Harvard

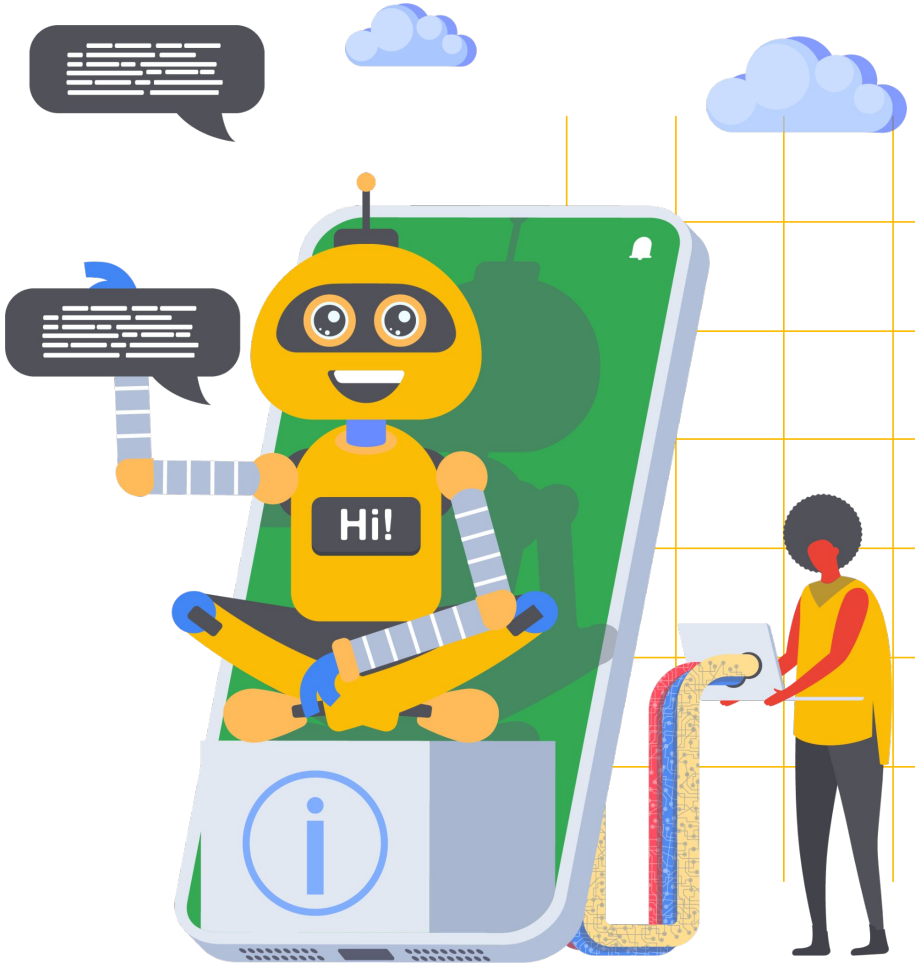
Yá’át’ééh 👋

CRESTLEX 3.0

CReating **E**ffective **ST**em
Learning **EX**periences

with Navajo Tech

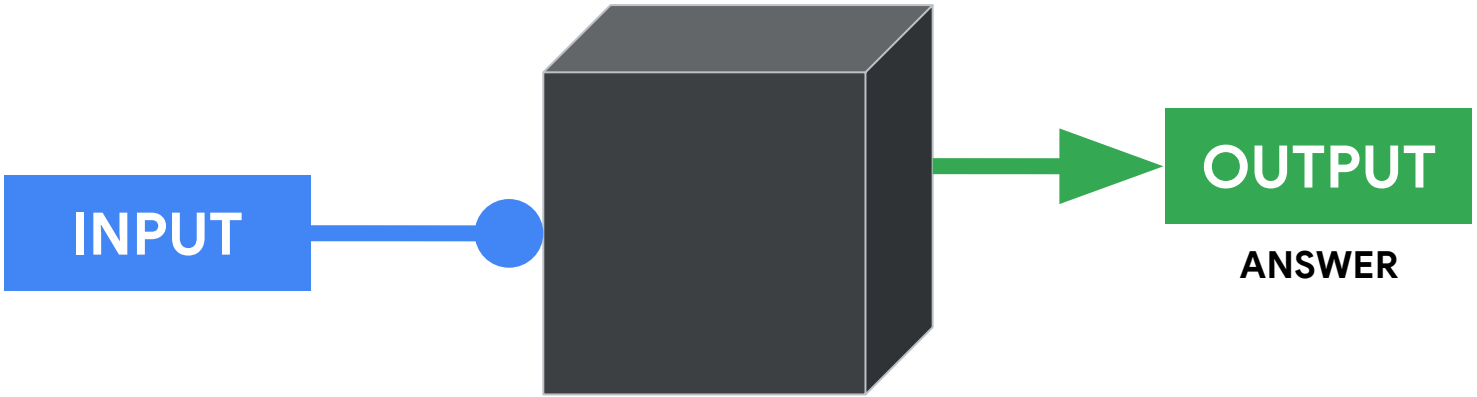
Harvard



How ML works?

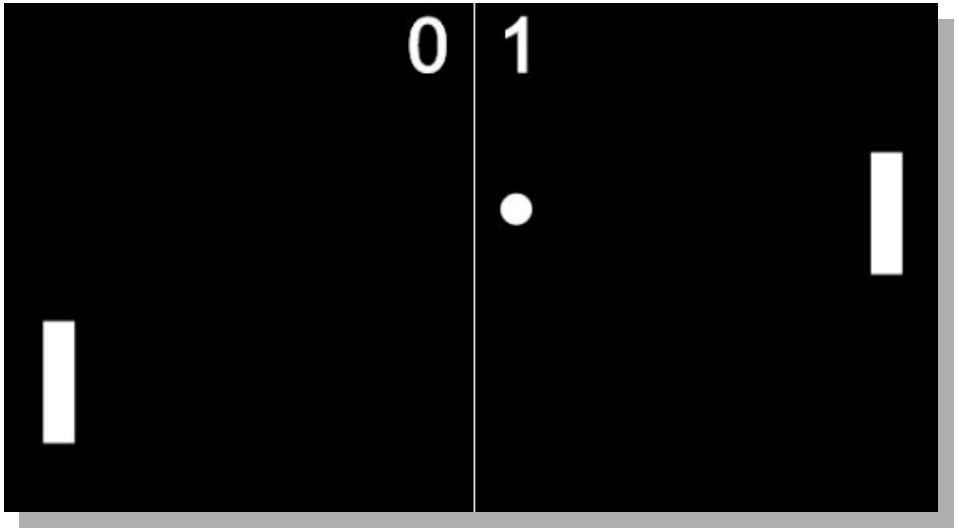
with Professor VJ

Computer Science



One method: **explicit** coding

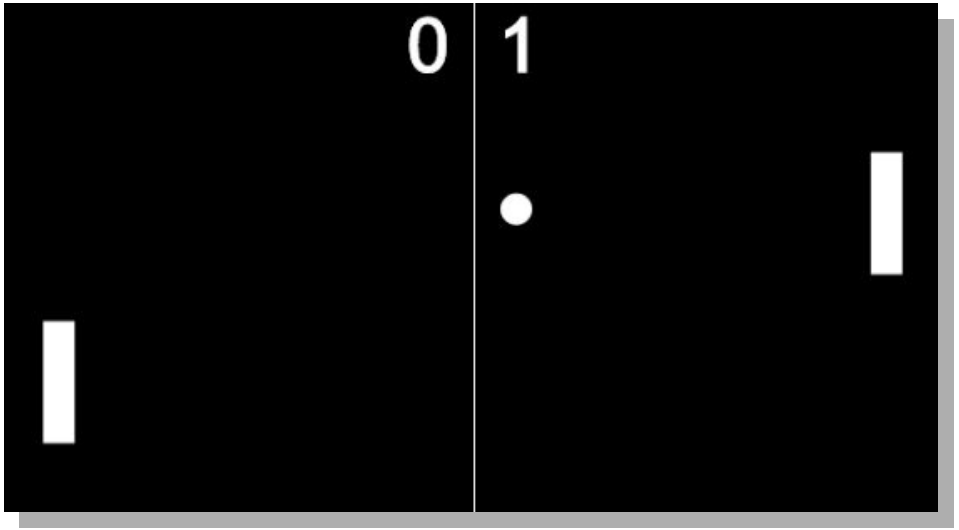
List **all** of the rules:



One method: **explicit** coding

List **all** of the rules:

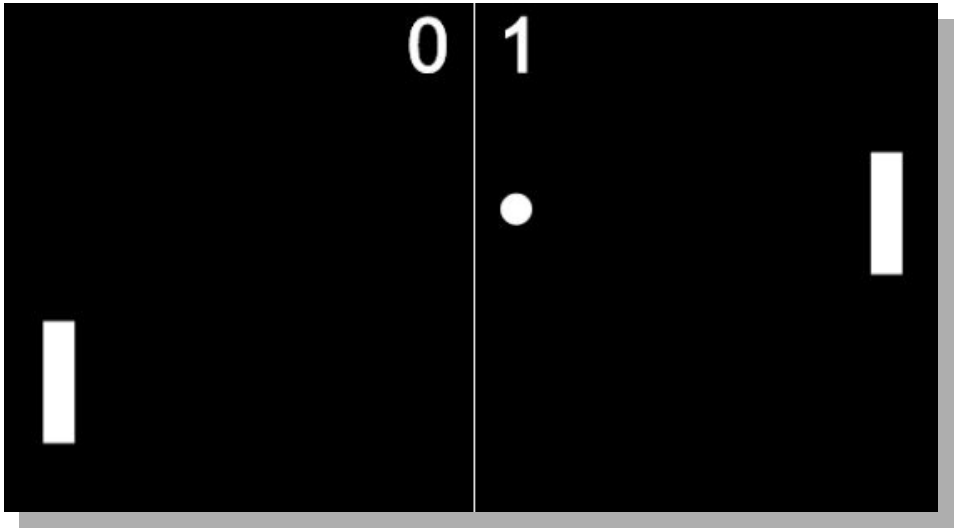
1. What happens when ball hits the paddle?



One method: **explicit** coding

List **all** of the rules:

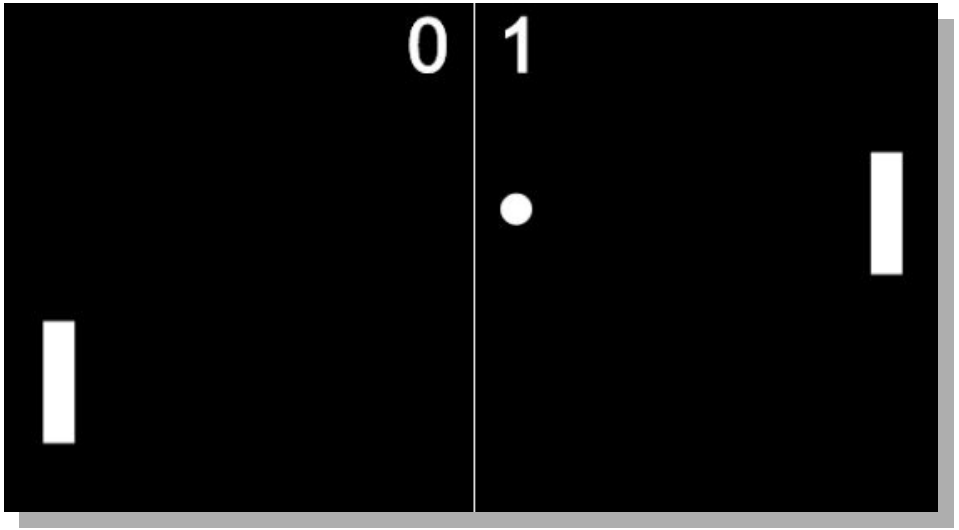
1. What happens when ball hits the paddle?
2. What happens if the ball passes the paddle?



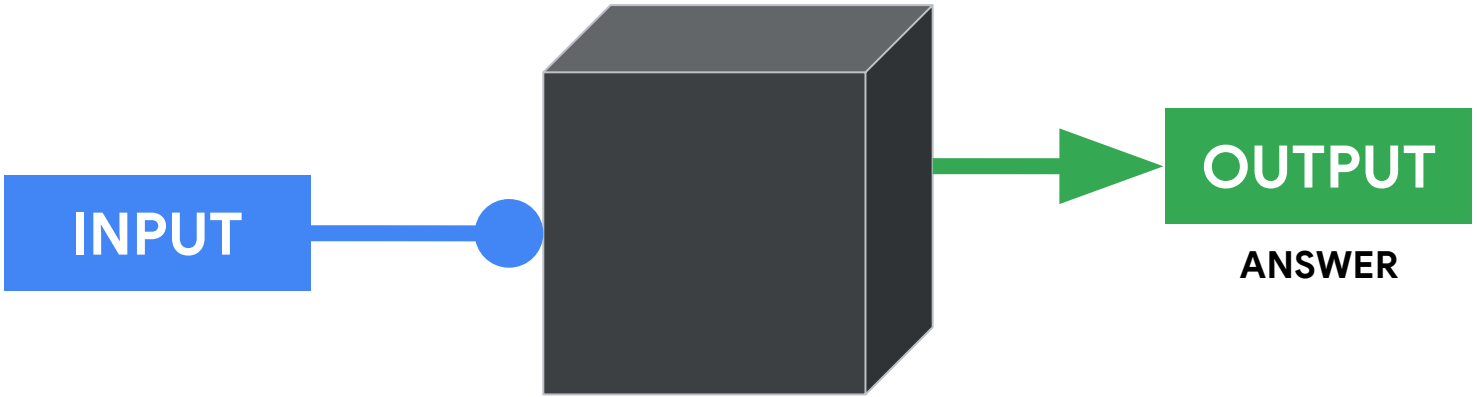
One method: **explicit** coding

List **all** of the rules:

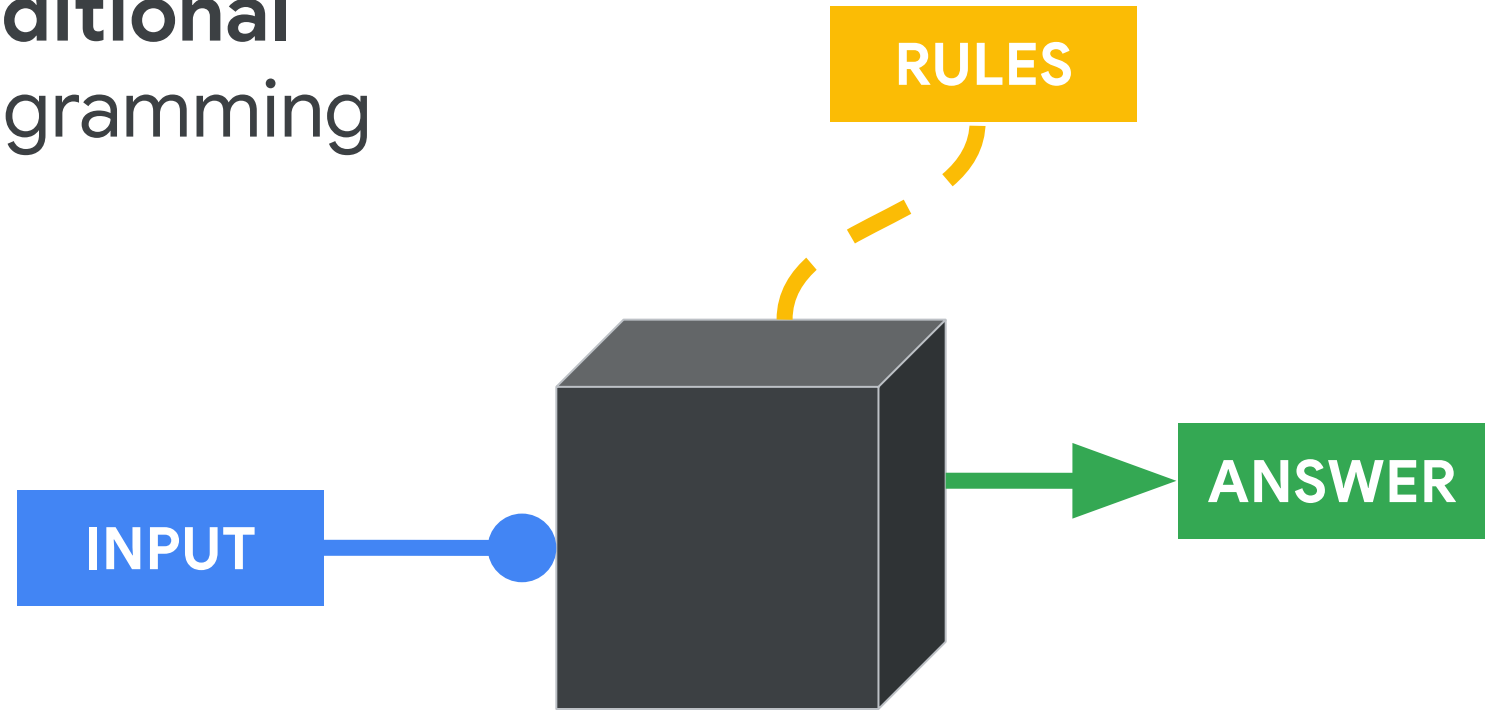
1. What happens when ball hits the paddle?
2. What happens if the ball passes the paddle?
3. Where does the ball restart after one player scored?



Computer Science



Traditional Programming



Let’s try to figure out **what** she’s doing?

data we can gather

input: **speed**

Let's try to figure out **what** she's doing?

```
if (speed < 4):
      then walking
```

data we can gather

input: **speed**

Write a **rule**

Let's try to figure out **what** she's doing?

```
if (speed < 4):
      then walking
```

```
if (speed < 4):
      then walking
else:
      running
```

data we can gather

input: **speed**

Write a **rule**

extend the rule

Let's try to figure out **what** she's doing?

```
if (speed < 4):
     then walking
```

```
if (speed < 4):
     then walking
else:
     running
```

```
if (speed < 4):
     then walking
else if (speed < 12):
     then running
else:
     biking
```

Let's try to figure out **what** she's doing?

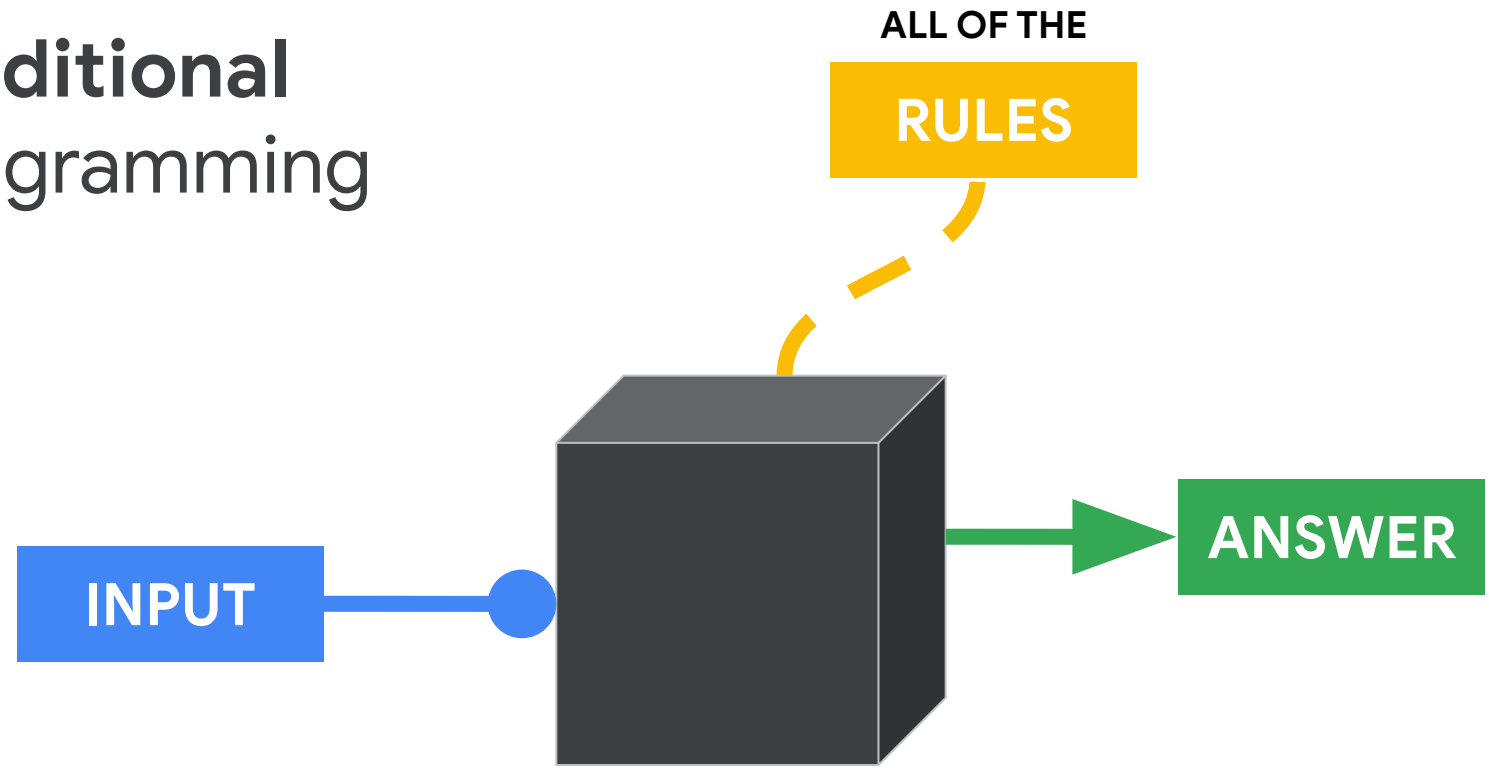
```
if (speed < 4):
    then walking
```

```
if (speed < 4):
    then walking
else:
    running
```

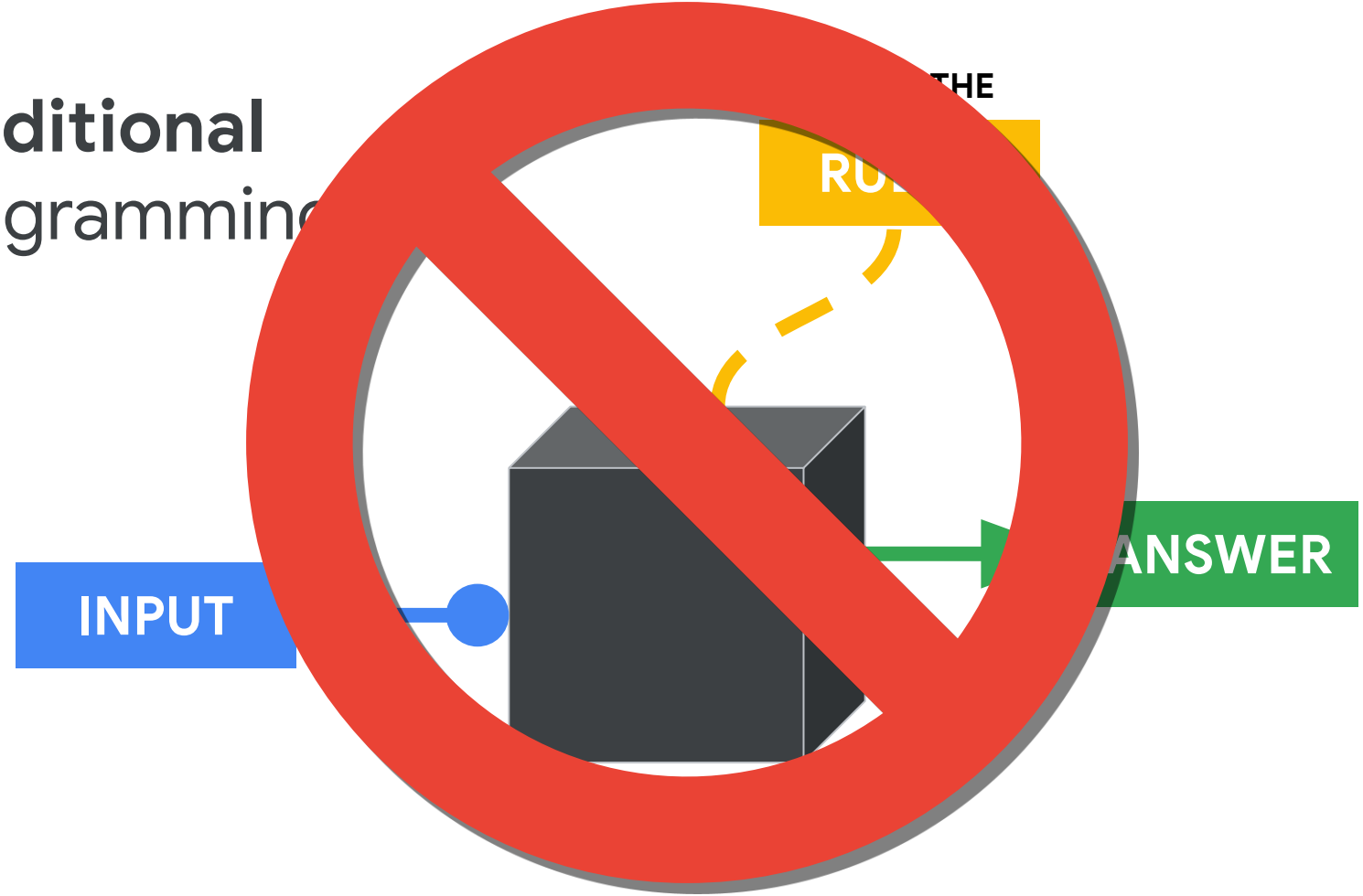
```
if (speed < 4):
    then walking
else if (speed < 12):
    then running
else:
    biking
```

?? WHAT IS THIS ??

Traditional Programming



Traditional Programming



Categorize

1

2

3

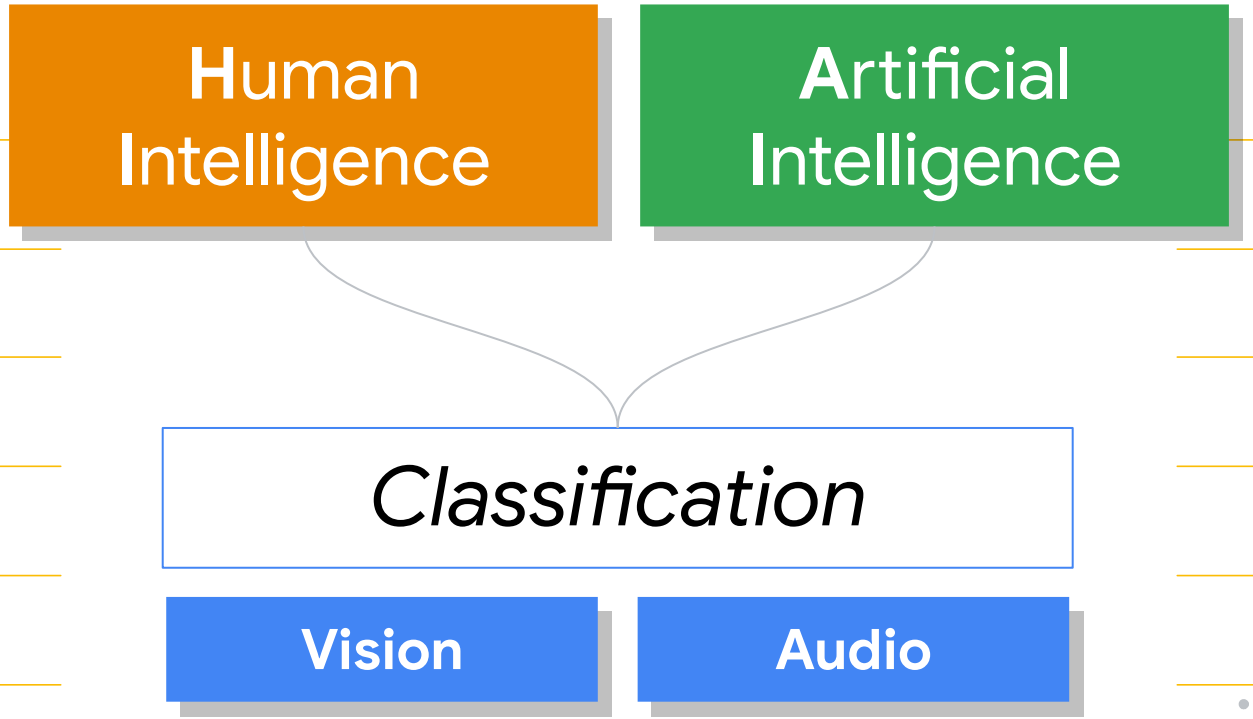
4

5

6

7

8


Human Intelligence
Artificial Intelligence
Classification
Vision
Audio

A **New** Method

Machine Learning

Machine Learning

Let's try to figure out **what** she's doing?

```
01010101001000110101
01010100101001001010
10101011010100101001
```

walking

```
11110101001001010101
01010010100101010100
11010110010101001111
```

running

```
00001110101110101101
01010111101011010101
11010111111001001011
```

biking

```
01111110101110101010
10101110101011010101
11111111100100001110
```

golfing

Let's try to figure out **what** she's doing?

01010101001000110101
01010100101001001010
10101011010010**1001**

walking

11110101001001010101
01010010100101010100
11010110010101001111

running

00001110101110101101
01010111101011010101
11010111111001001011

biking

01111110101110101010
10101110101011010101
11111111100100001110

golfing

Let's try to figure out **what** she's doing?

0101010100100011010101010100101001010010101011010010**1001**

walking

1111010100100101010101010010100101010011010110100**1111**

running

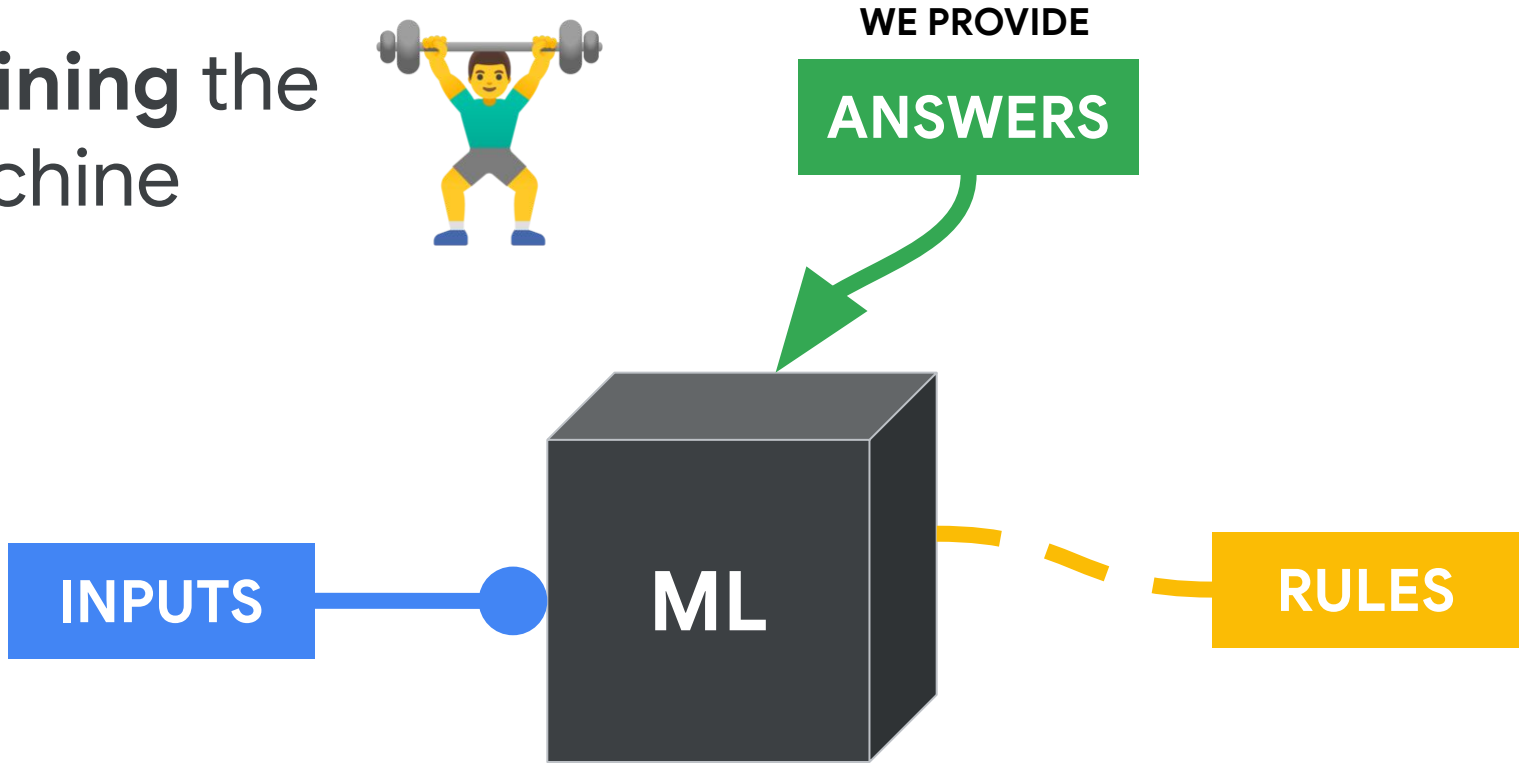
0000111010111010110101010111010110101011010010**1011**

biking

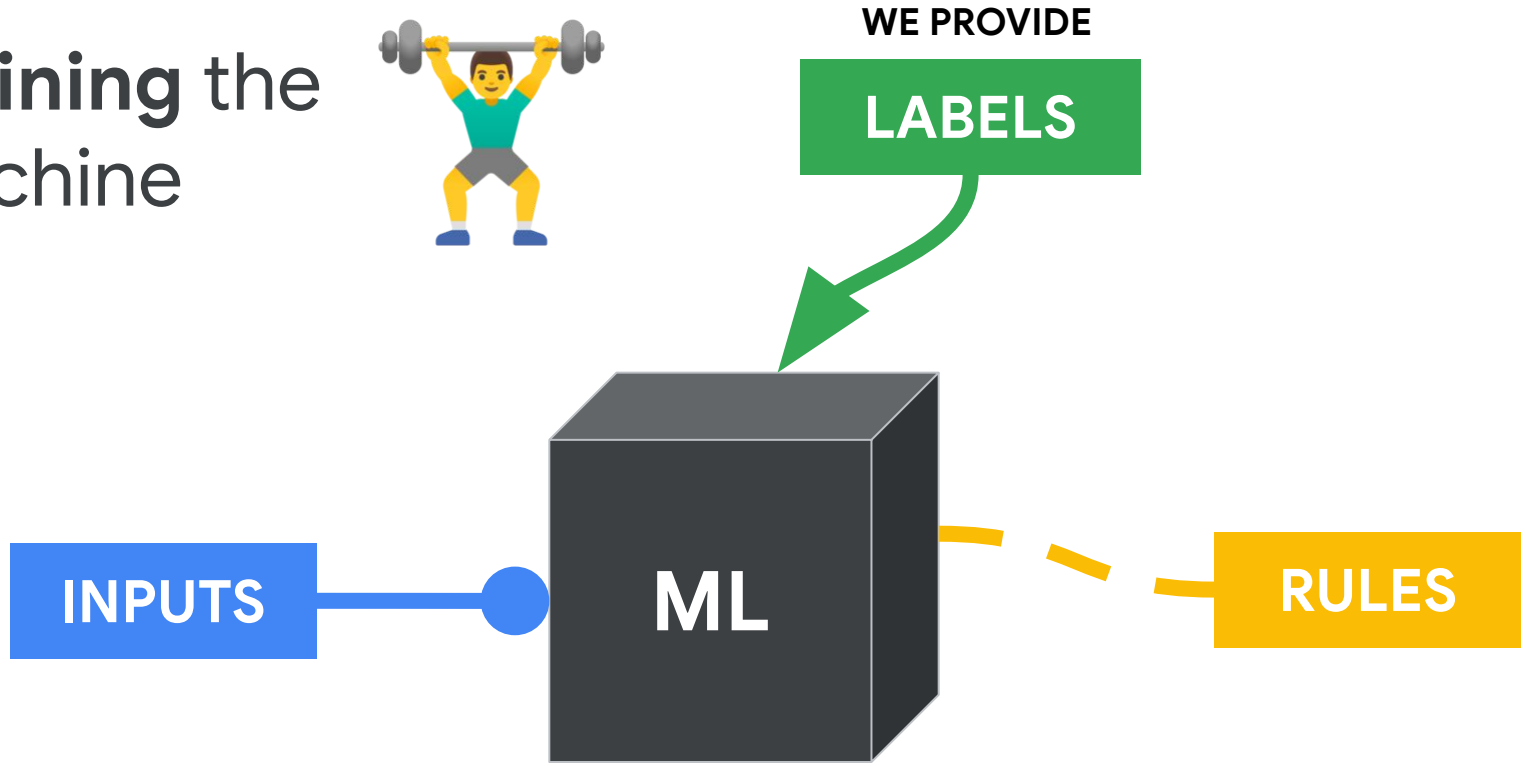
0111111010111010101010101110101101010111111111001000**1110**

golfing

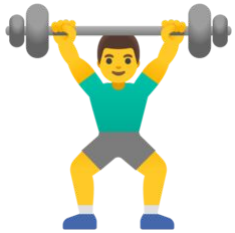
Training the machine

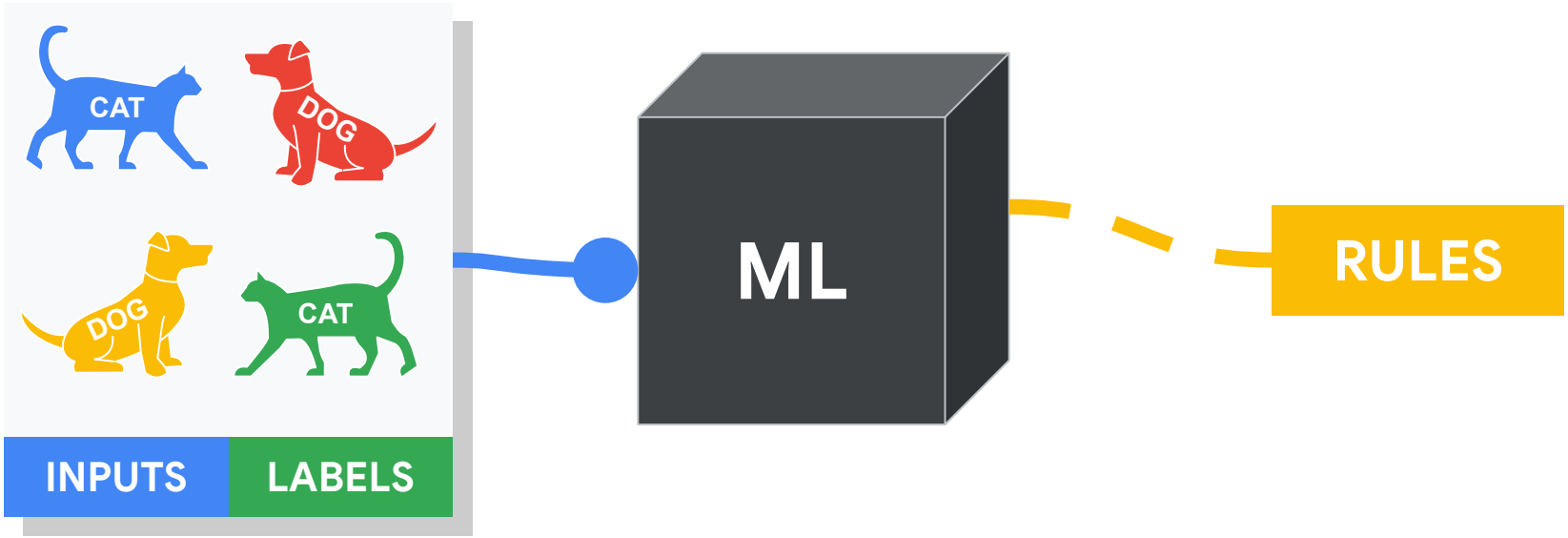


Training the machine

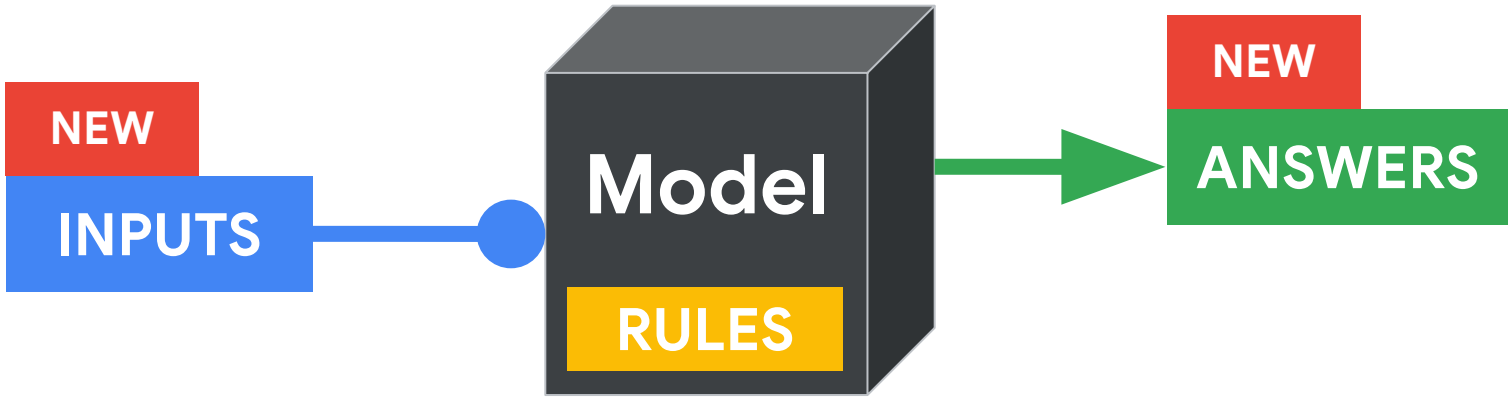


Training the machine

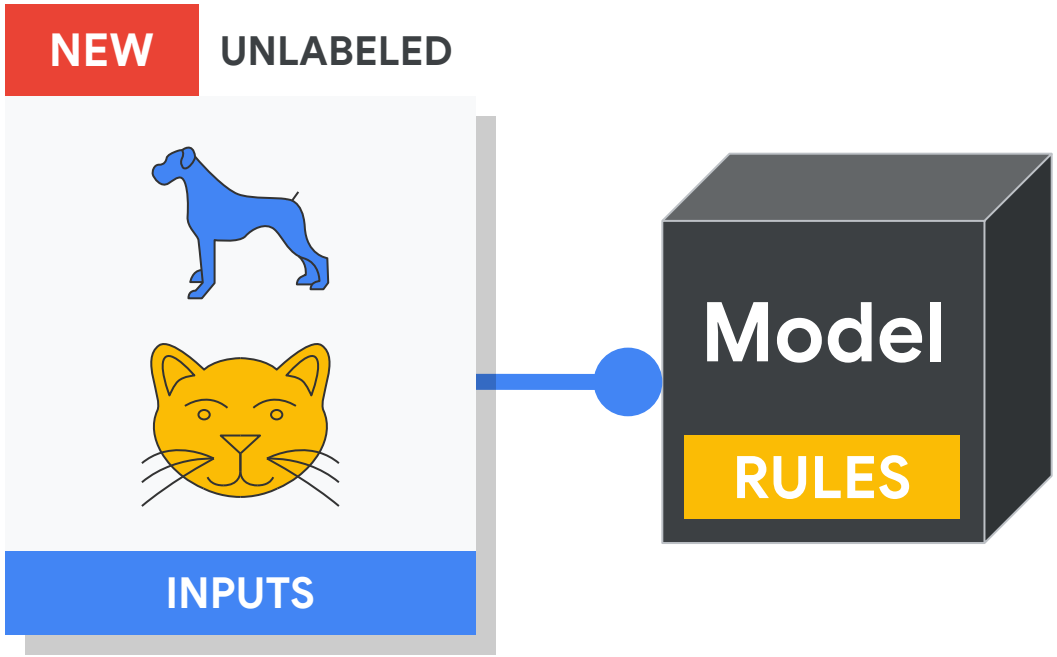




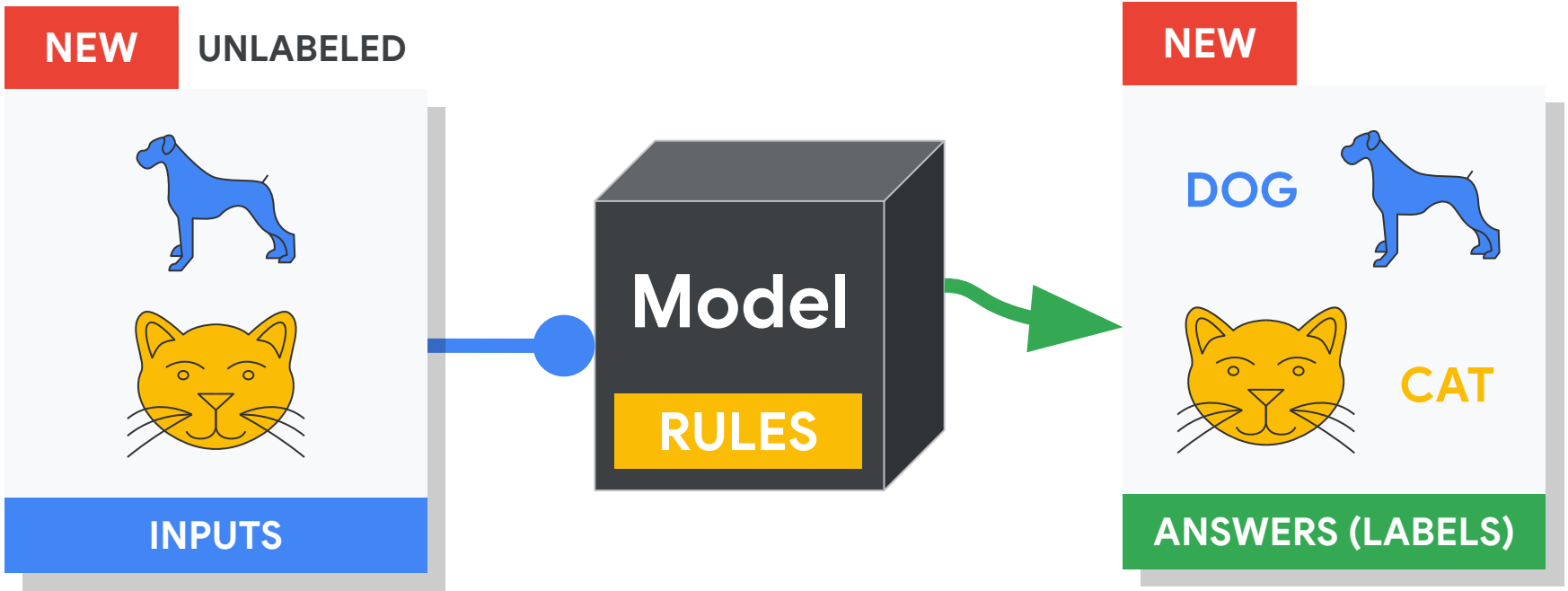
After it's **learned:**



After it's **learned:**



Making **predictions:**



Review what we've learned

Machine learning provides a computer with data, **rather than explicit instructions**. Using these data, the computer learns to **recognize patterns** and becomes able to execute tasks on its own.