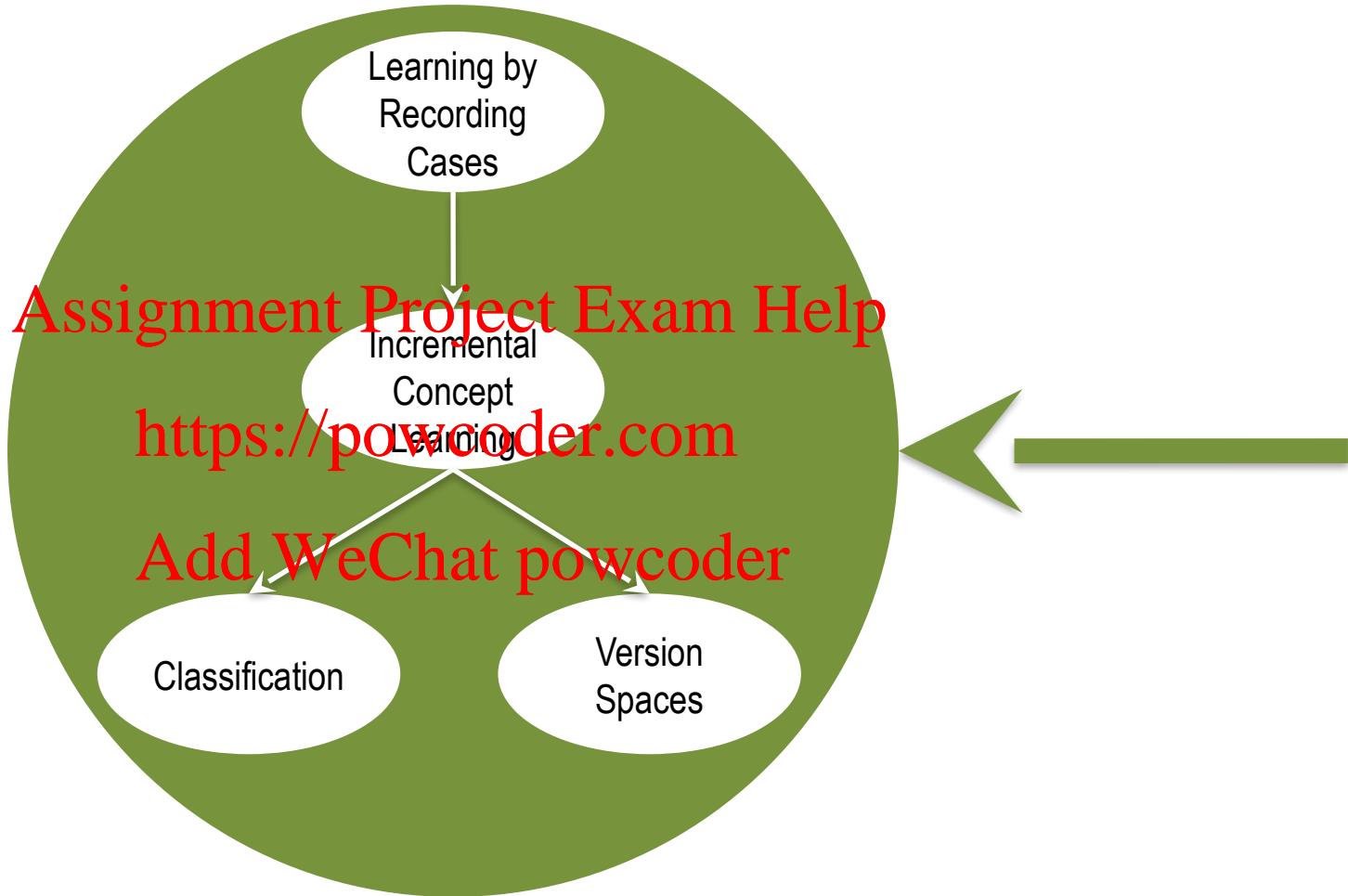




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Incremental
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Concept
Learning
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Learning



Lesson Preview

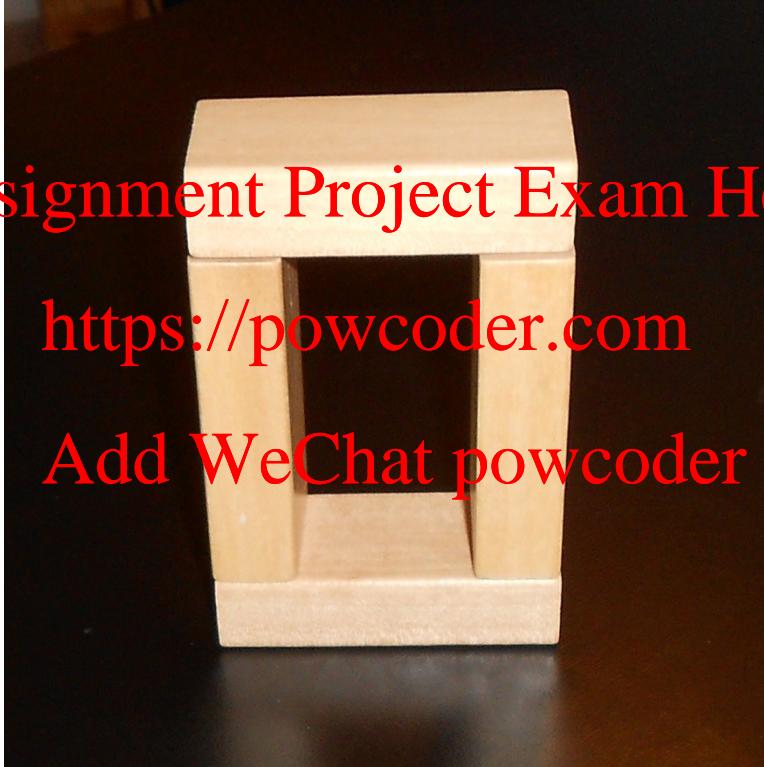
- Purpose of incremental concept learning
- Variabilization
- Specialization
- Generalization
- Heuristics for specialization and generalization

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This is a foo.



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This is not a foo.



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This is a foo.

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Is this a foo?



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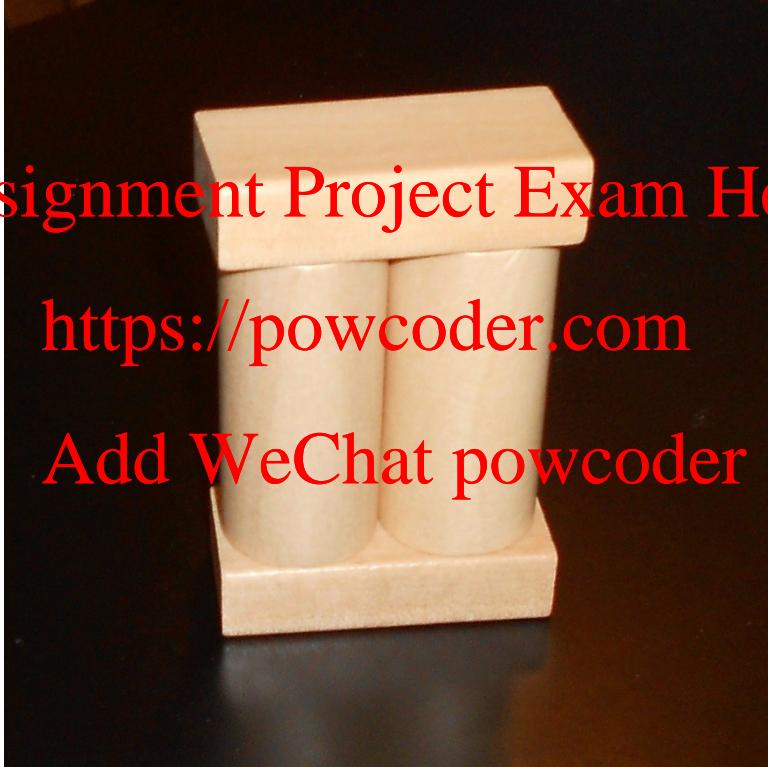
Yes

No

Is this a foo?

Yes

No



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Is this a foo?

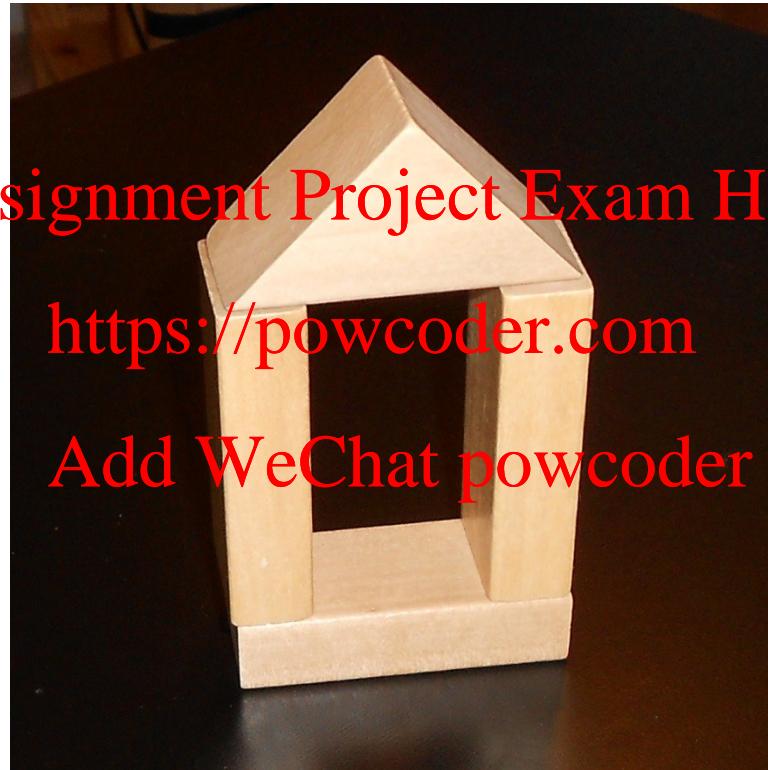
Yes

No

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Is this a foo?

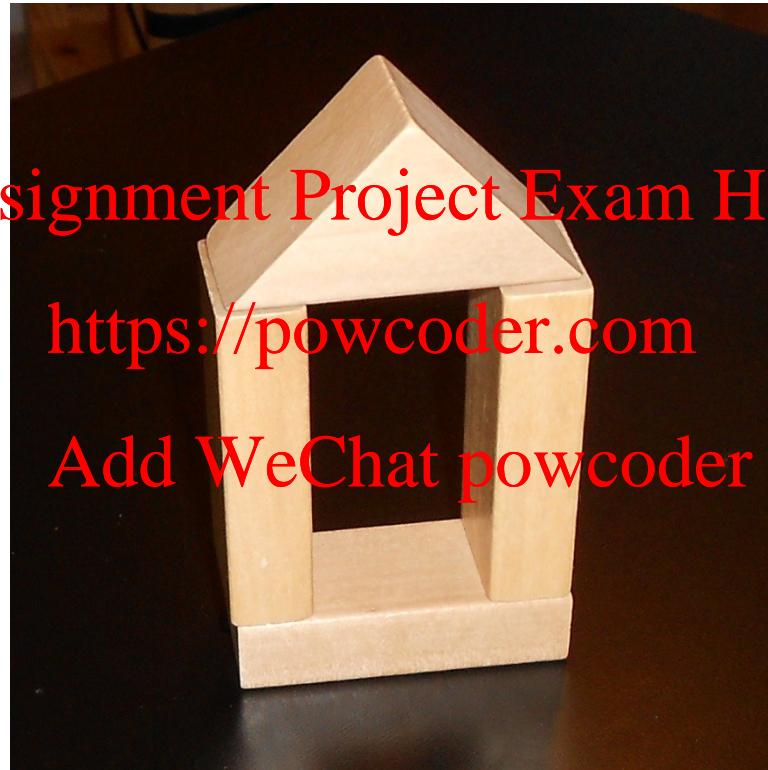
Yes

No

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Is this a foo?

Yes

No

Assignment Project Exam Help

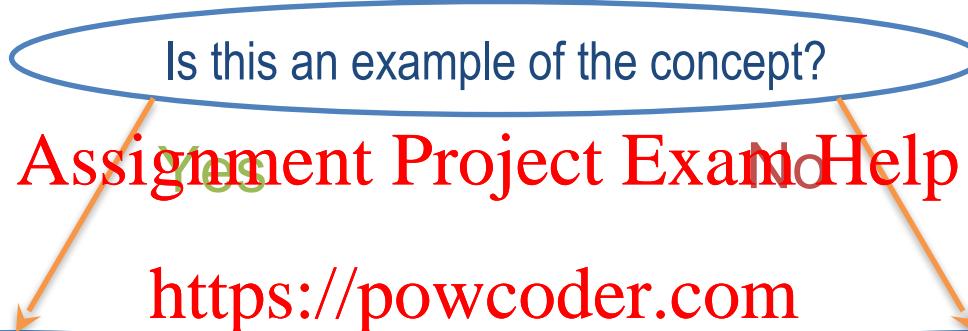
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Incremental Concept Learning

Given new example:



Does it fit the current
definition of the concept?

Yes

Do nothing

No

Generalize

Does it fit the current
definition of the concept?

Yes

Specialize

No

Do nothing



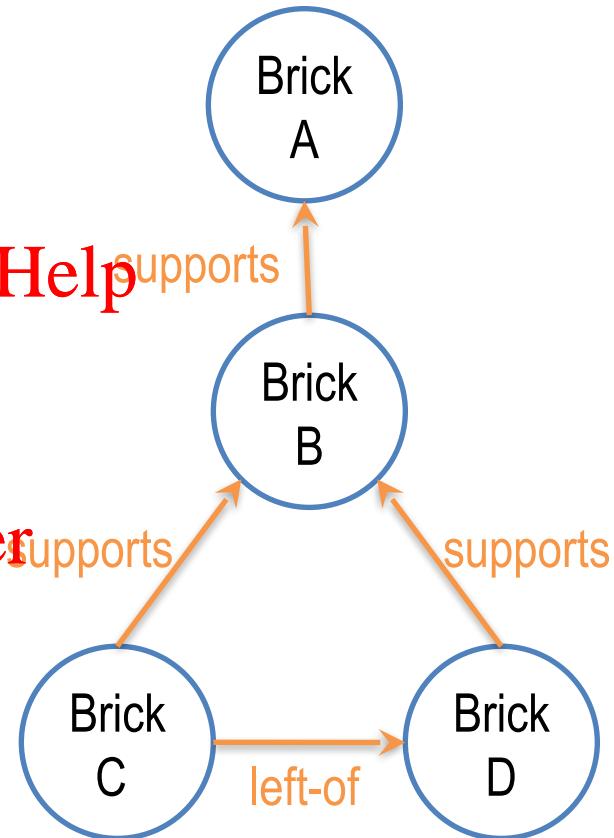
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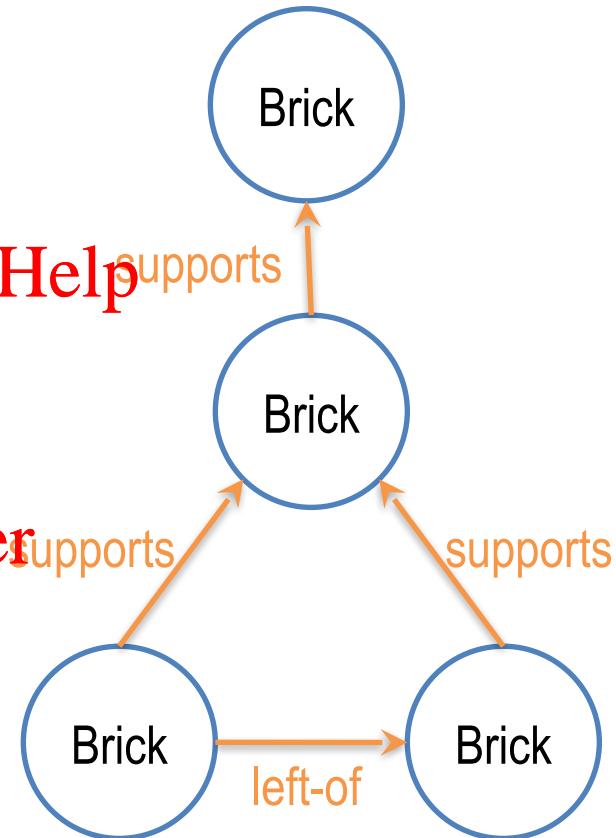


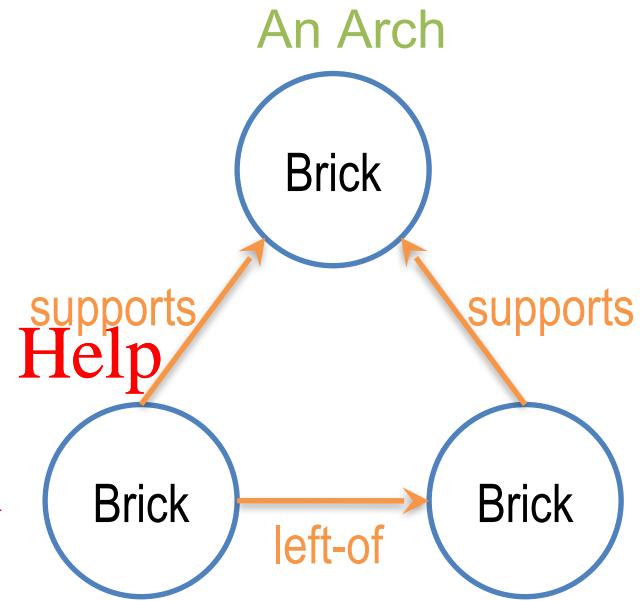
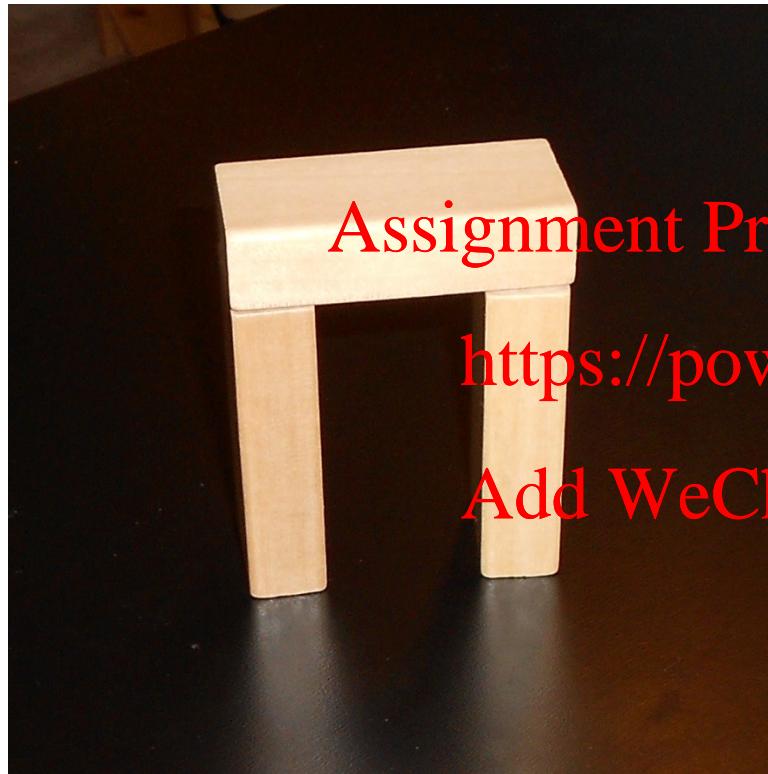
An Arch



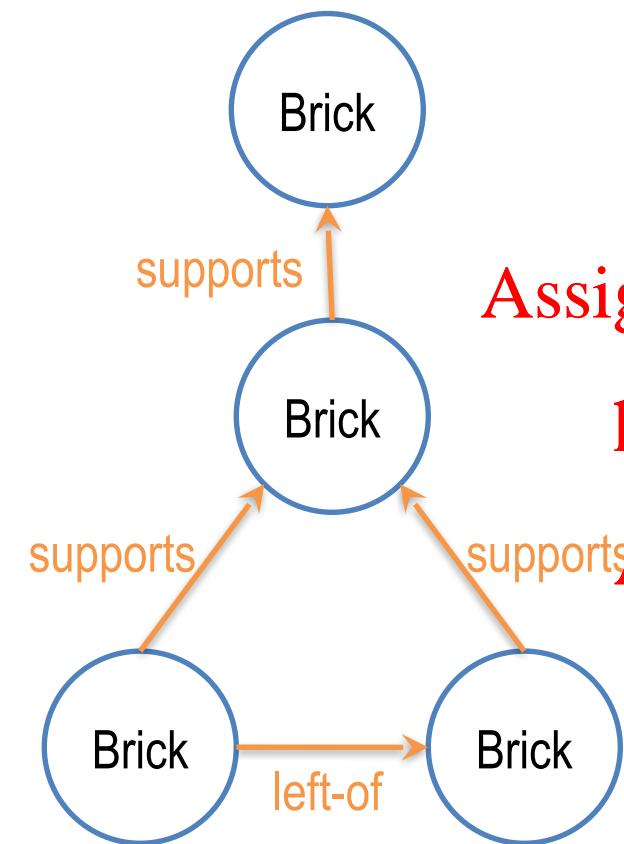


An Arch

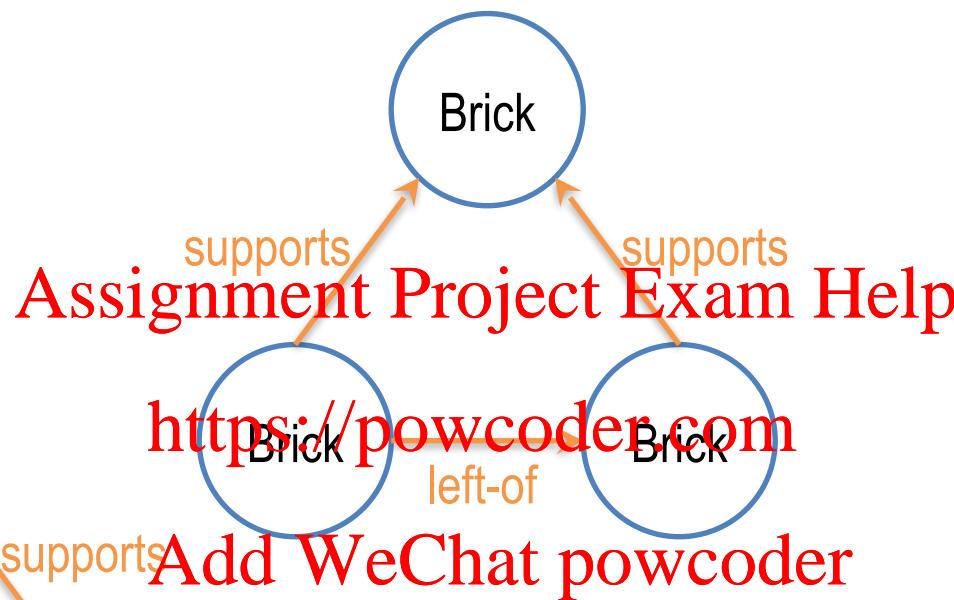




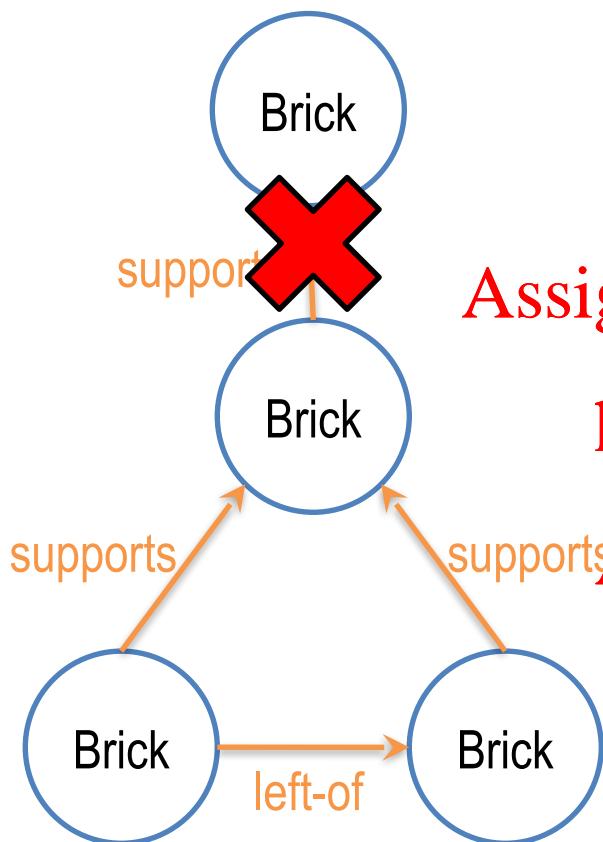
Current Concept



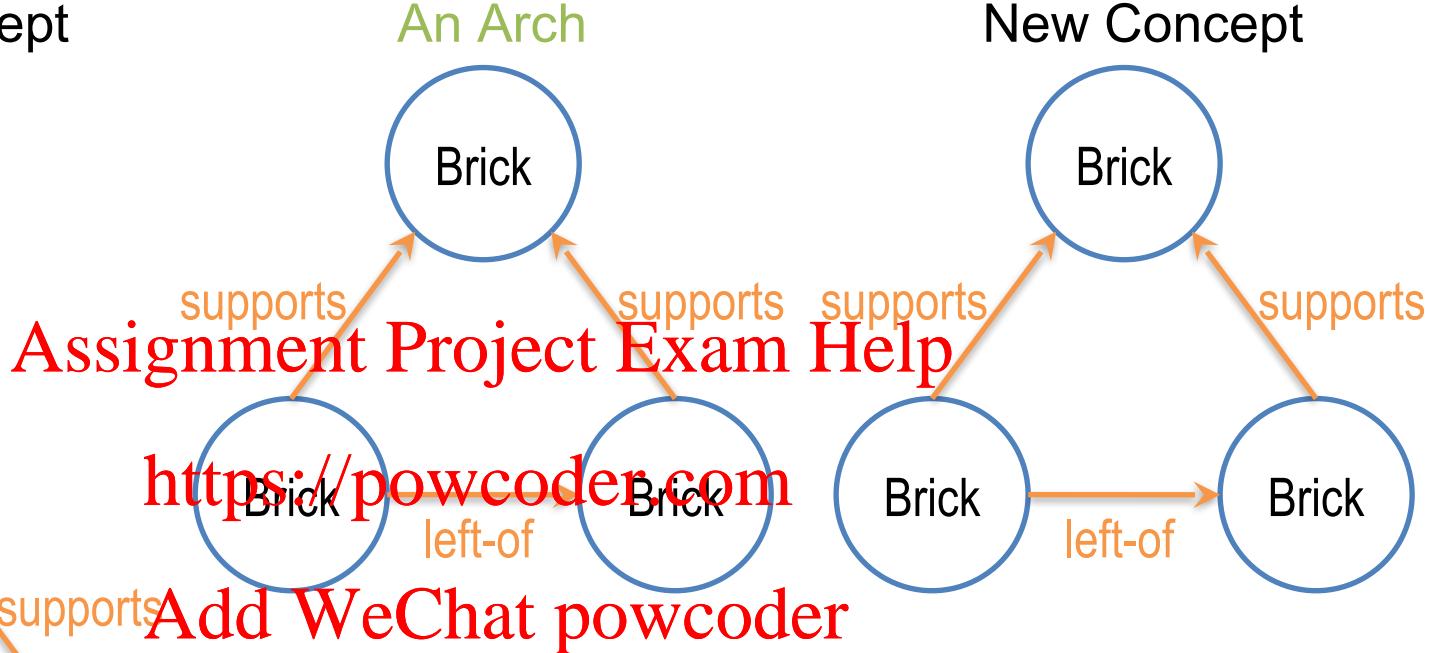
An Arch



Current Concept

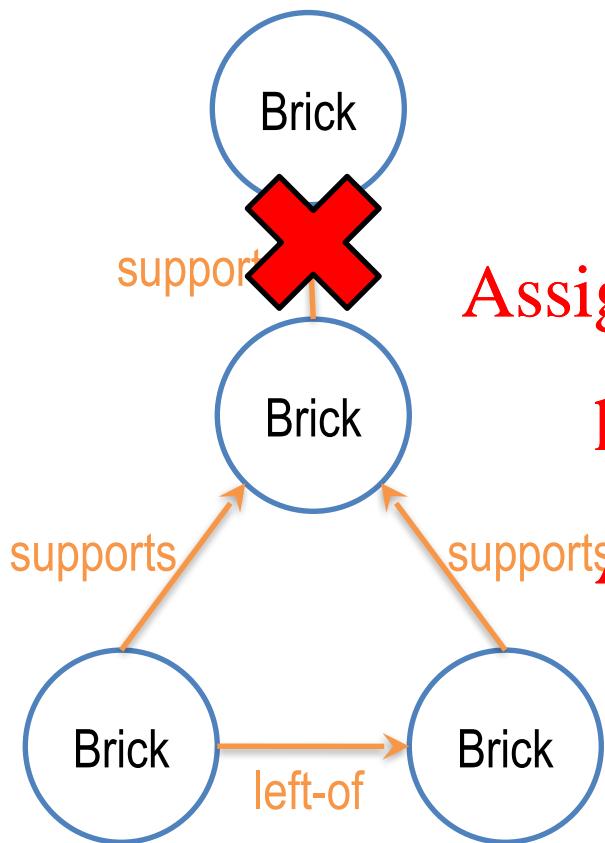


An Arch

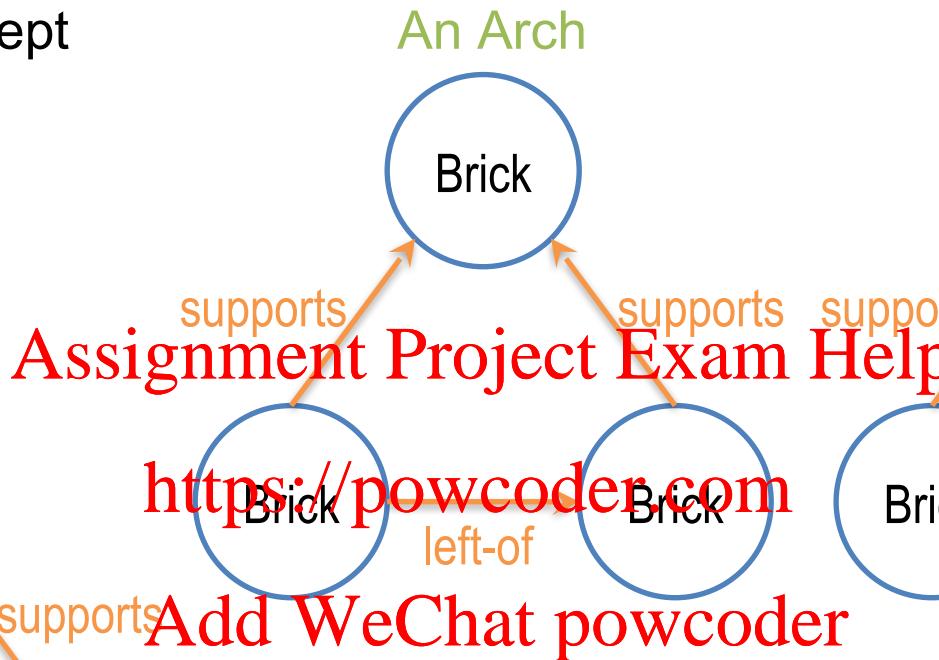


New Concept

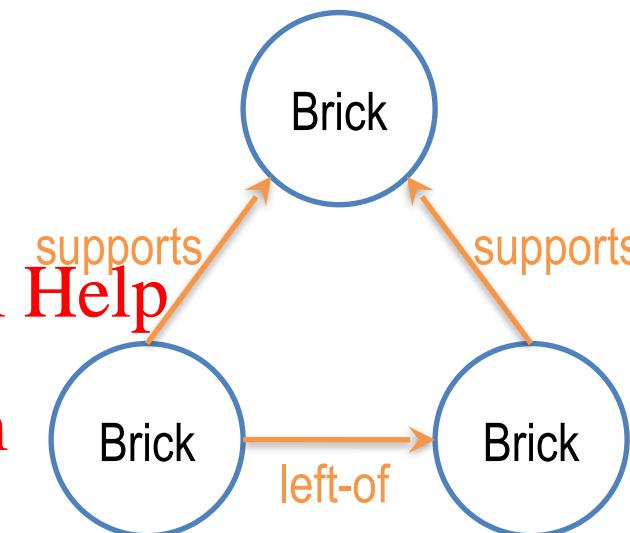
Current Concept



An Arch

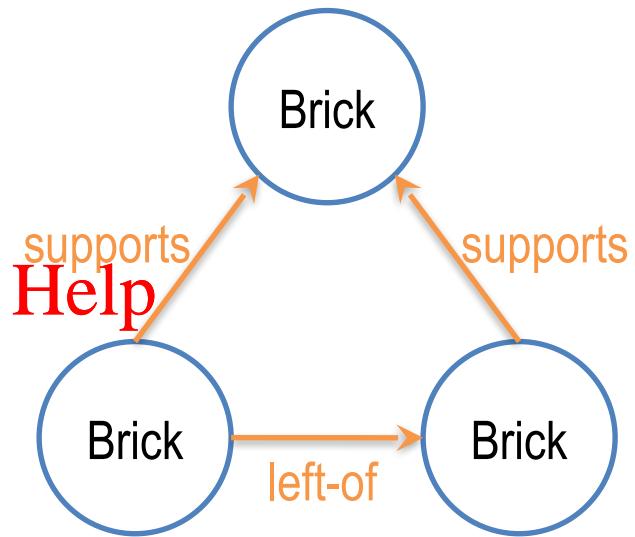


New Concept



“drop-link” heuristic

Current Concept



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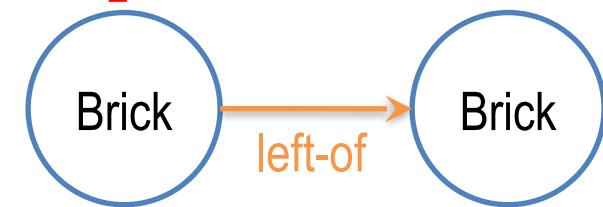
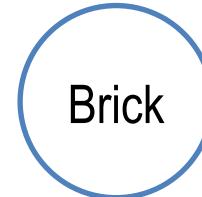


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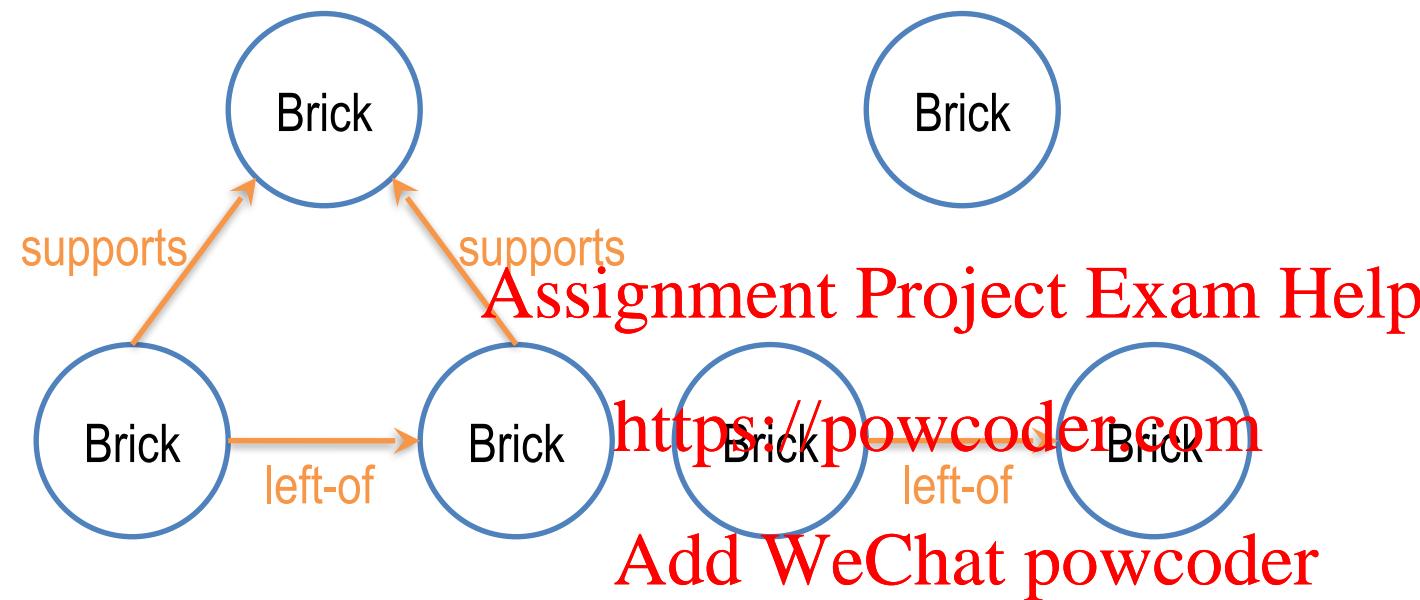
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Add WeChat powcoder

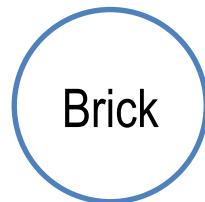
Not an Arch



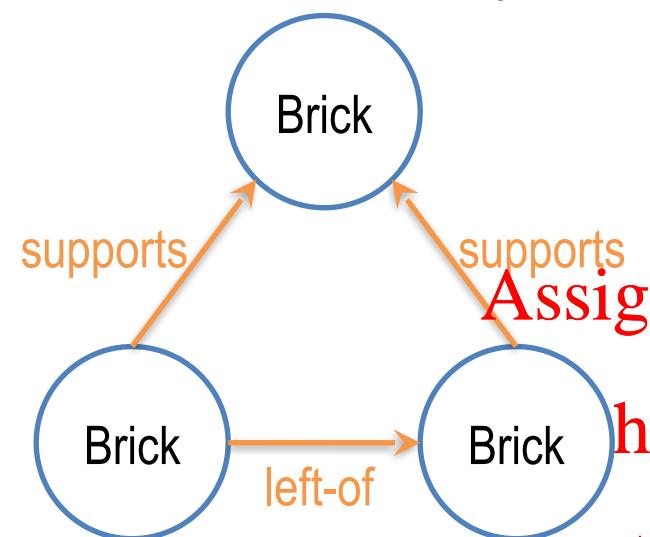
Current Concept



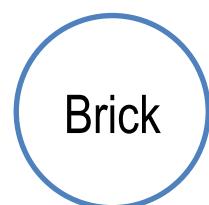
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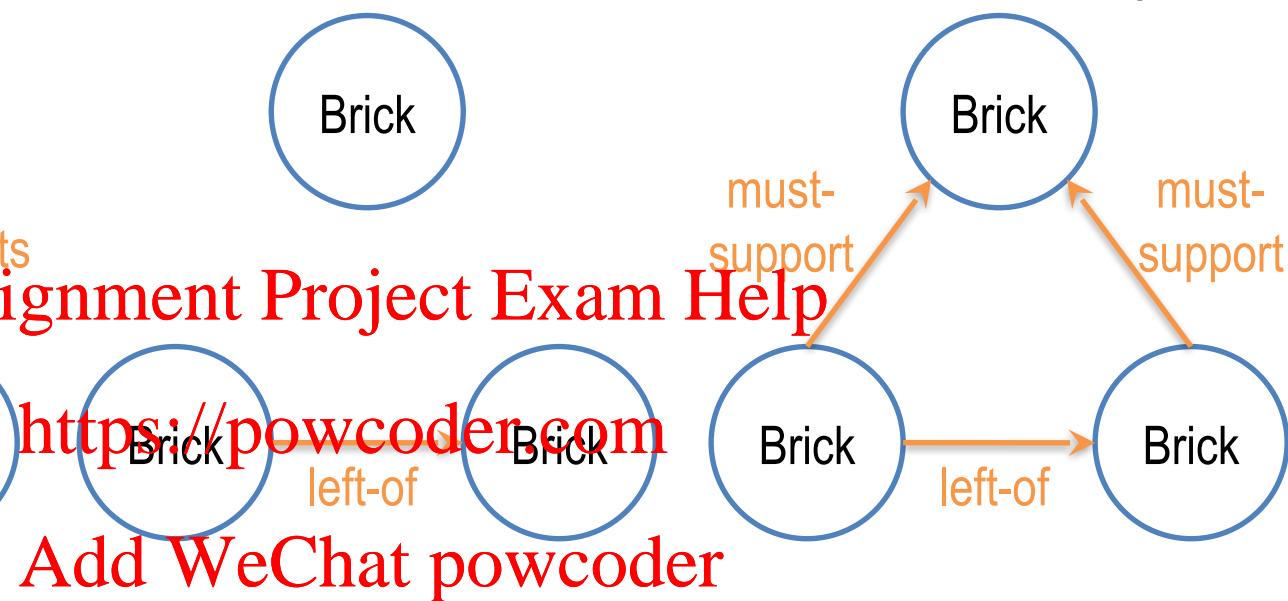
Current Concept



Not an Arch



New Concept

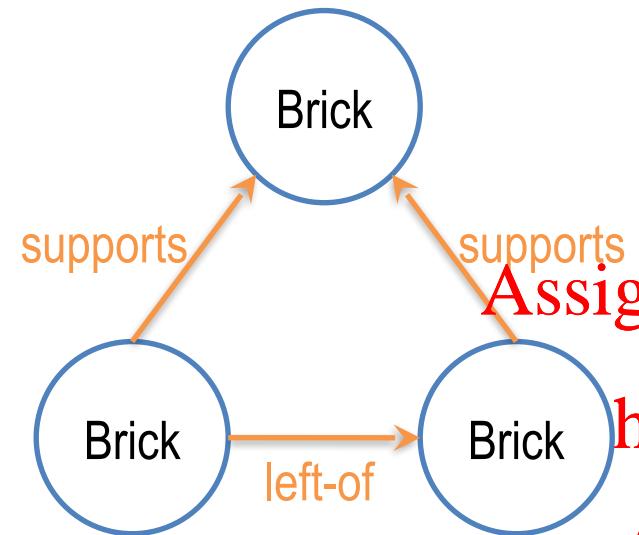


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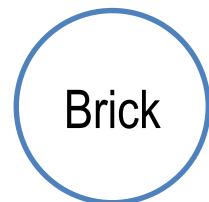
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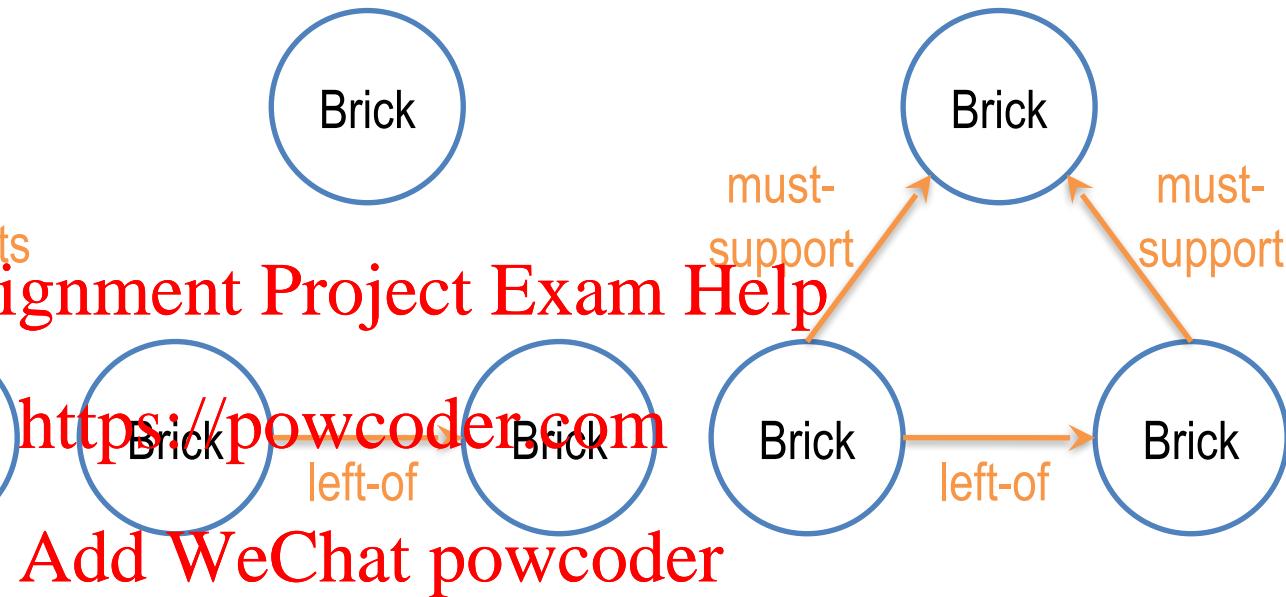
Current Concept



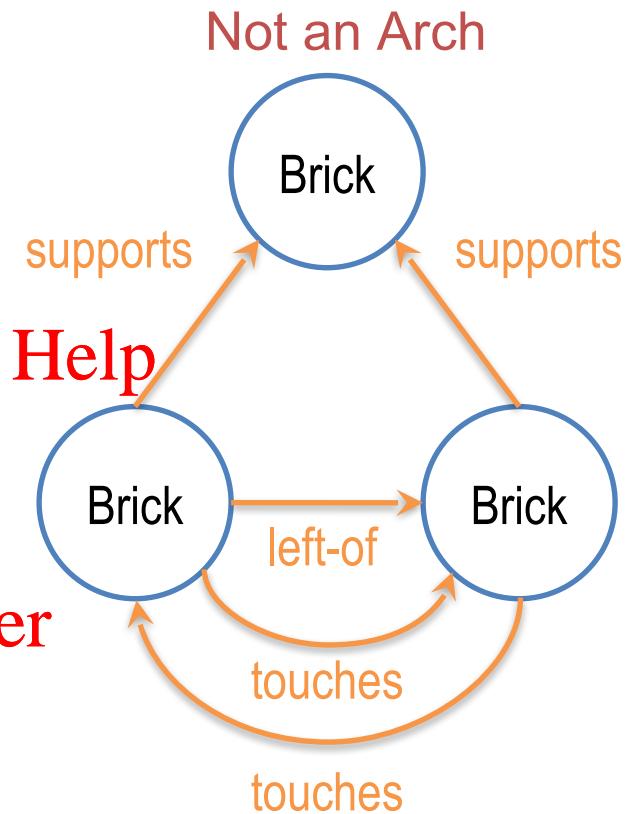
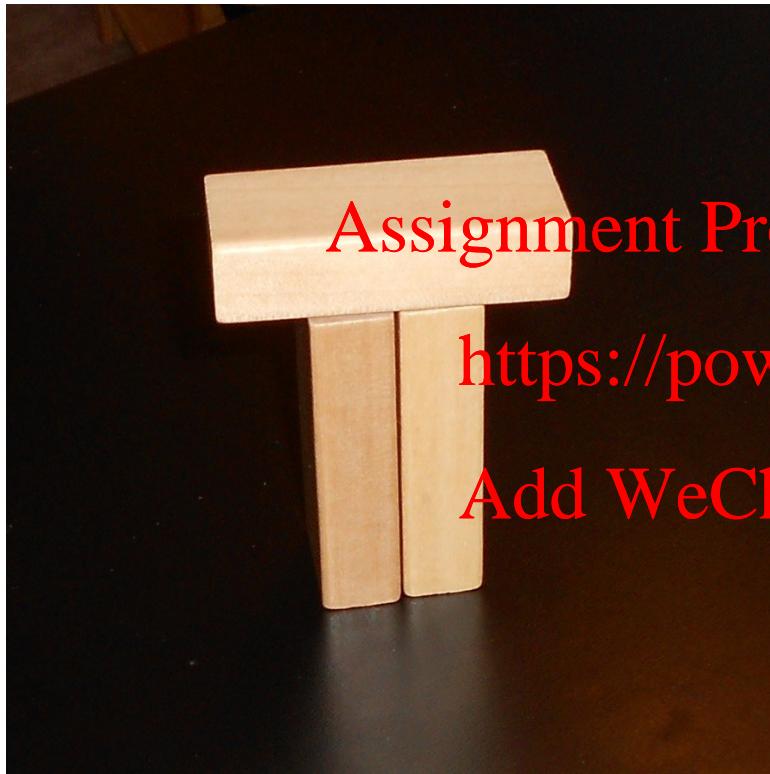
Not an Arch



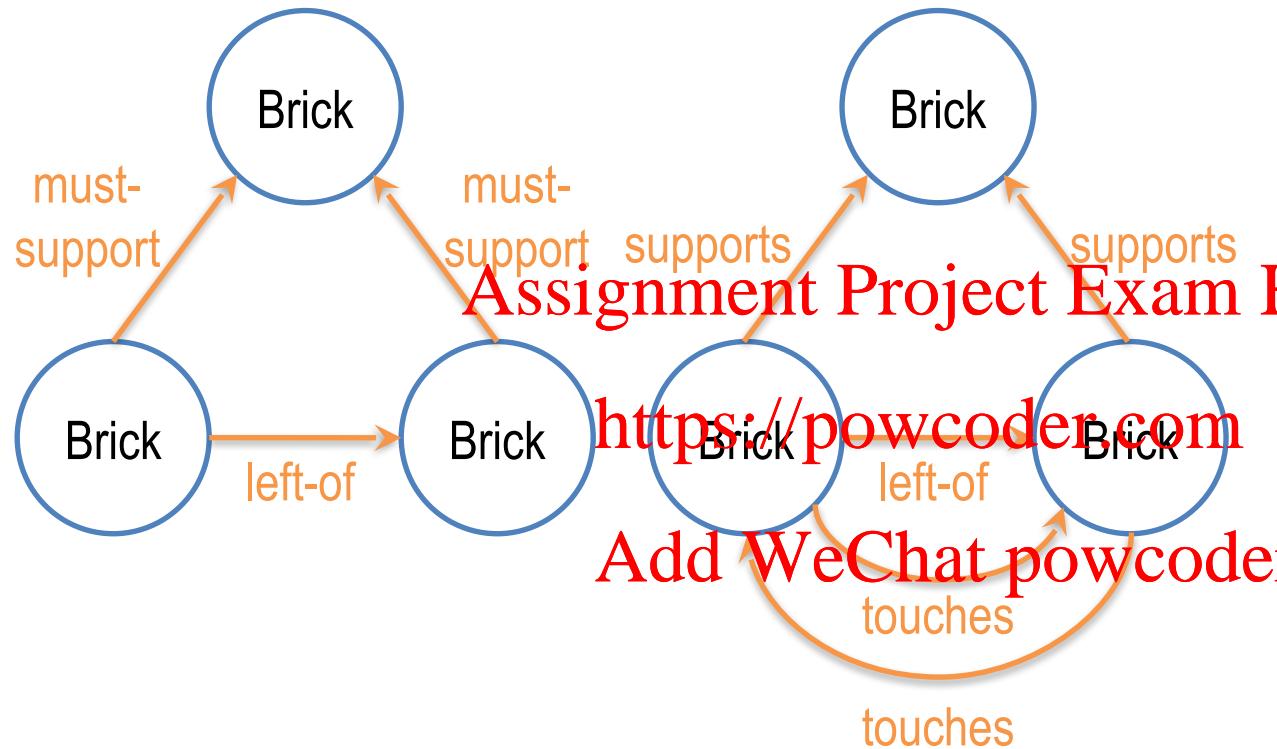
New Concept



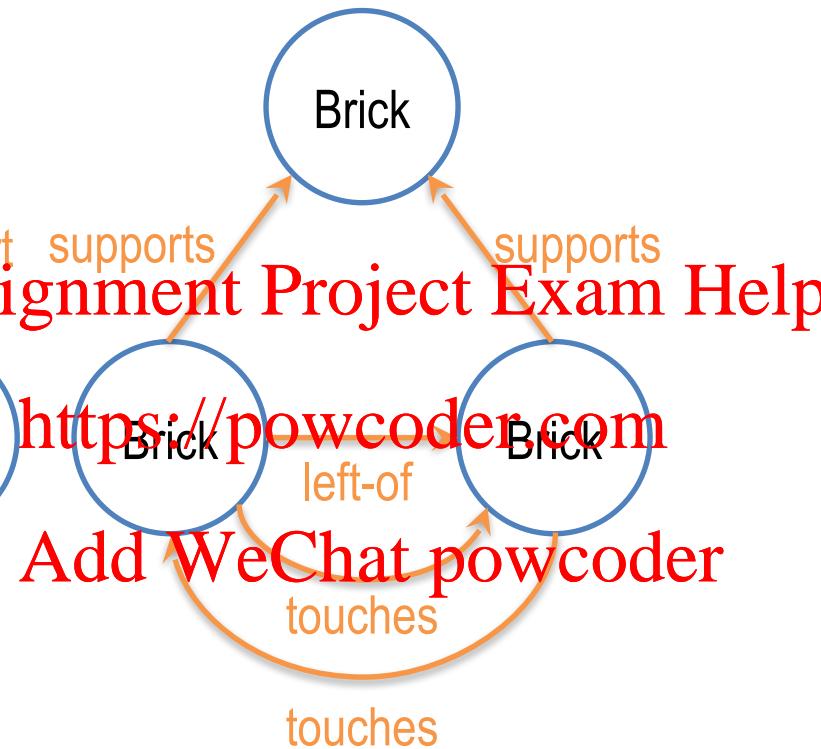
“require-link” heuristic



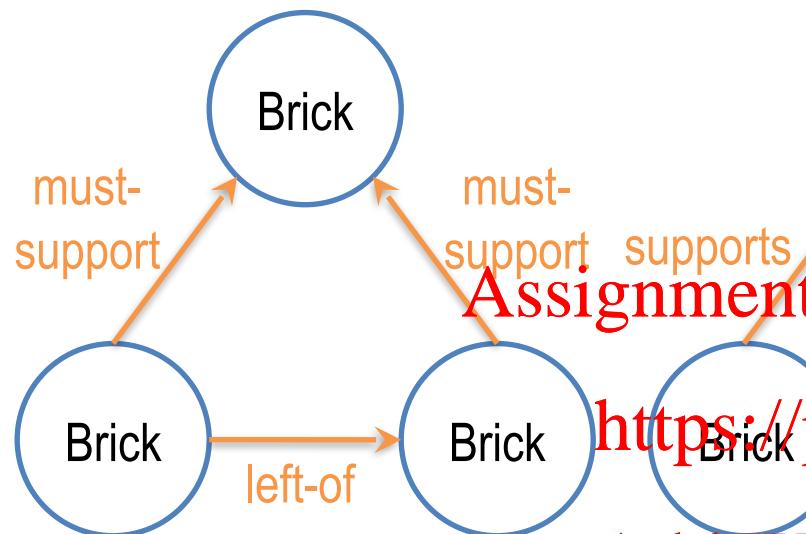
Current Concept



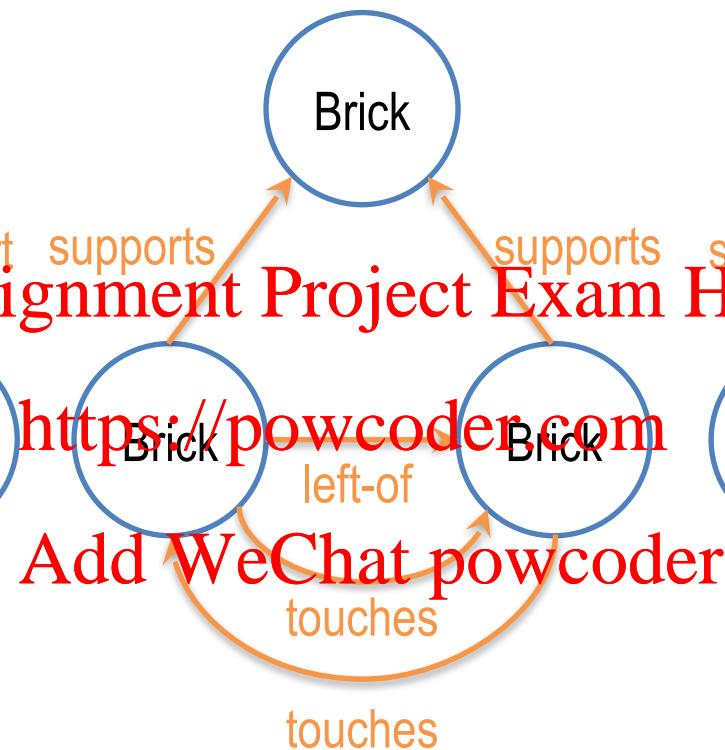
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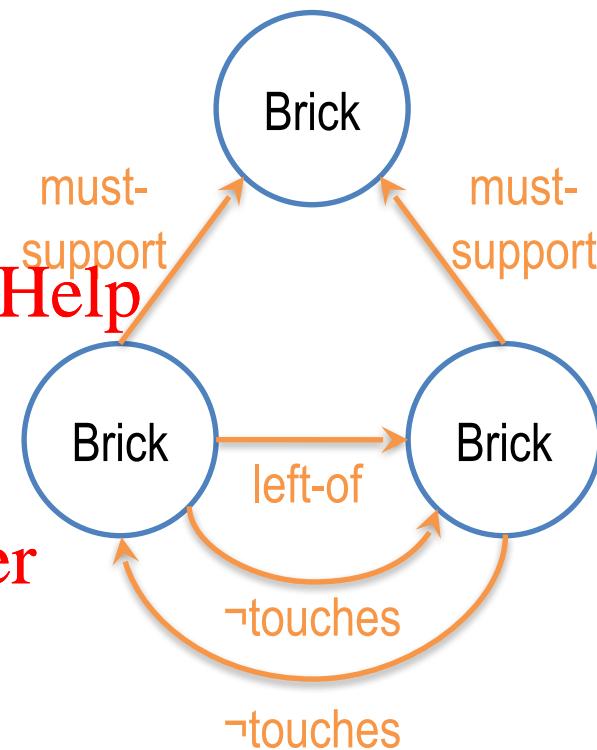
Current Concept



Not an Arch



New Concept



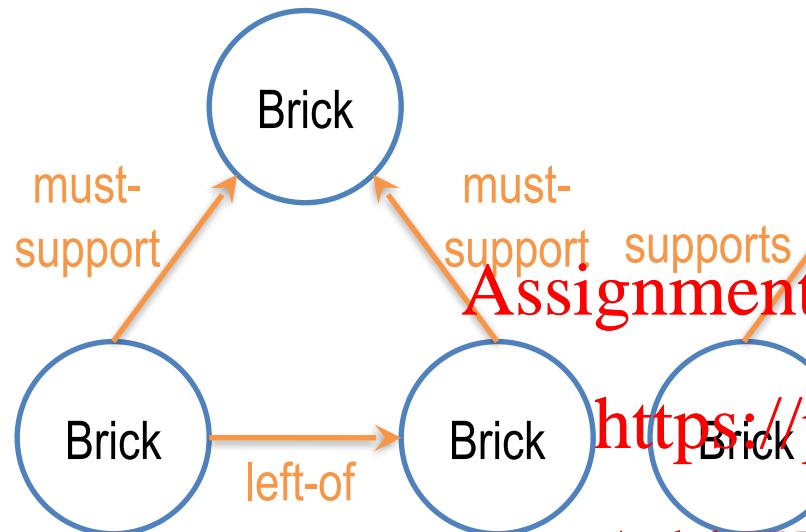
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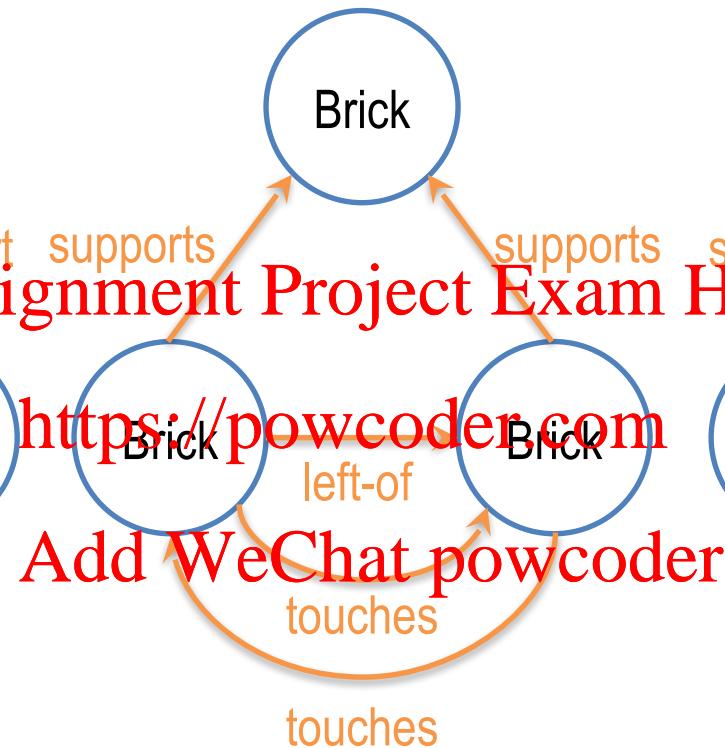
touches

touches

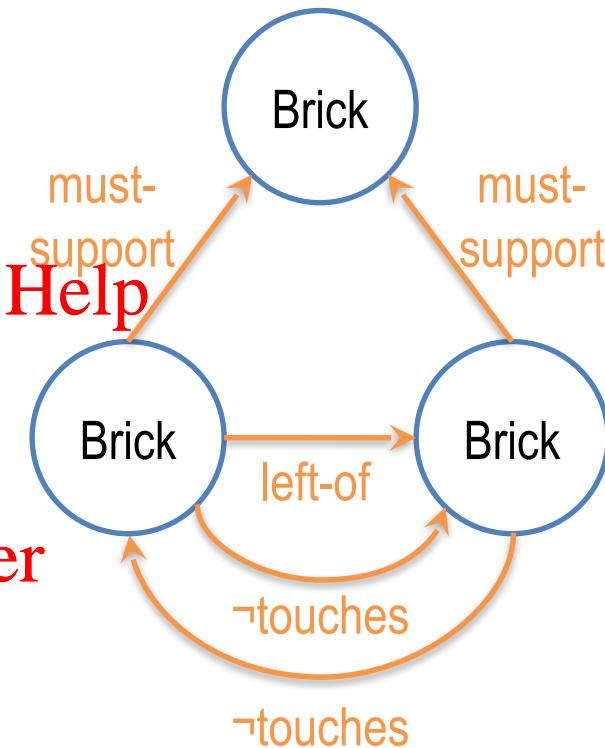
Current Concept



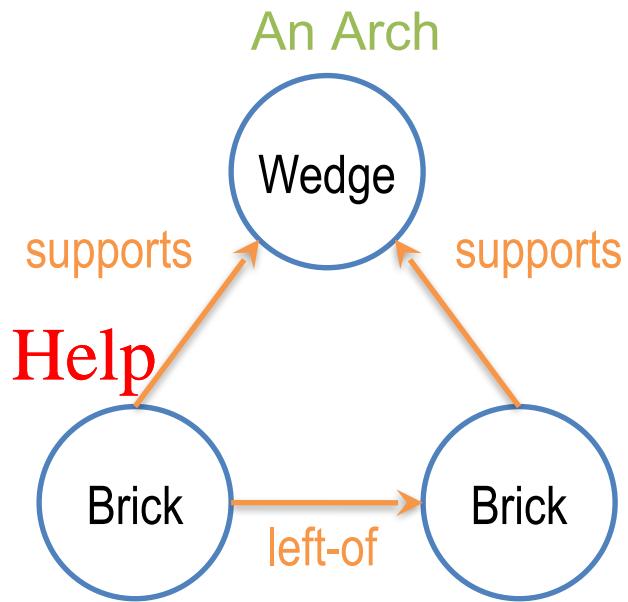
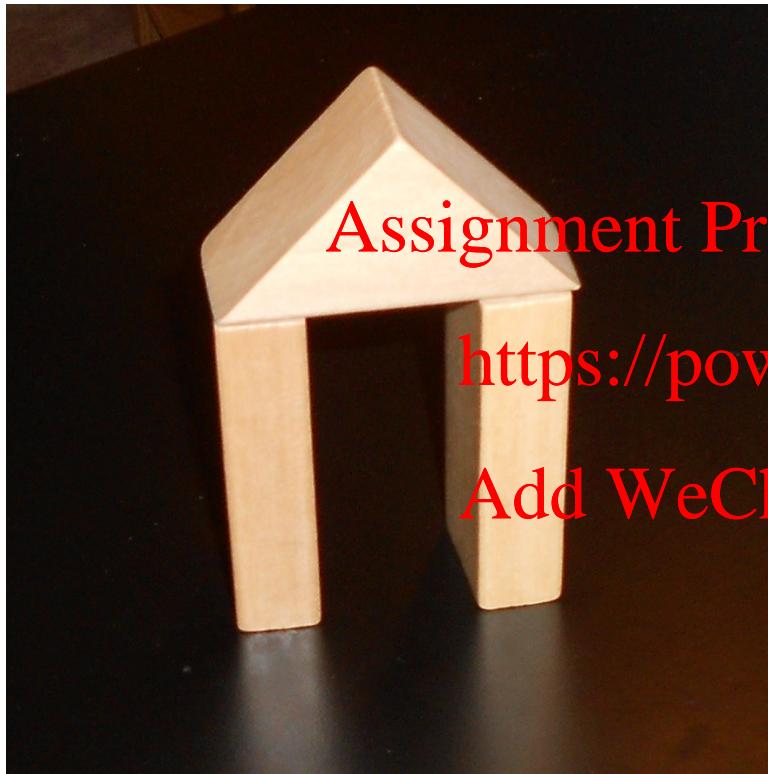
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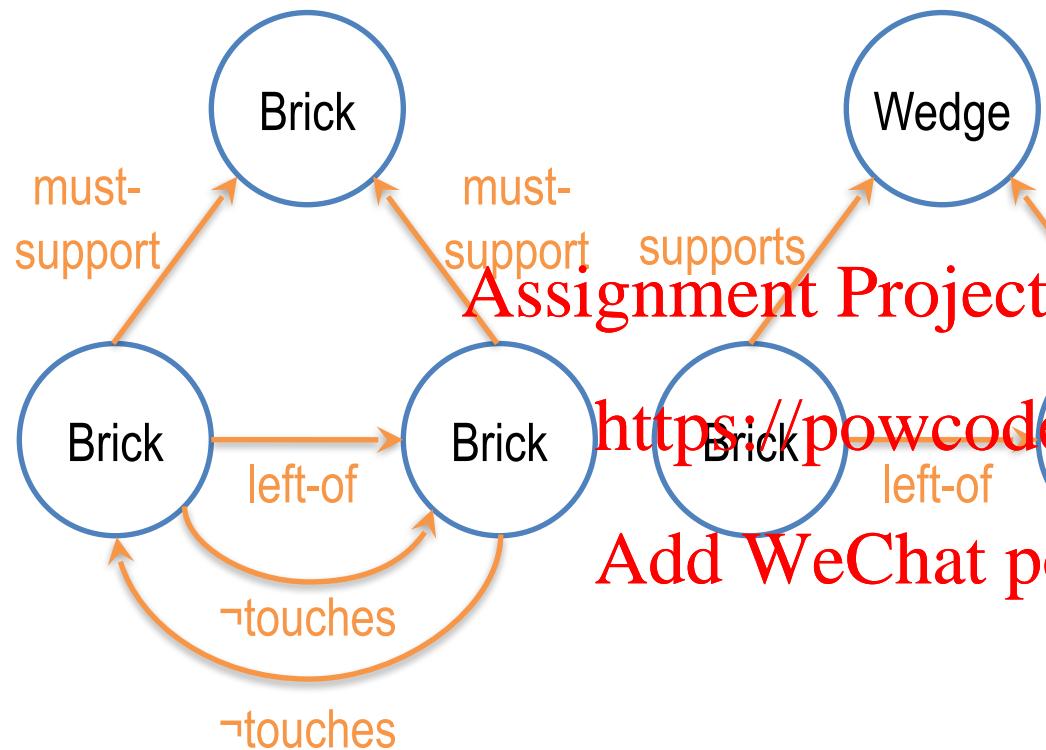
New Concept



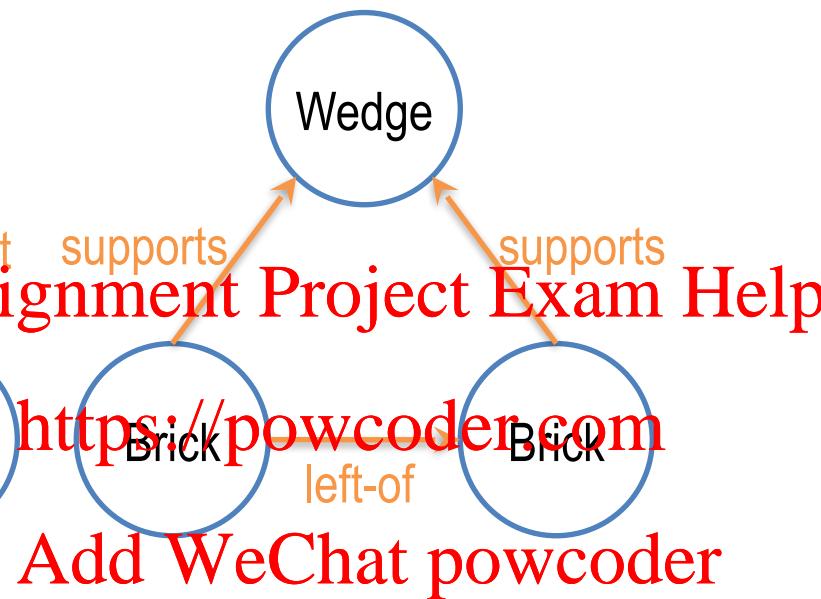
“forbid-link” heuristic



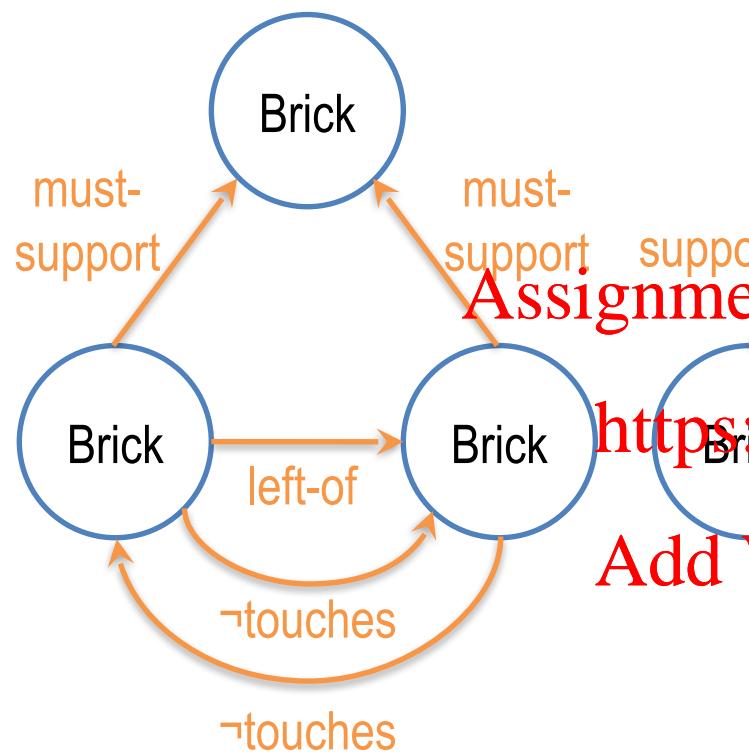
Current Concept



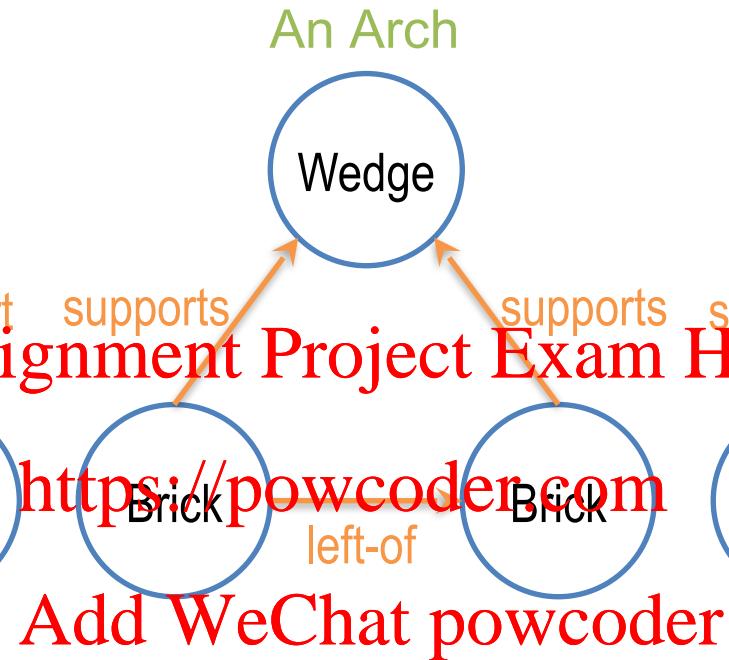
An Arch



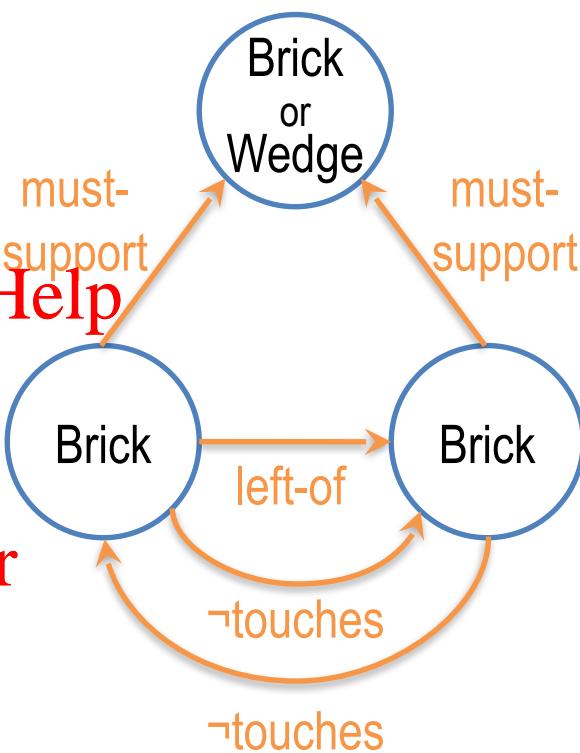
Current Concept



An Arch



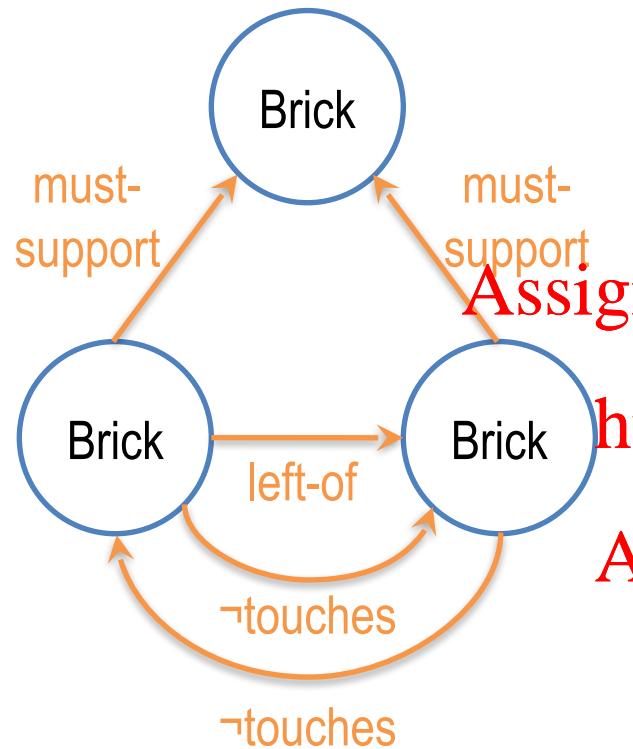
New Concept



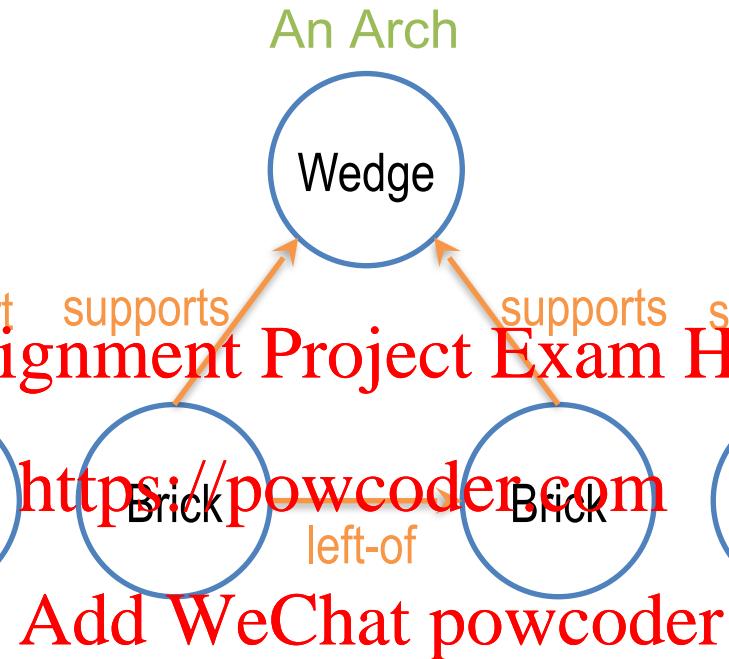
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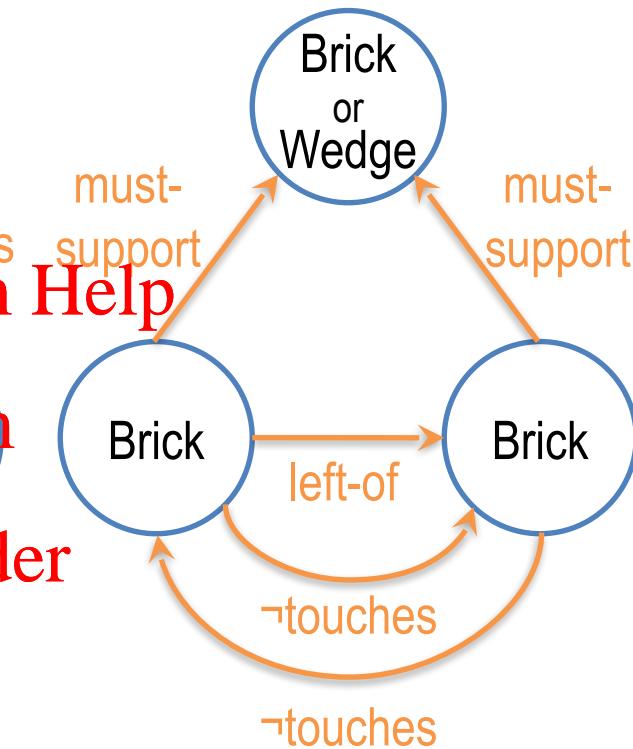
Current Concept



An Arch



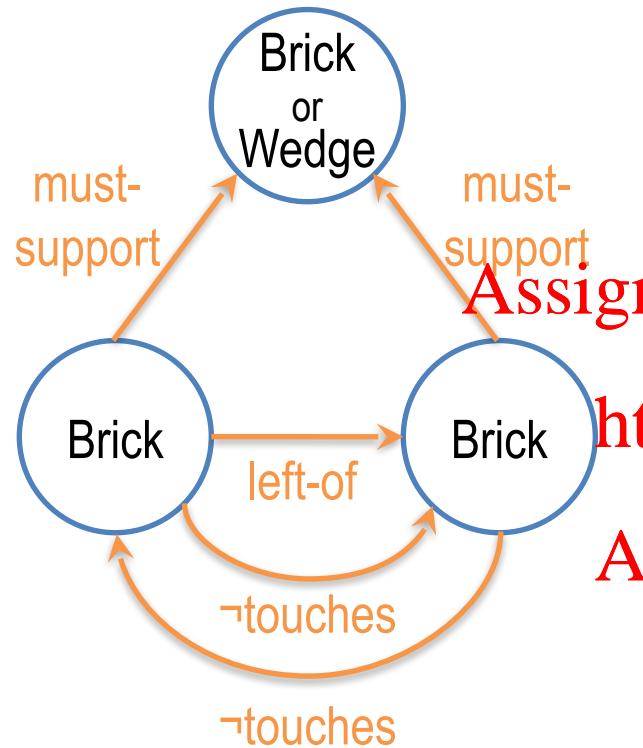
New Concept



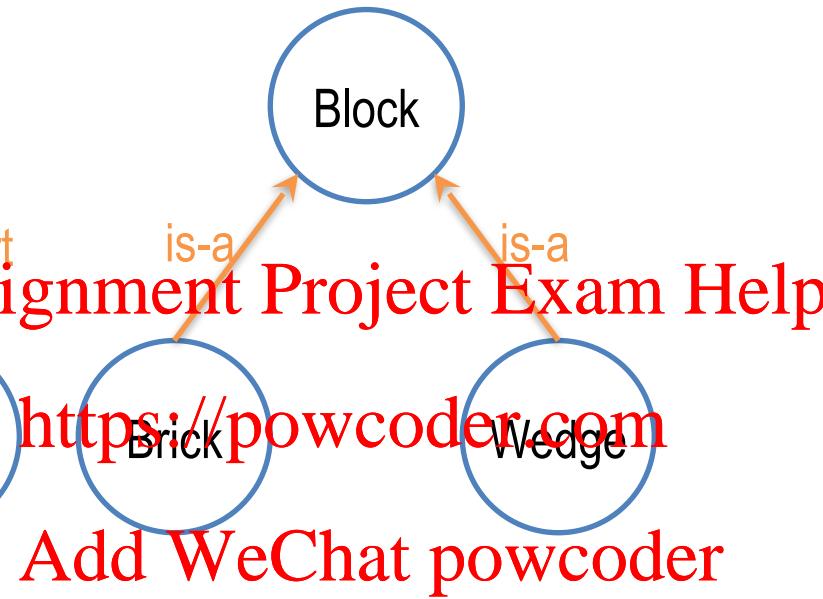
“enlarge-set” heuristic

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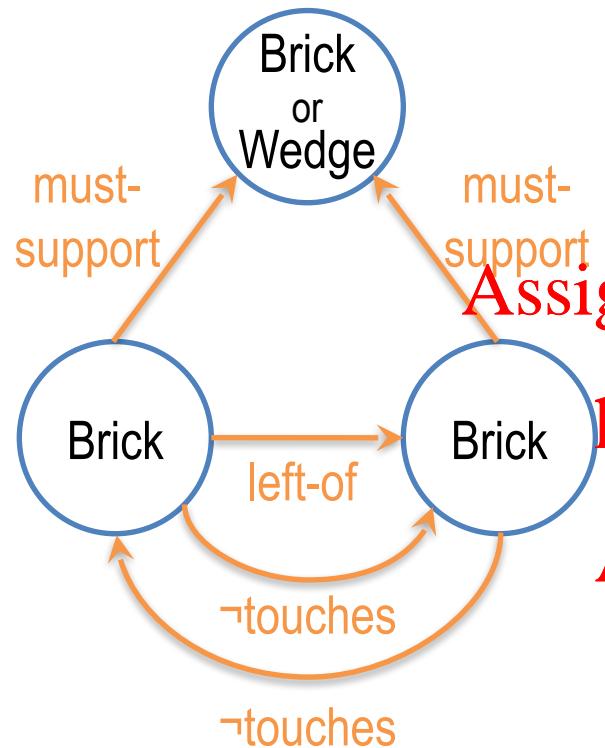
Current Concept



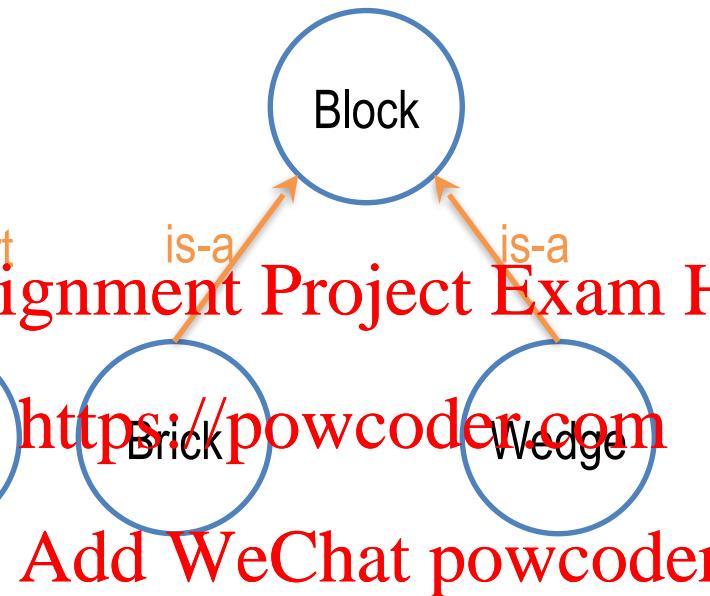
Background Knowledge



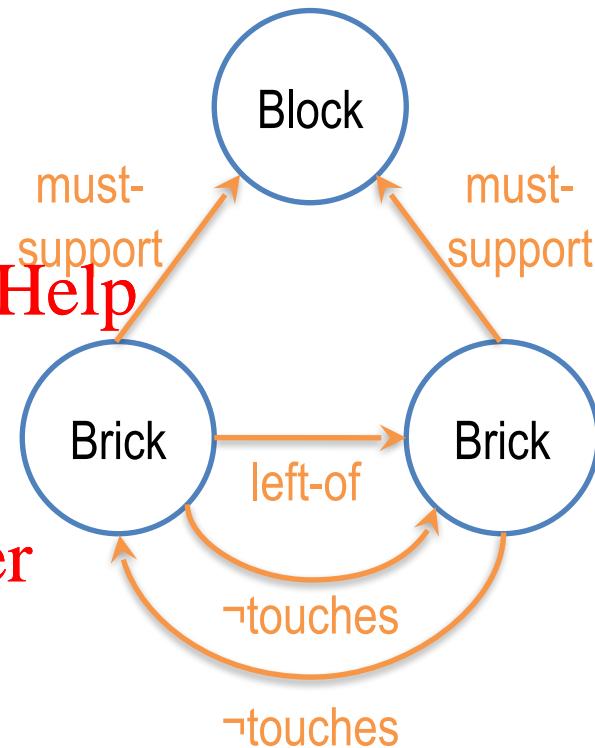
Current Concept



Background Knowledge



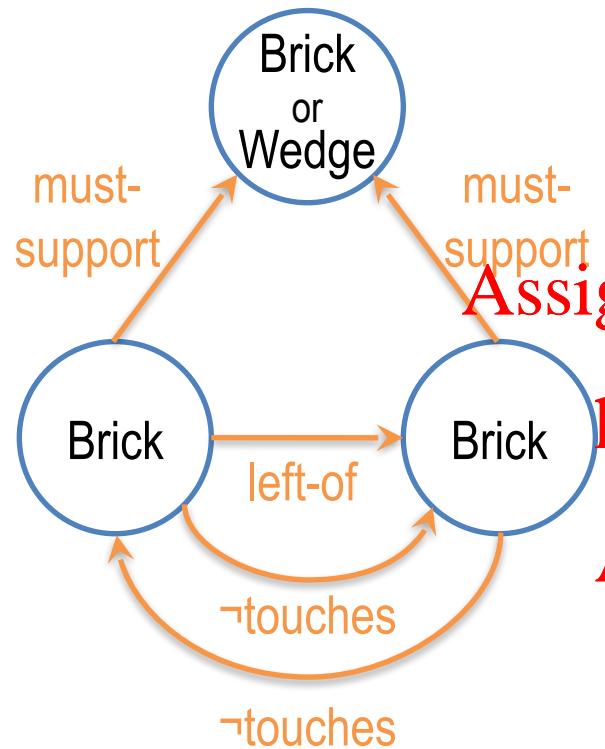
New Concept



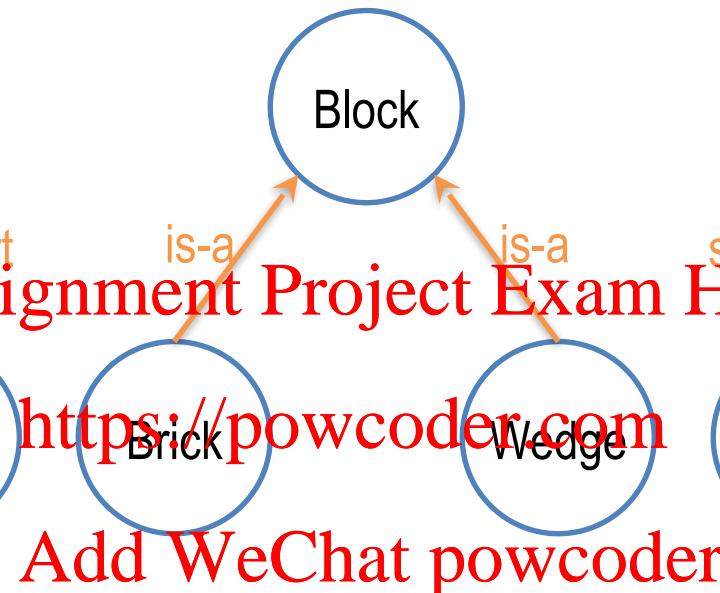
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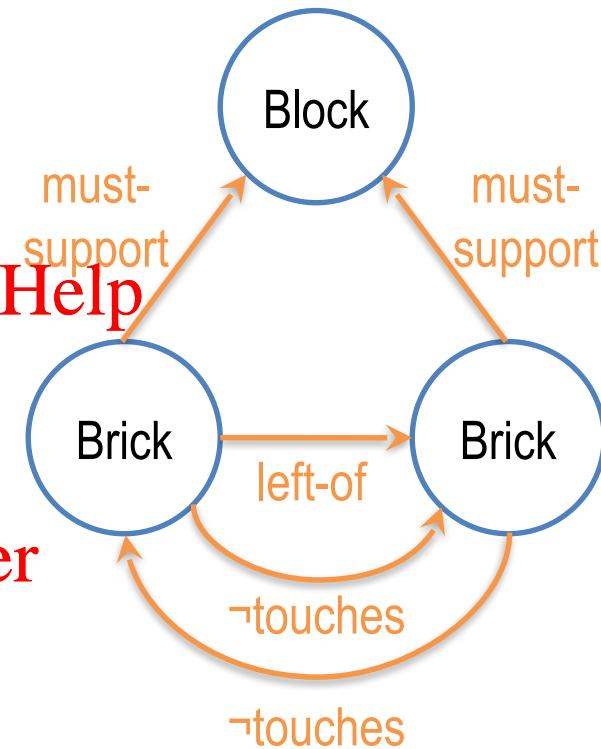
Current Concept



Background Knowledge



New Concept



“climb-tree” heuristic

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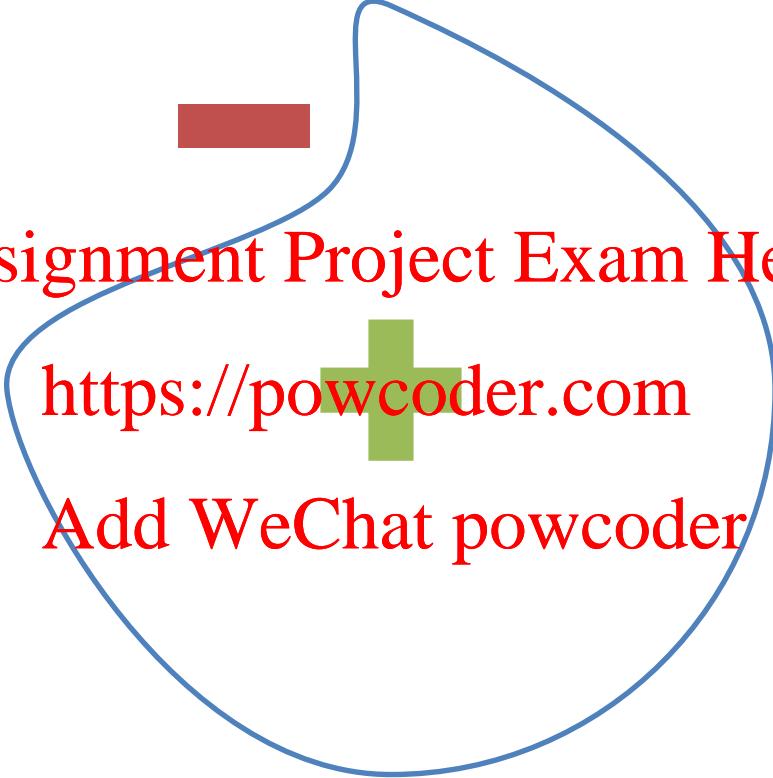


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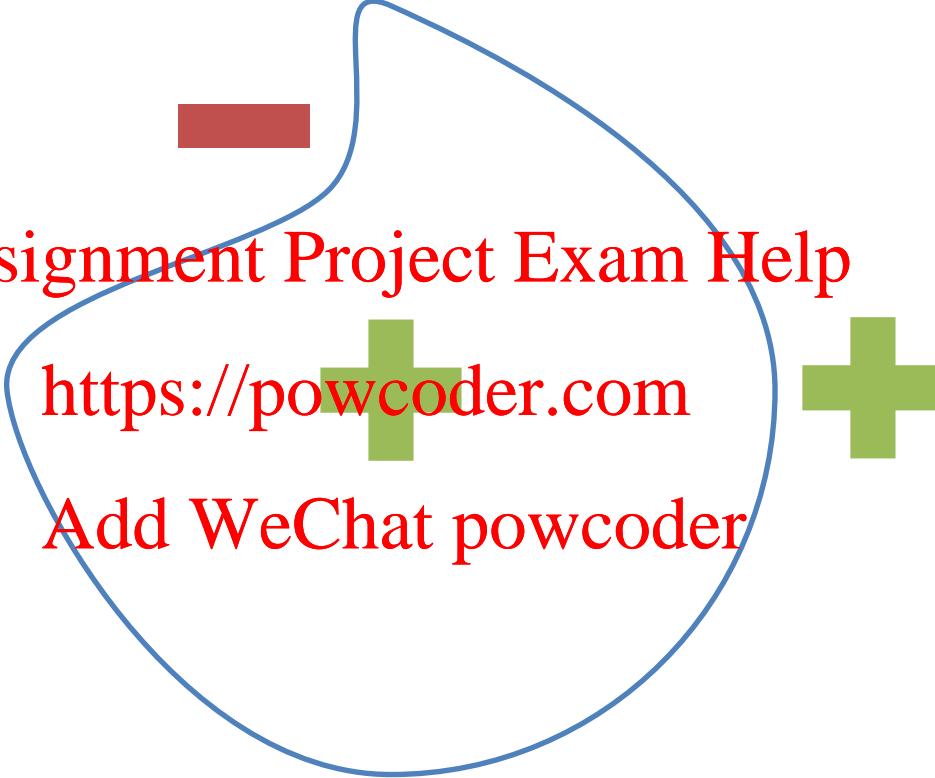
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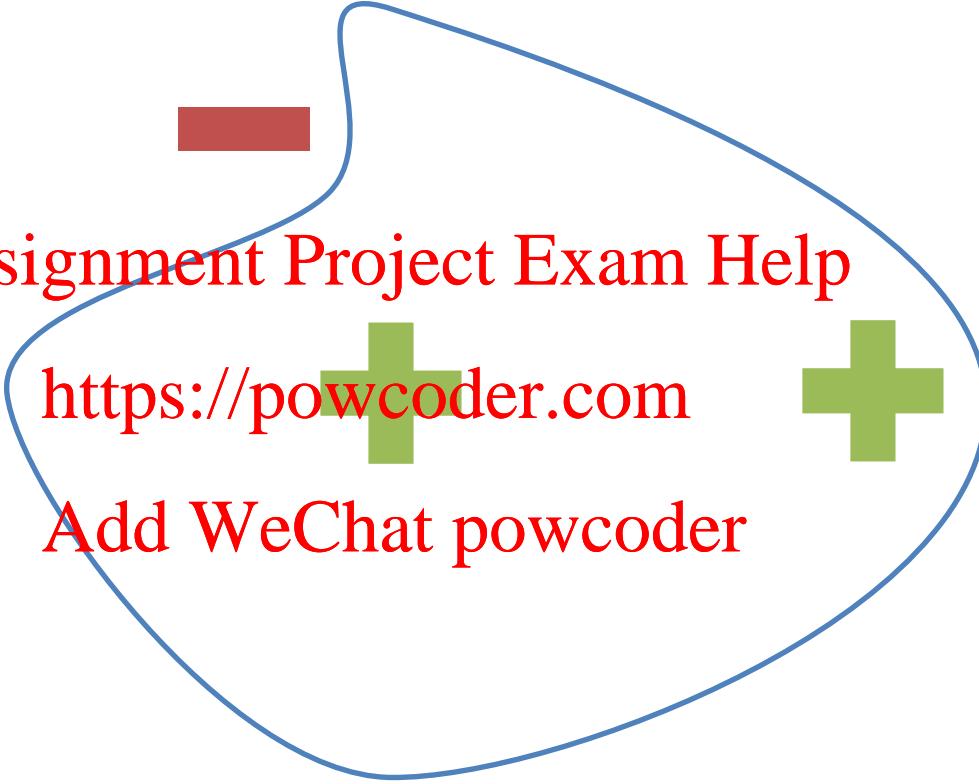


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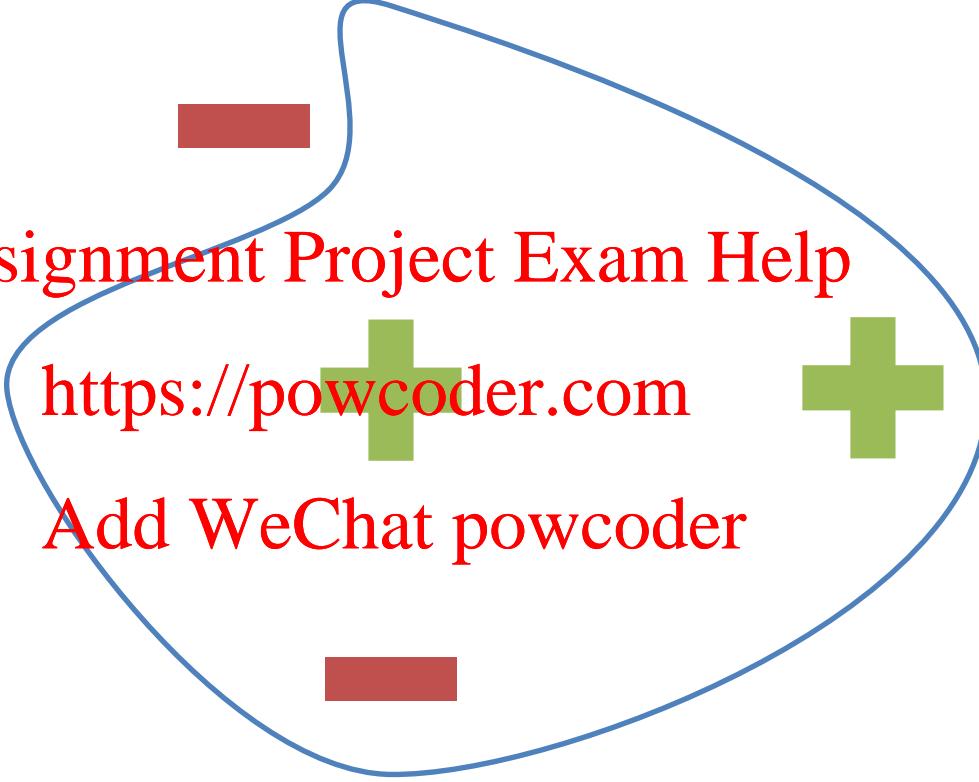


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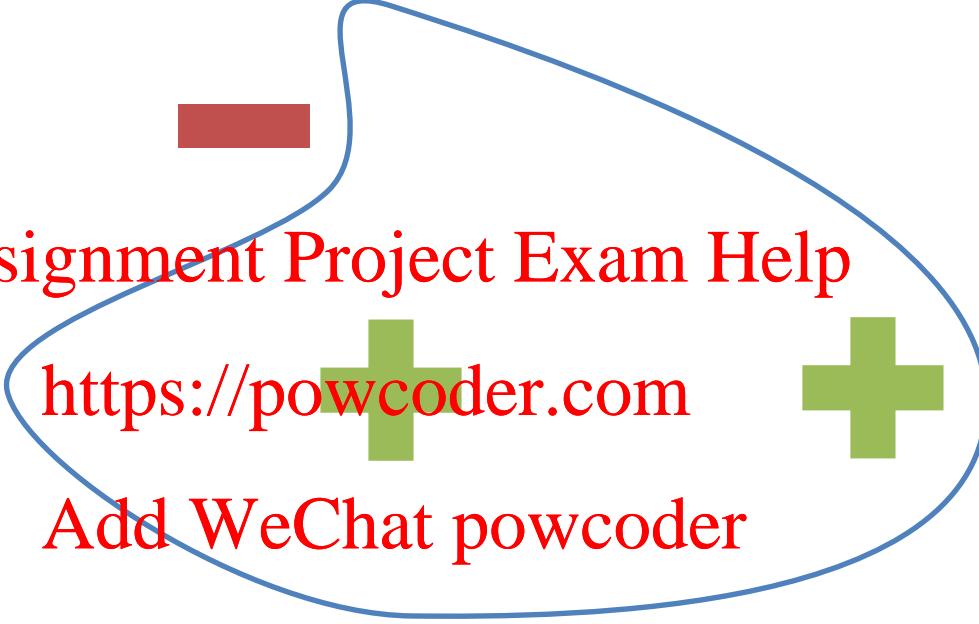




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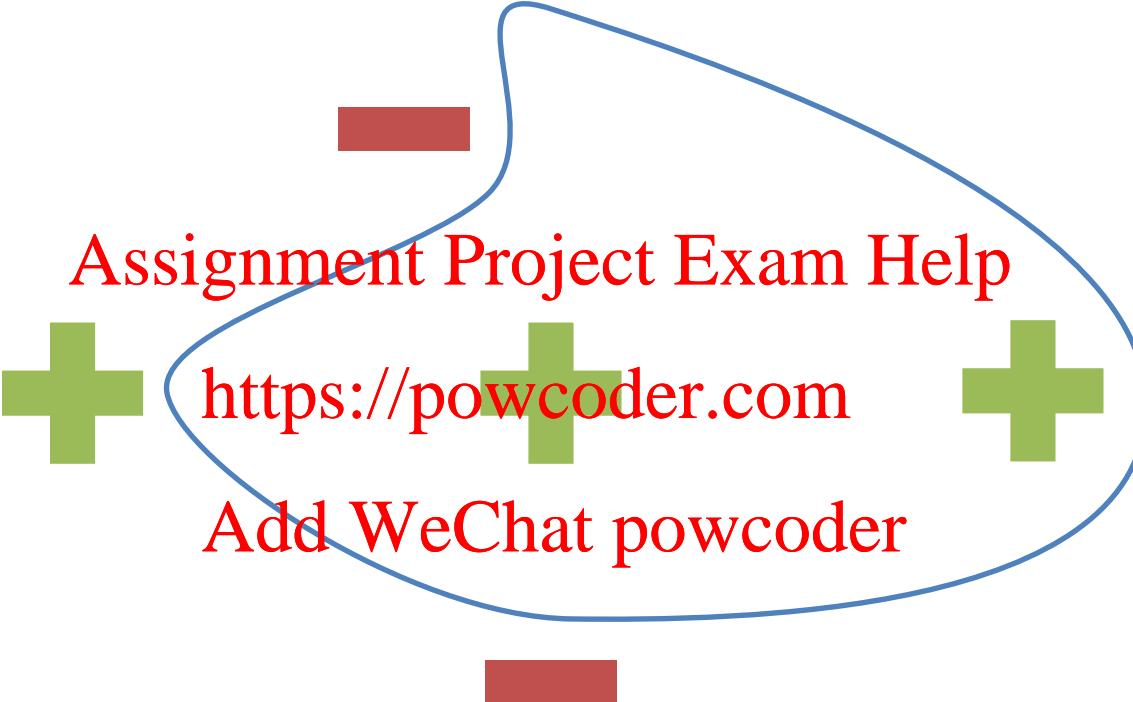


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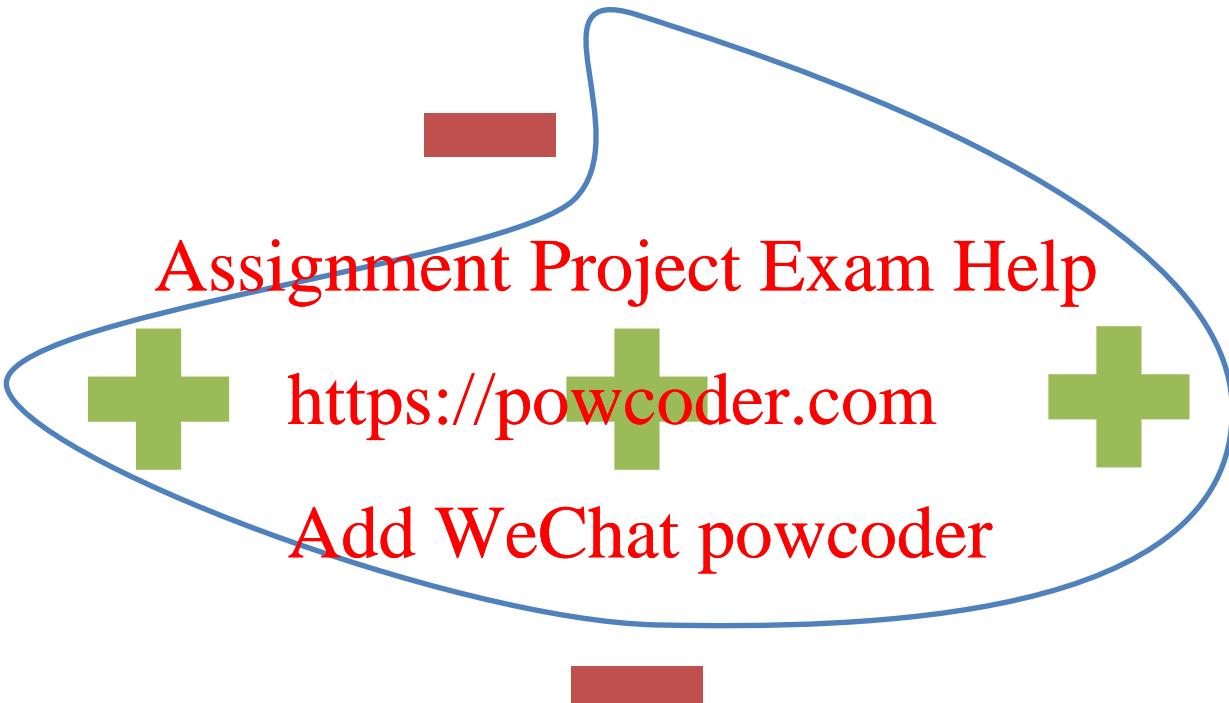




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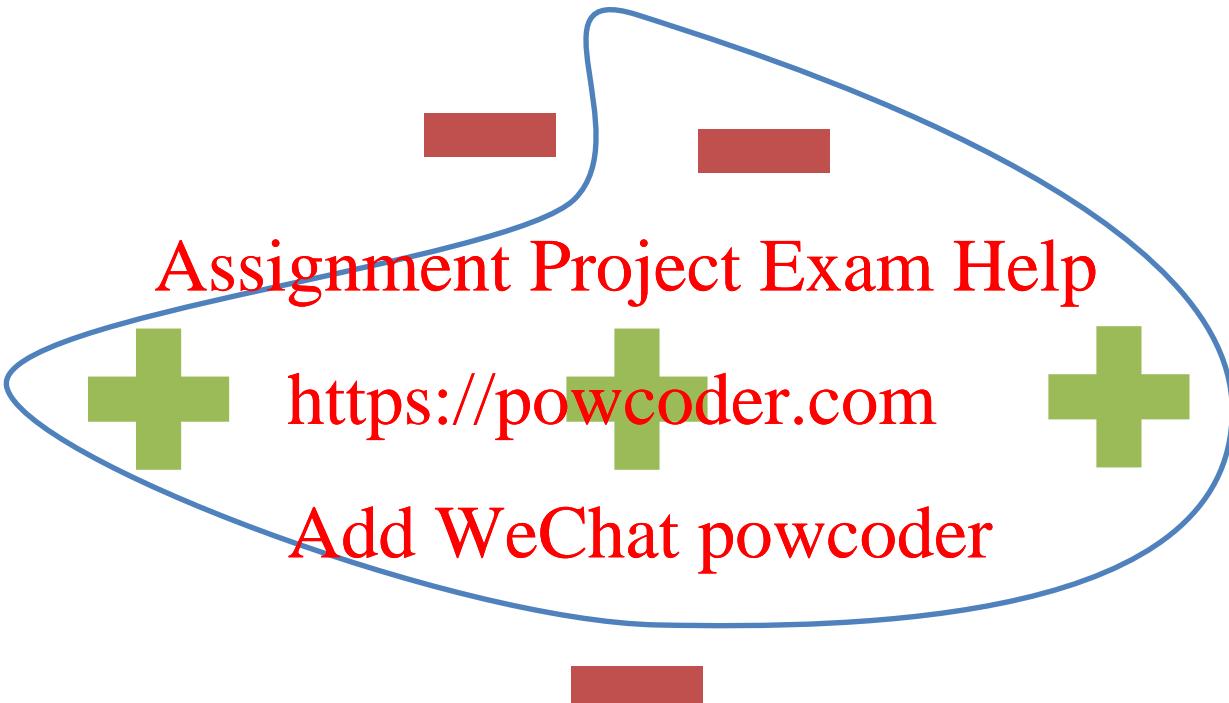
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Heuristics for Specializing and Generalizing

require-link: link must be present to be a positive example of the concept

enlarge-set: multiple objects or links may fit one role in the concept

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forbid-link: link must be absent to be a positive example of the concept

climb tree: generalize over multiple objects in the same role based on knowledge

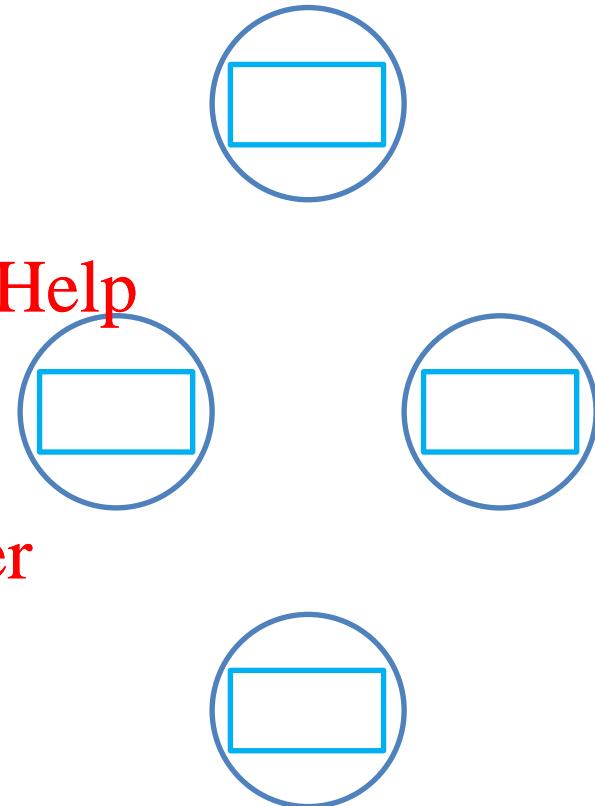
drop-link: link is not necessary to be a positive example of the concept

close-interval: expand range of values to be a positive example of the concept

This **is** a foo.

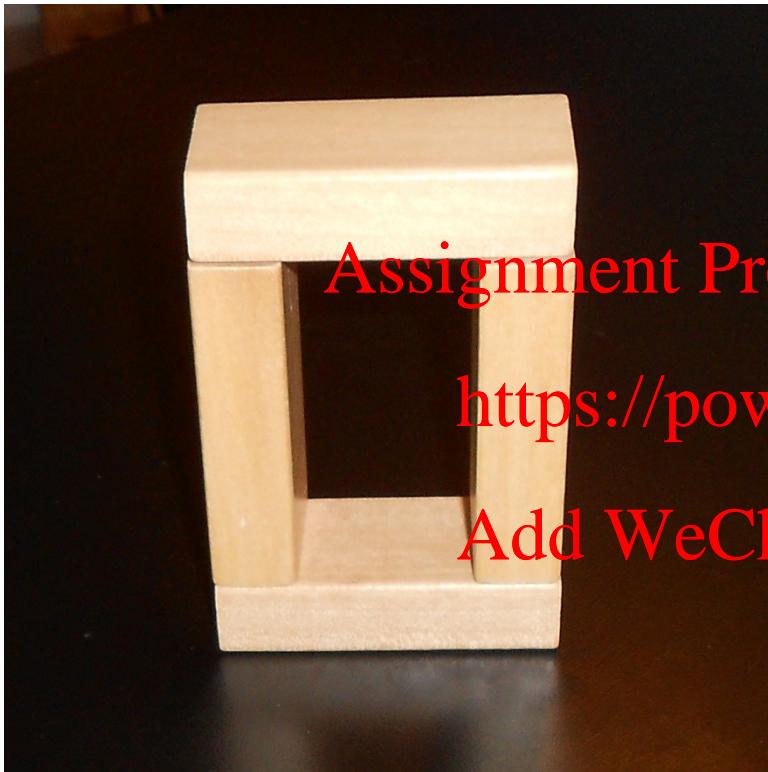


Current Concept



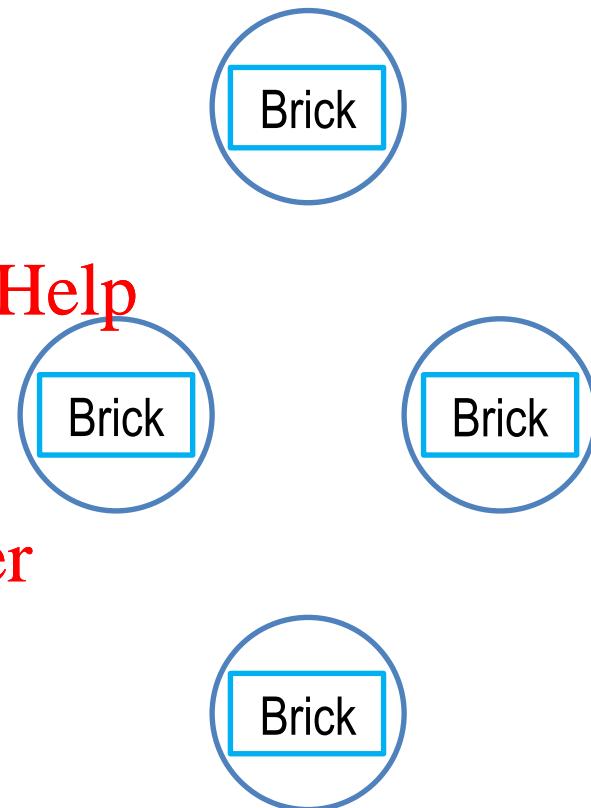
Variabalyze this concept on the right.

This **is** a foo.



Variabalize this concept on the right.

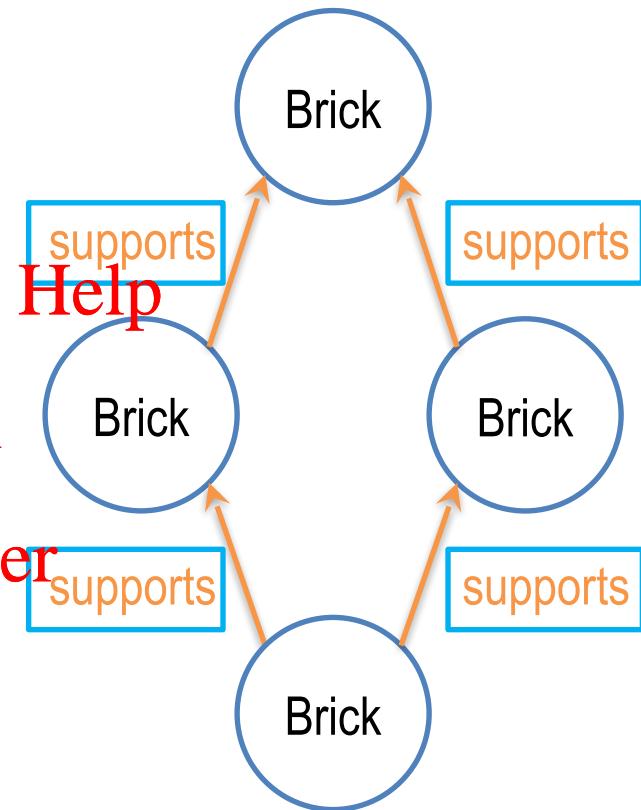
Current Concept



This **is** a foo.



Current Concept

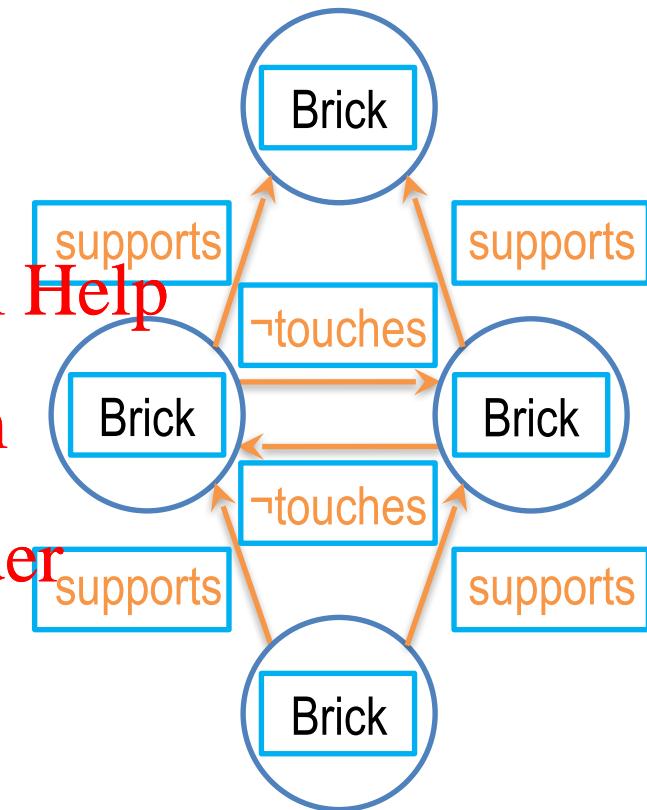


Write the connections for this concept on
the right.

This **is not** a foo.

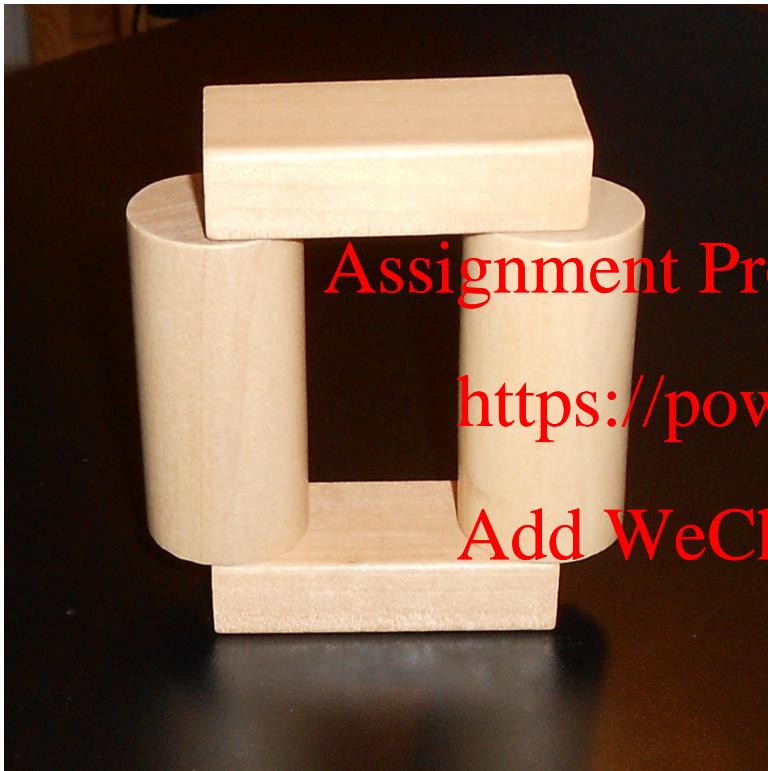


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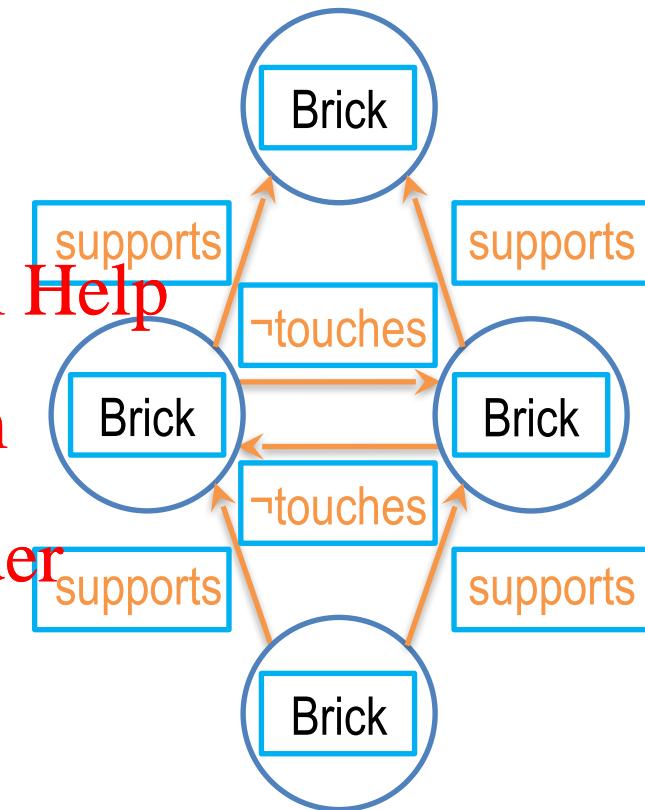


Modify the concept on the right to specialize based on this example.

This **is** a foo.

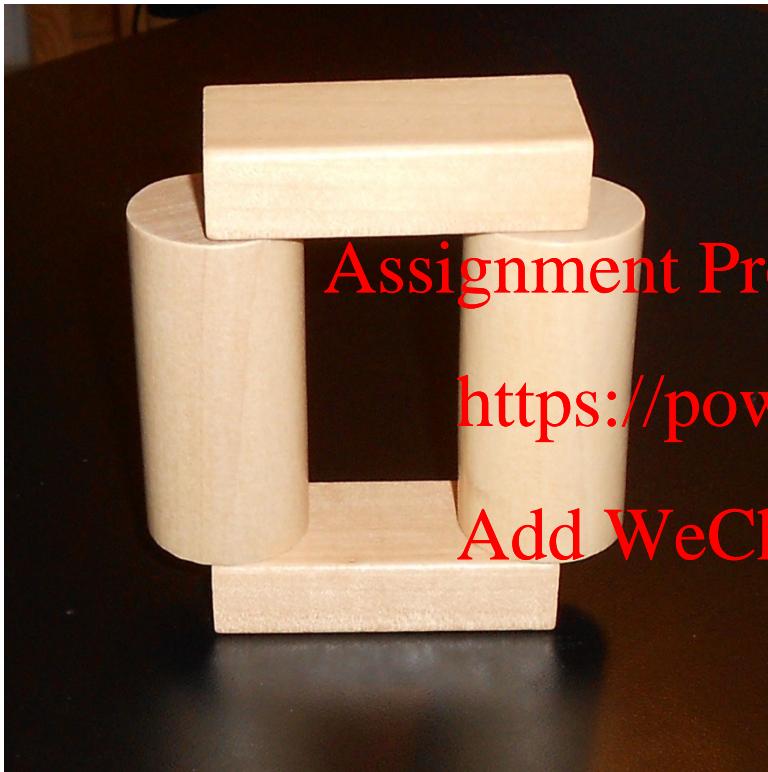


Current Concept

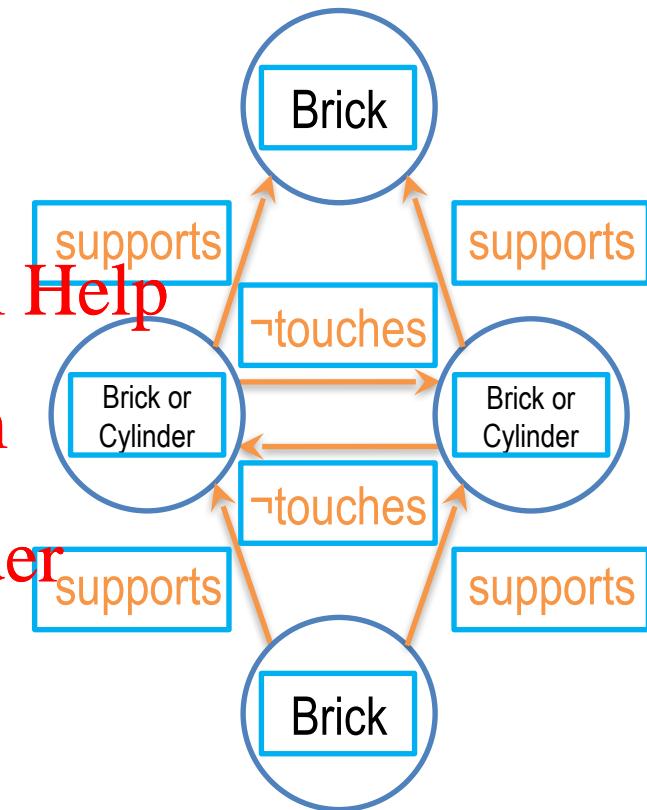


Modify the concept on the right to generalize based on this example.

This **is** a foo.

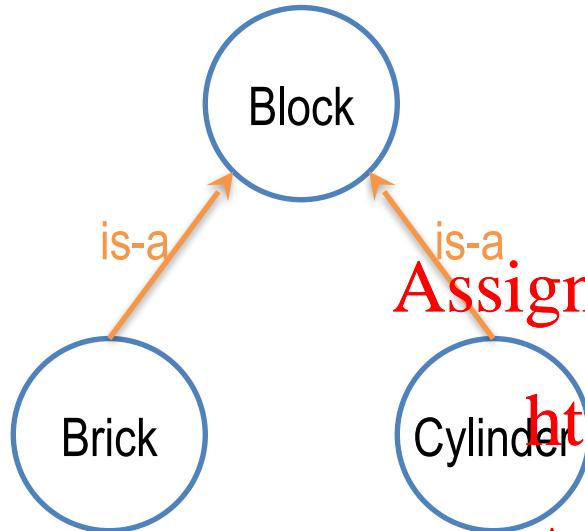


Current Concept

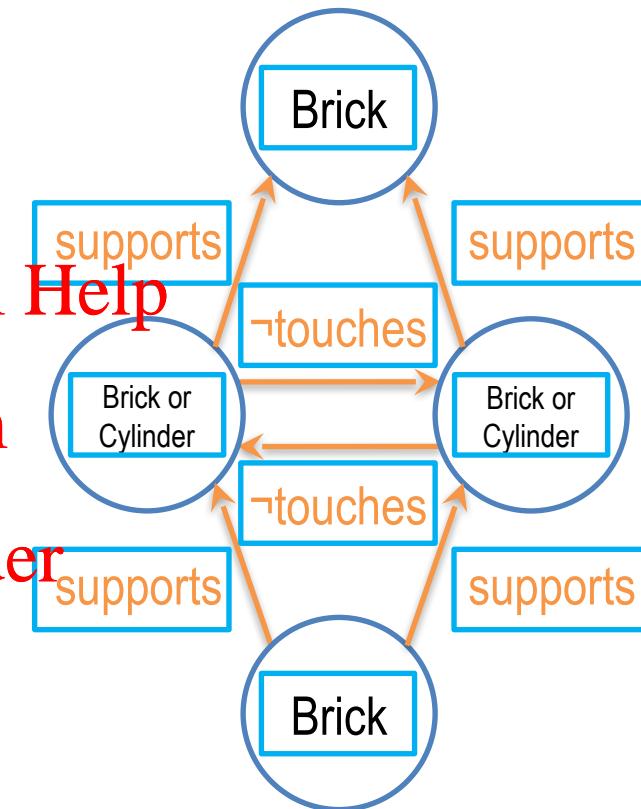


Modify the concept on the right to generalize based on this example.

Background Knowledge



Current Concept



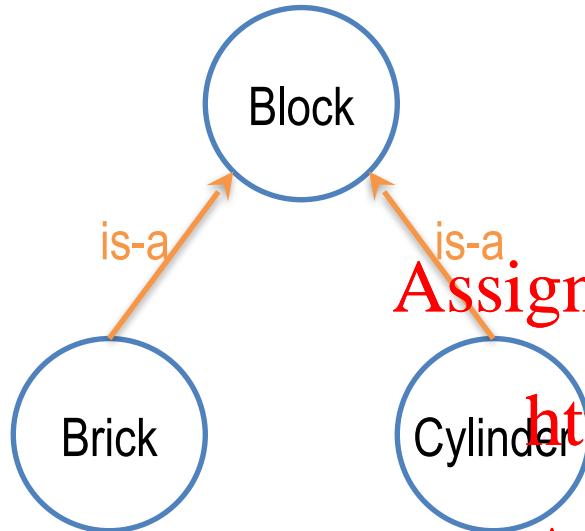
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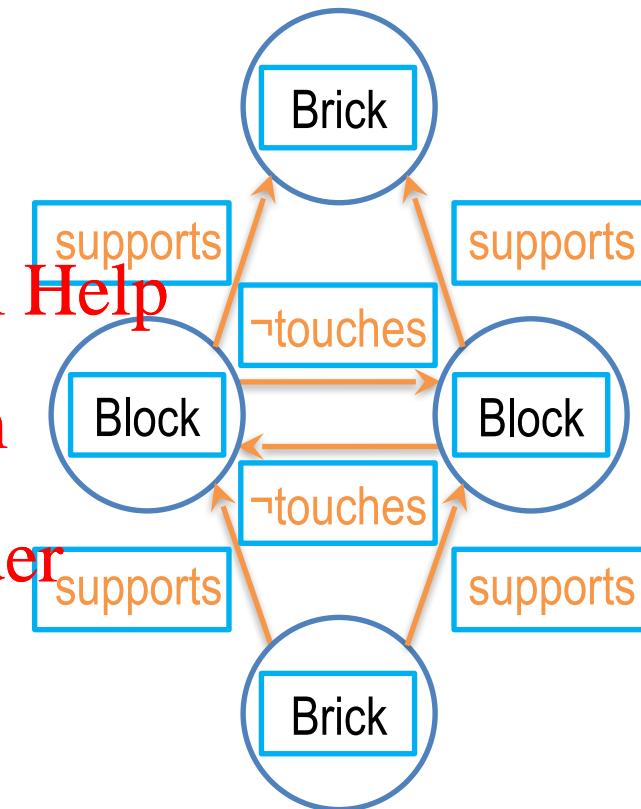
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Modify the concept on the right to generalize based on this knowledge.

Background Knowledge



Current Concept



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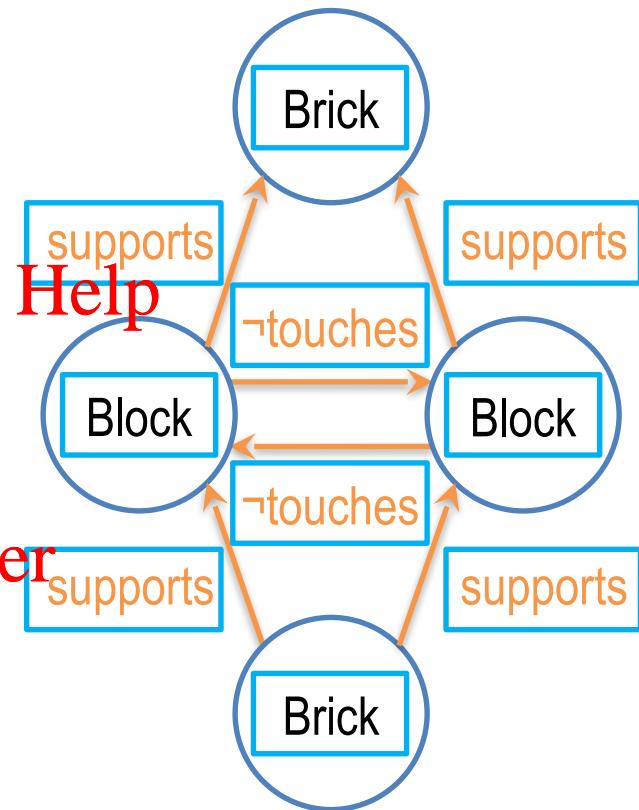
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Modify the concept on the right to generalize based on this knowledge.

This **is not** a foo.

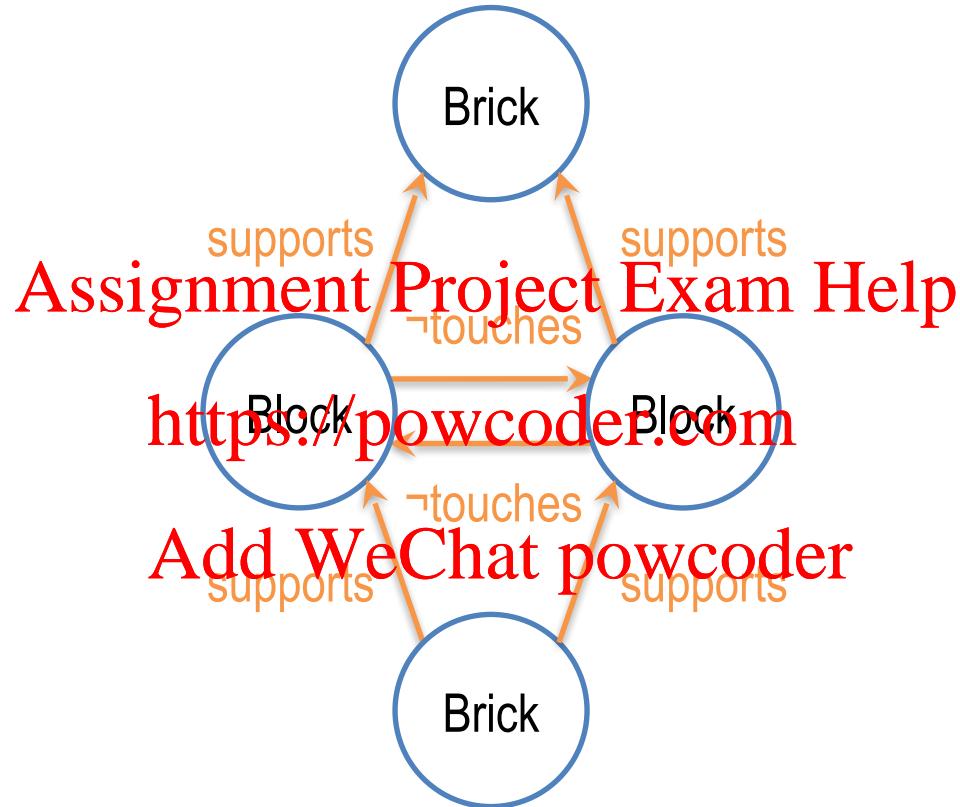


Current Concept



Modify the concept on the right to specialize based on this example.

Final Concept



Assignment

How would you use incremental concept learning to design an agent that could answer Raven's progressive matrices?

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To recap...

- Purpose of incremental concept learning
- Variabilization
- Specialization
- Generalization
- Heuristics for specialization and generalization

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