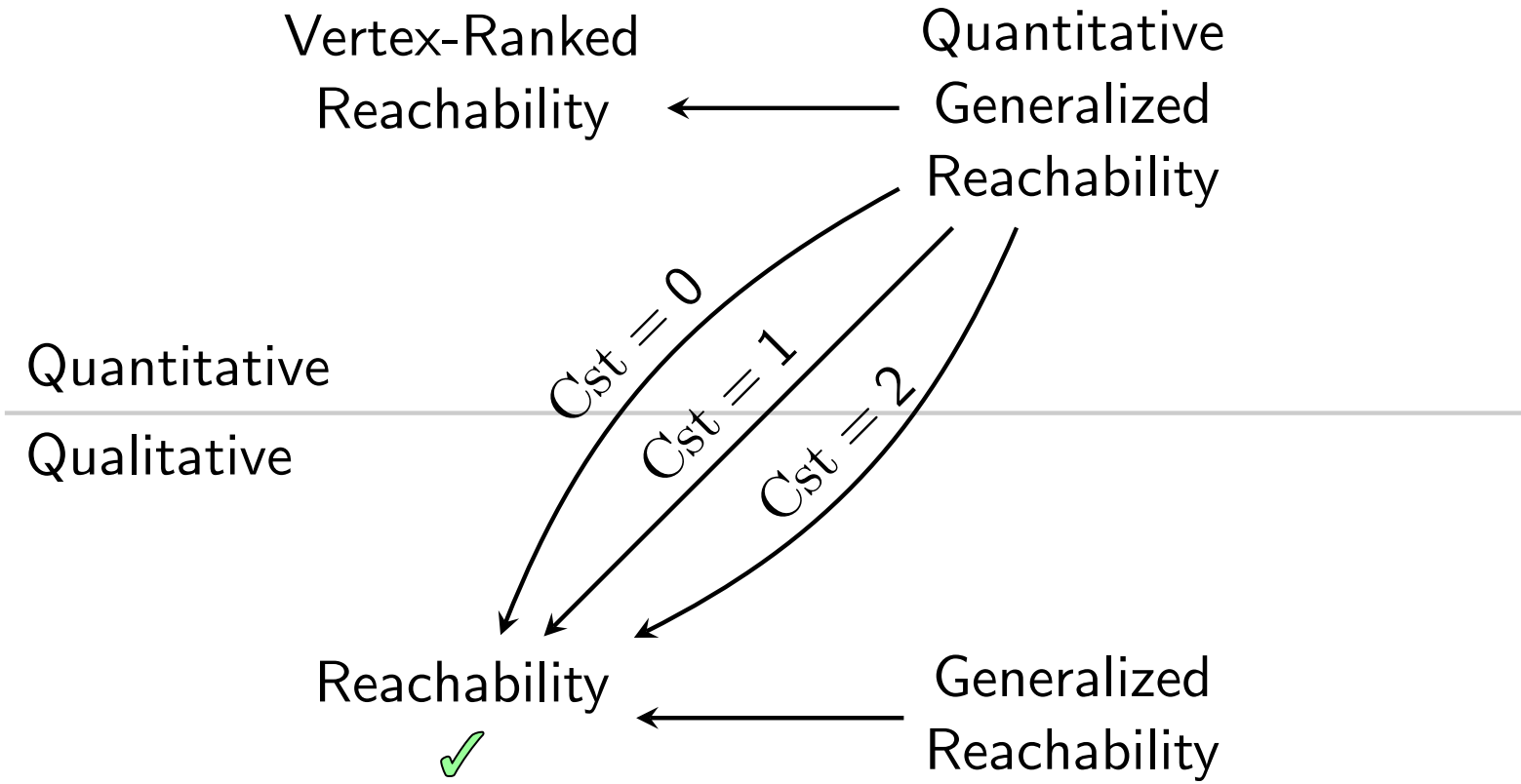

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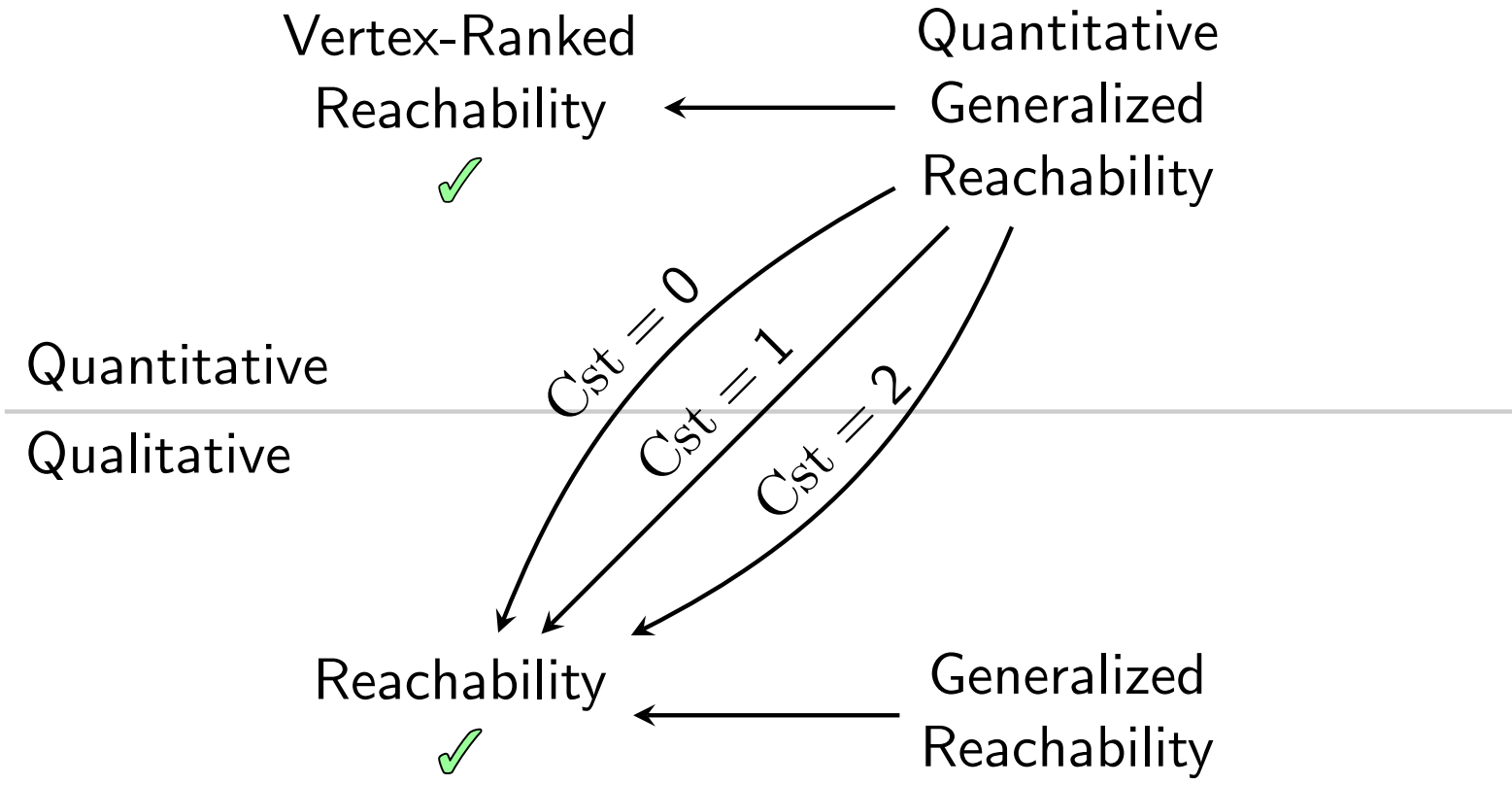

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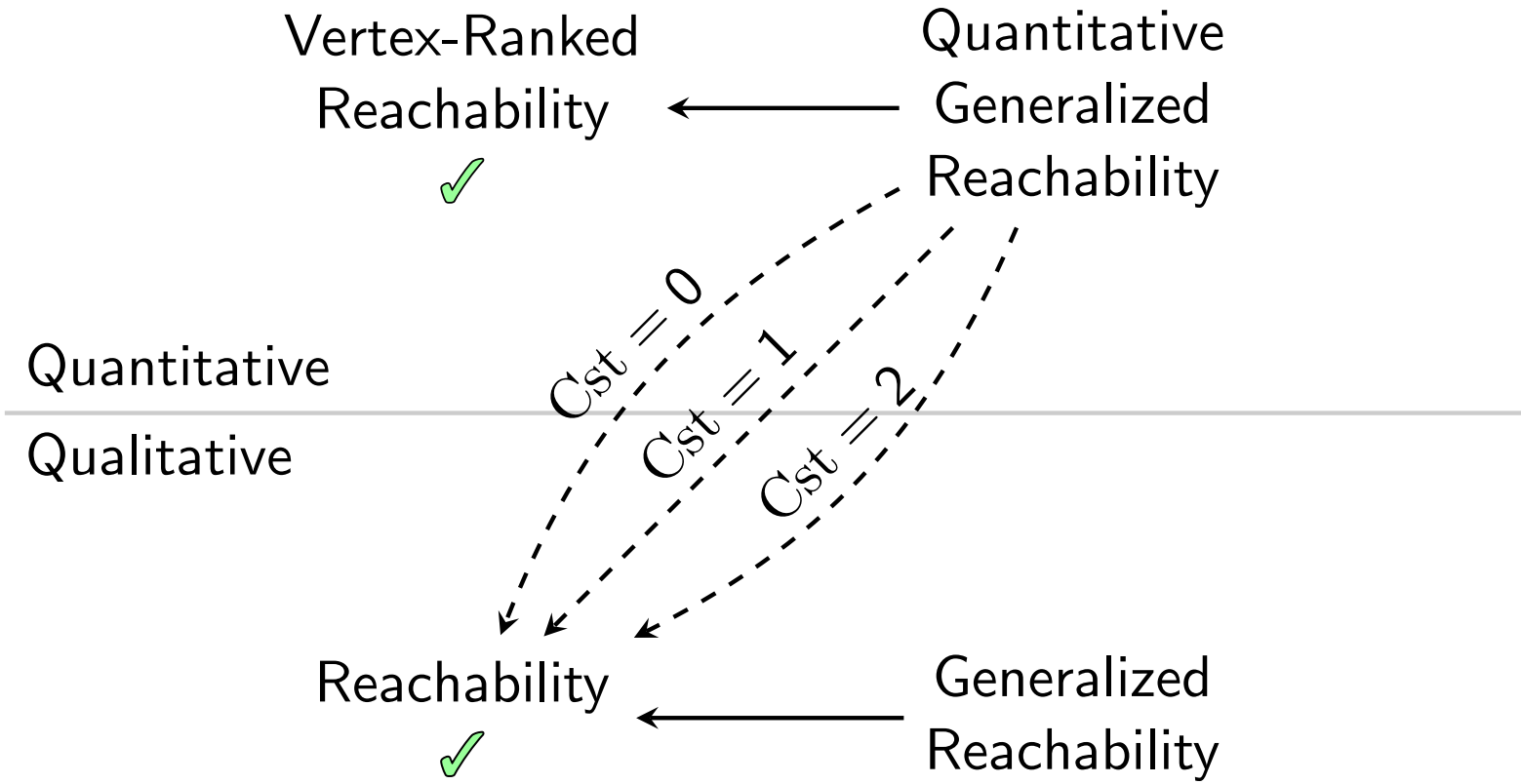

Conclusion

Contribution

- Lifted reductions to quantitative games

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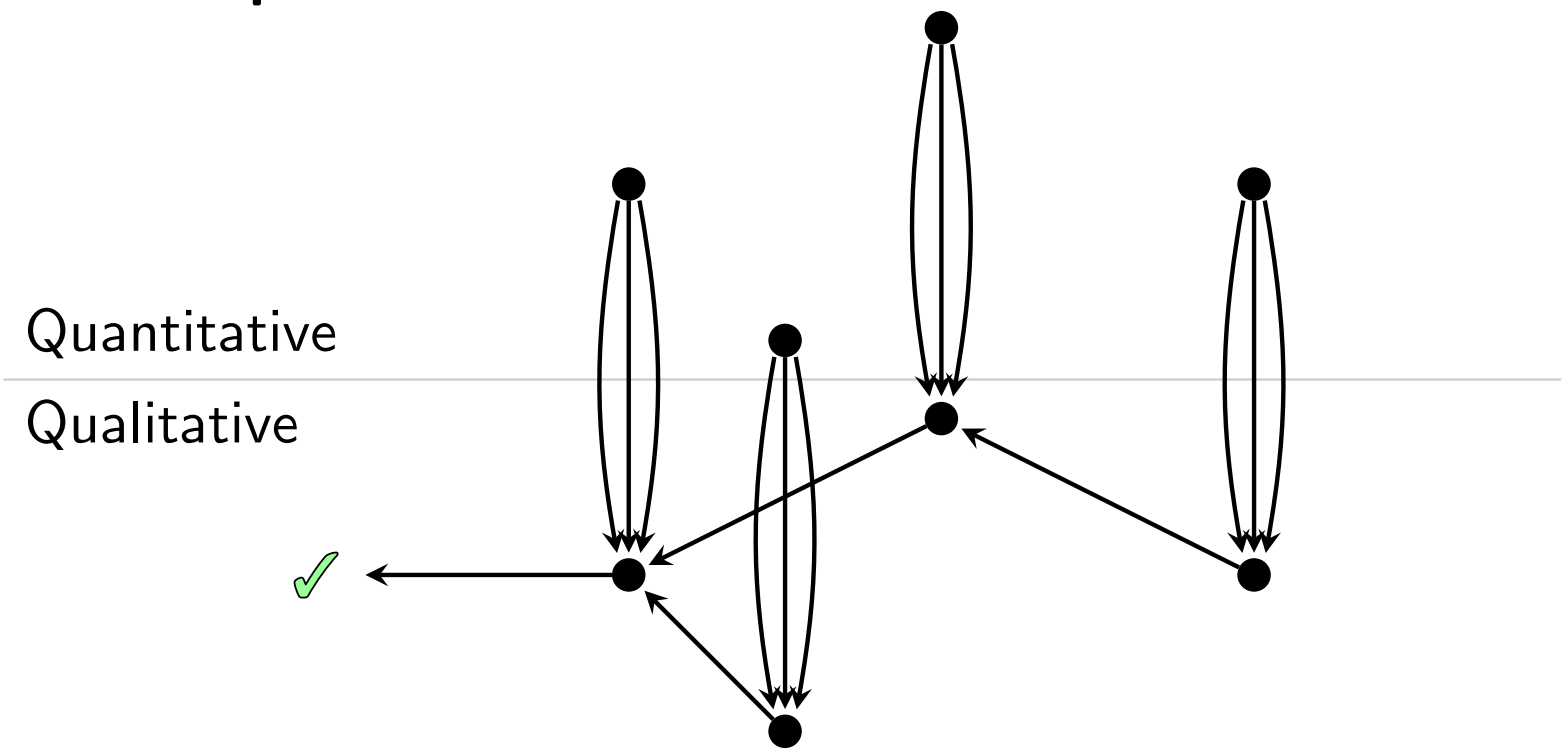

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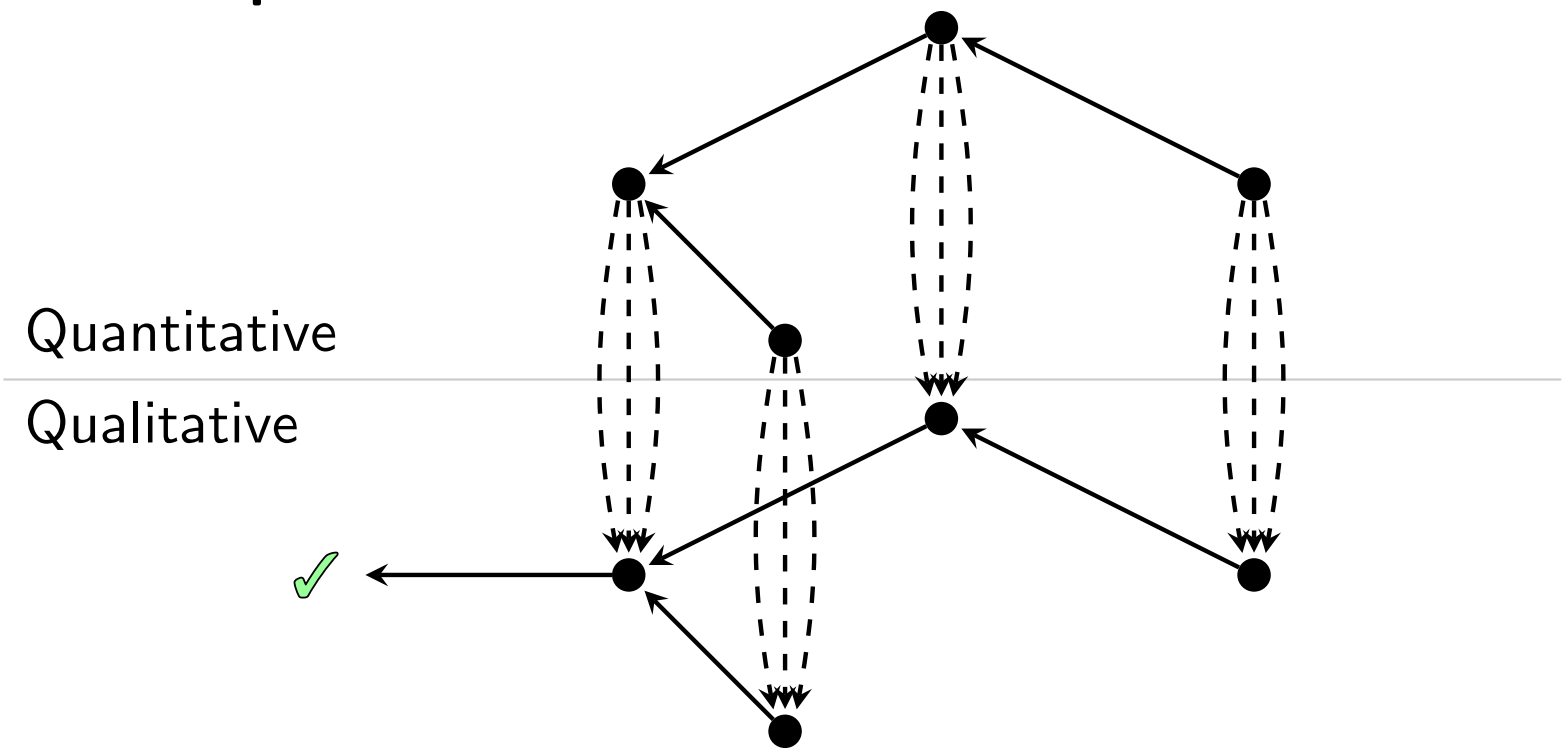

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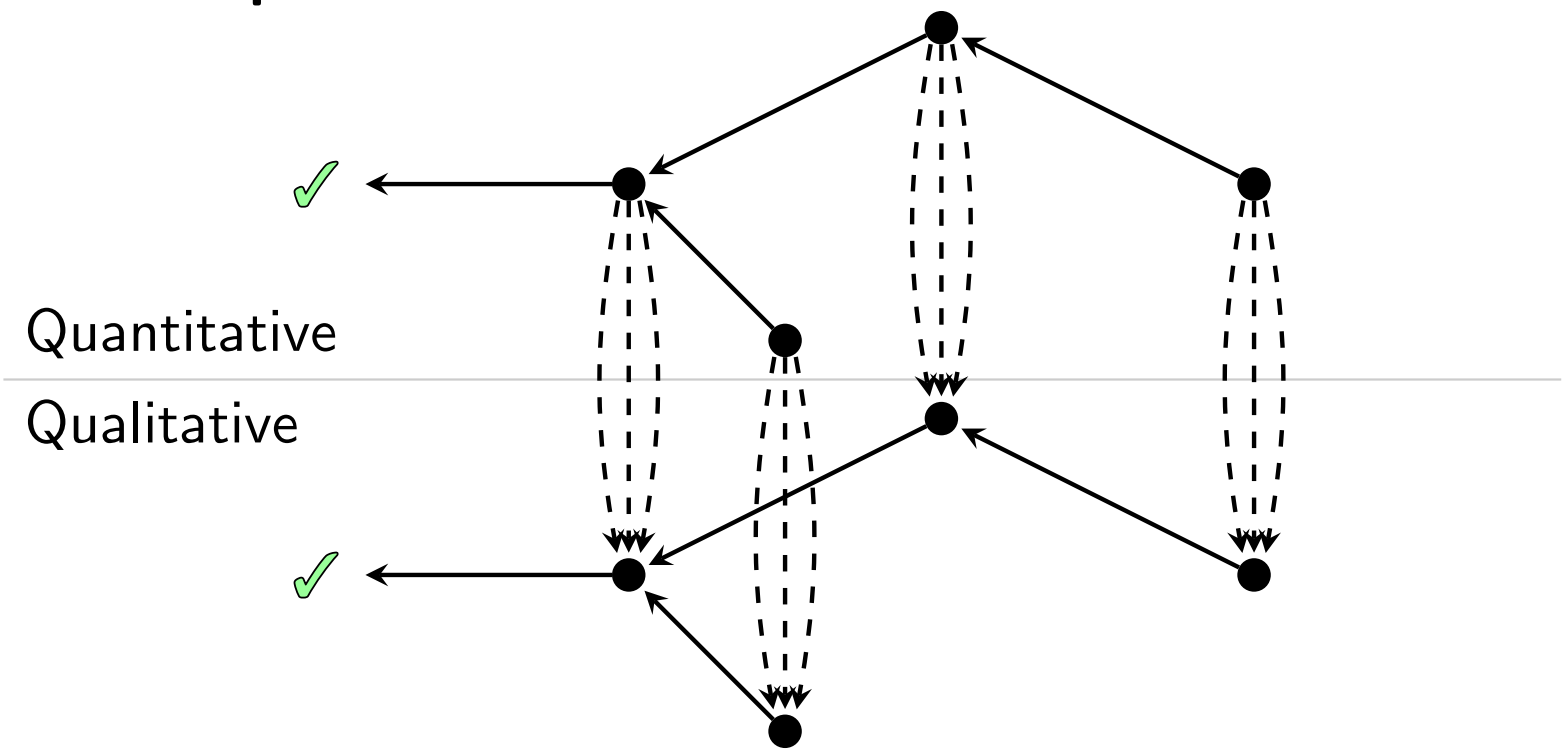
Next Steps