Learning big logical rules by joining small rules

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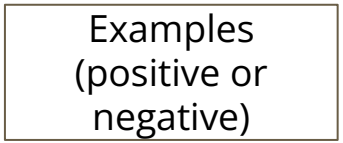
Inductive Logic Programming (ILP)

a form of program synthesis

Inductive Logic Programming (ILP)

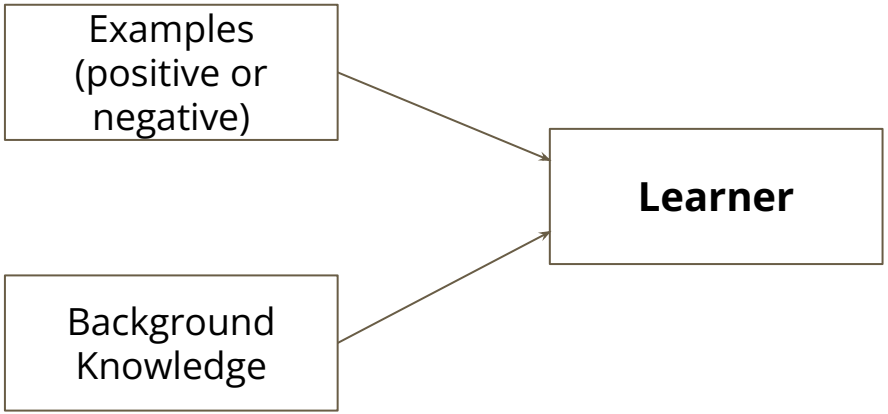


Inductive Logic Programming (ILP)

Examples (positive or negative)

Background Knowledge

Inductive Logic Programming (ILP)



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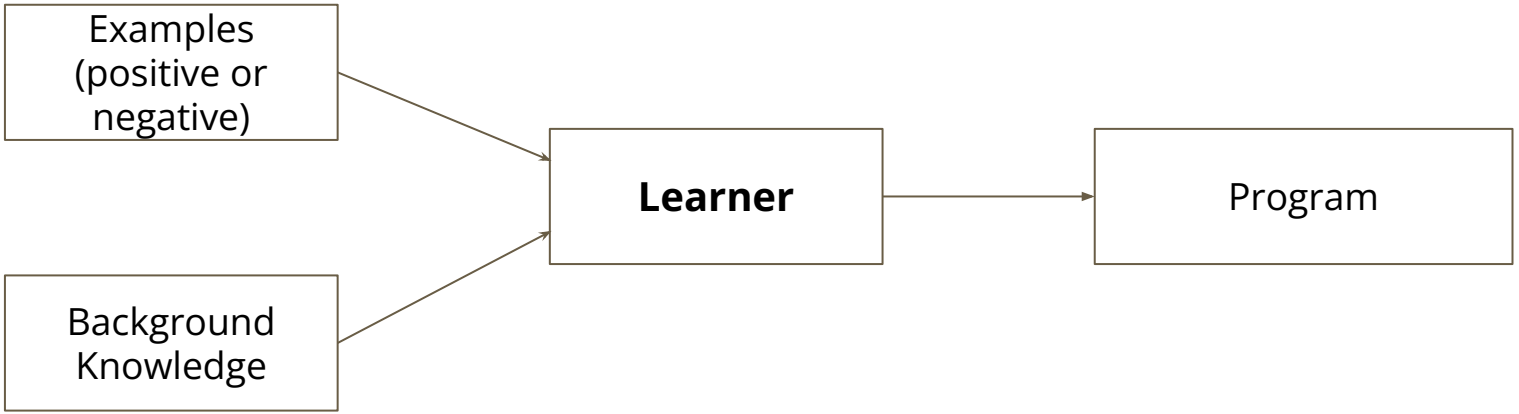

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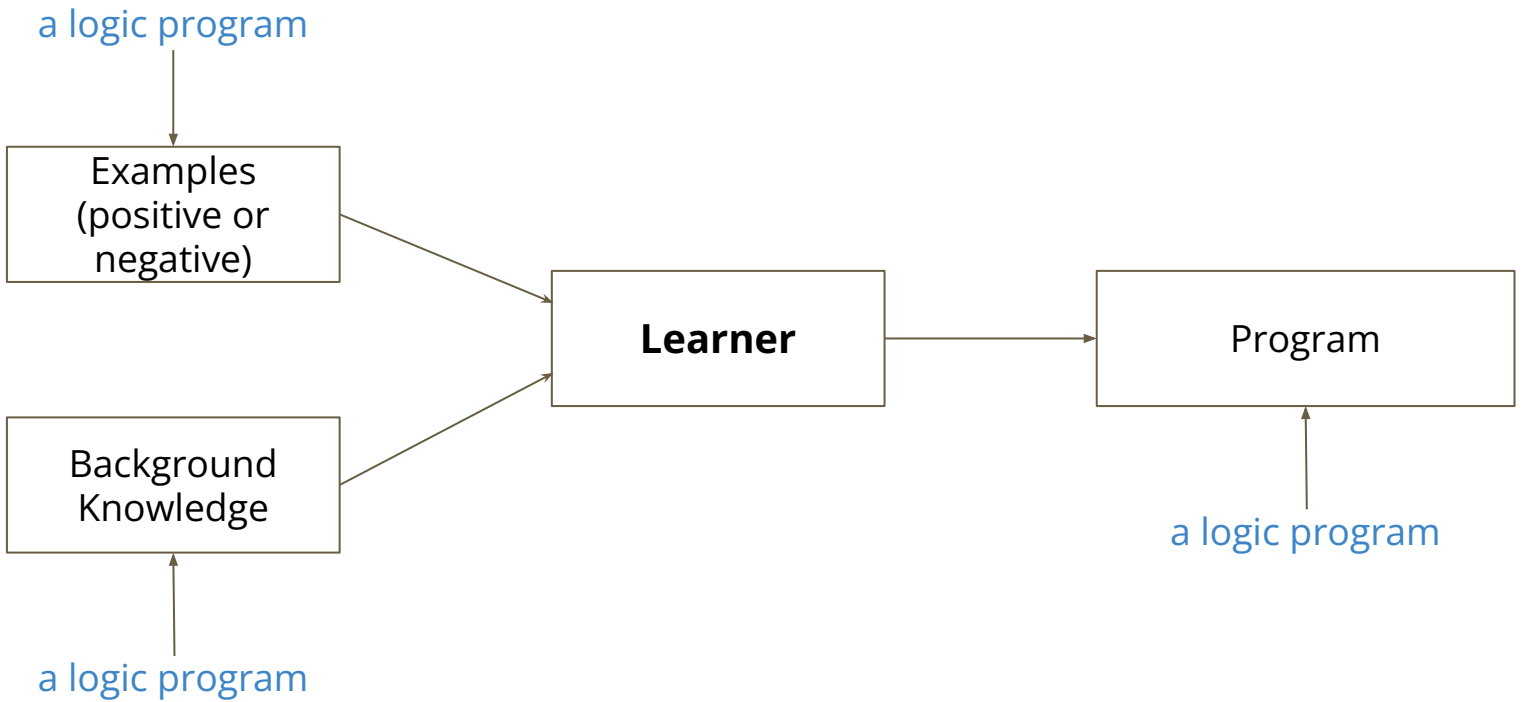
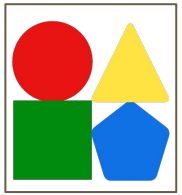
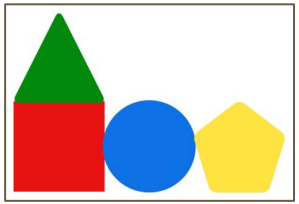
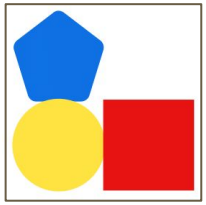
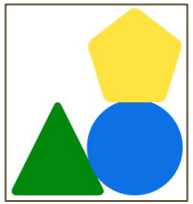


Positive examples	Negative examples
 	  

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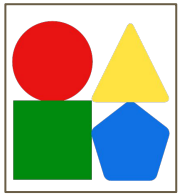
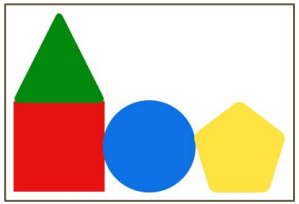
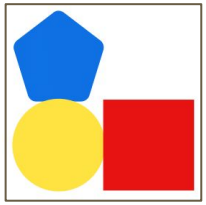
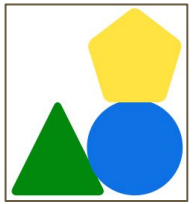
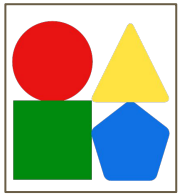
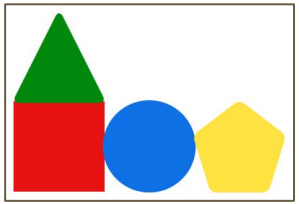
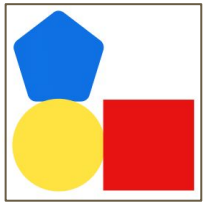
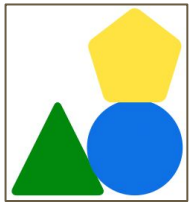
 	  

Background Knowledge	

`piece(ex1,p1_1).`
`red(p1_1).`
`square(p1_1).`
`piece(ex1,p1_2).`
`green(p1_2).`
	`piece(ex2,p2_1).`
	`green(p2_1).`
	`triangle(p2_1).`
	`piece(ex2,p2_2).`
	`red(p2_2).`

Positive examples	Negative examples
 	  

Background Knowledge	
piece(ex1,p1_1). red(p1_1). square(p1_1). piece(ex1,p1_2). green(p1_2).	piece(ex2,p2_1). green(p2_1). triangle(p2_1). piece(ex2,p2_2). red(p2_2).

Program

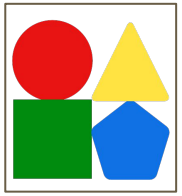
```
zendo(Structure) ←
    piece(Structure,Red), red(Red),
    piece(Structure,Blue), blue(Blue),
    piece(Structure,Green),green(Green)
```

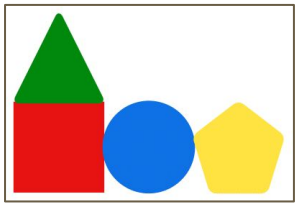
Challenge

Learning programs with large rules is difficult.

In this work: an approach to learn large rules.

Our idea





1. We learn rules which entail some positive examples.

```
zendo1(Structure) ← piece(Structure,Red), red(Red).
zendo2(Structure) ← piece(Structure,Blue), blue(Blue).
zendo3(Structure) ← piece(Structure,Green), green(Green).
zendo4(Structure) ← piece(Structure,Yellow), yellow(Yellow).
```

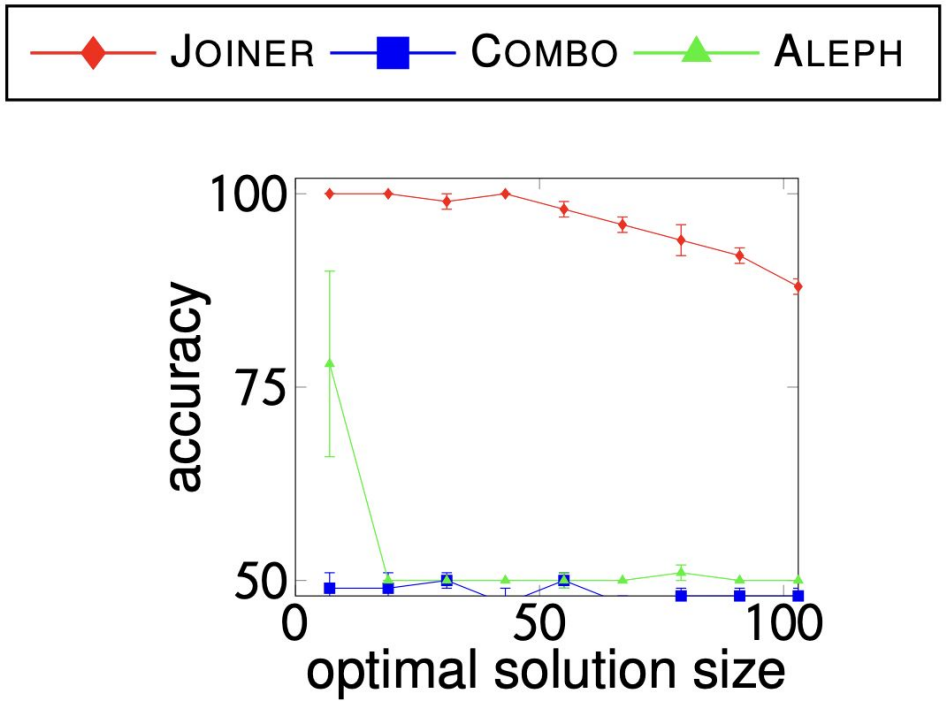
Our idea

1. We learn rules which entail some positive examples.
2. We join rules.

```
zendo(Structure) ← zendo1(Structure),zendo2(Structure),zendo3(Structure).
```

We implement our approach using a SAT-based approach.

Impact



Our approach can learn rules 10 times longer than current approaches.

Thank you!

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