

Reading Material

Lab Exercise 7: Example game of Pangolins

Your input is prefixed by '>', and the computer's output is in bold text.

1 The Pangolins Game - 1st round

Assume that, initially, the computer only knows about one object: a pangolin. Suppose you were, rather boringly, actually thinking of a pangolin.

```
1 OK, please think of something  
2 Is it a pangolin?  
3 > Yes  
4 Good. That was soooo easy.
```

Figure 1: 1st round

2 The Pangolins Game - 2nd round

At the end of every round, the computer asks you if you want to play again or stop:

Would you like to play again?

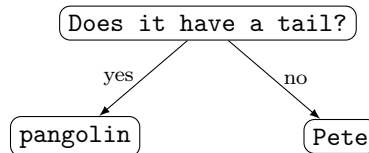
Let's play again, but more interestingly this time - imagine you are thinking of Pete.

```
1 > Yes
2 OK, please think of something
3 Is it a pangolin?
4 > No
5 Oh. Well you win then — What were you thinking of?
6 > Pete
7 Please give me a question about Pete, so I can tell the
  difference between Pete and a pangolin
8 > Does it have a tail?
9 What is the answer for Pete?
10 > No
11 Thanks
```

Figure 2: 2nd round

Now the computer can improve its knowledge base, by incorporating a new object (Pete)

It can put objects and questions together into a single data structure, a **binary decision tree**:



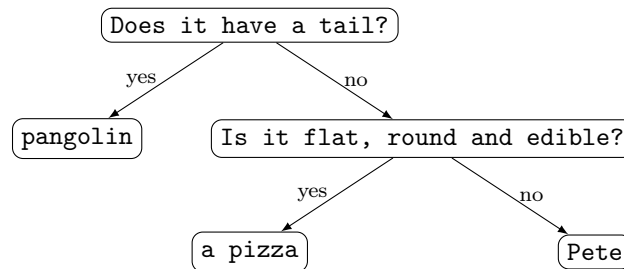
Trees consist of “leaf nodes” that don’t point to any other nodes (in this game they are always the names of objects) and “non-leaf nodes” that point to one or more other nodes (in this game they are always questions, and they always point to two other nodes, one for “yes” and one for “no”). The start of the tree is usually called the “root” of the tree.

3 The Pangolins Game - 3rd round

```
1 Would you like to play again?
2 > Yes
3 Does it have a tail?
4 > No
5 Is it Pete?
6 > No
7 Oh. Well you win then — What were you thinking of?
8 > a pizza
9 Please give me a question about a pizza , so I can tell
  the difference between a pizza and Pete
10 > Is it flat , round and edible?
11 What is the answer for a pizza?
12 > Yes
13 Thanks
```

Figure 3: 3rd round

Now the computer can distinguish Pete from a pizza.
It has had to make a fairly simple change to its decision tree:

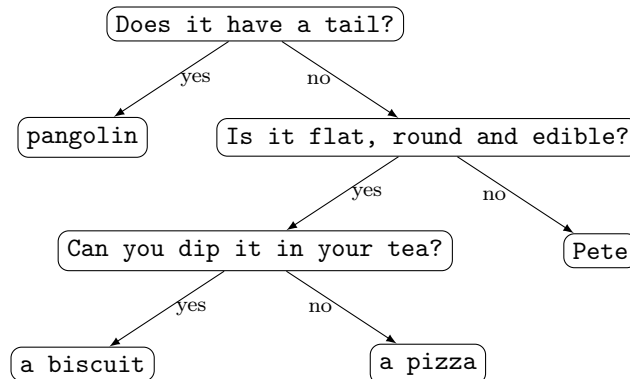


4 The Pangolins Game - 4th round

```
1 Would you like to play again?
2 > Yes
3 Does it have a tail?
4 > No
5 Is it flat , round and edible?
6 > Yes
7 Is it a pizza?
8 > No
9 Oh. Well you win then — What were you thinking of?
10 > a biscuit
11 Please give me a question about a biscuit , so I can tell
    the difference between a biscuit and a pizza
12 > Can you dip it in your tea?
13 What is the answer for a biscuit?
14 > Yes
15 Thanks
```

Figure 4: 4th round

Now the computer can distinguish a biscuit from a pizza.
It has had to make another fairly simple change to its decision tree:

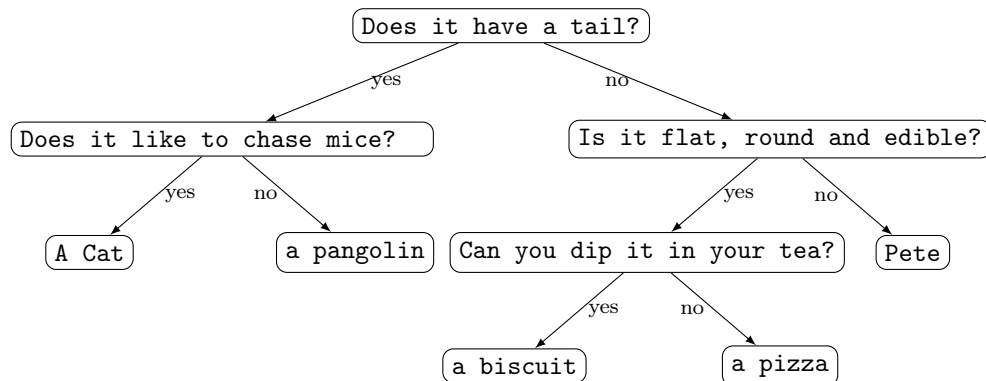


5 The Pangolins Game - 5th round

```
1 Would you like to play again?
2 > Yes
3 Does it have a tail?
4 > Yes
5 Is it a pangolin?
6 > No
7 Oh. Well you win then — What were you thinking of?
8 > A Cat
9 Please give me a question about a Penguin, so I can tell
  the difference between Cat and a pangolin
10 > Does it like to chase mice?
11 What is the answer for a Cat?
12 > Yes
13 Thanks
14 Would you like to play again?
15 > No
```

Figure 5: 5th round

Now the computer can distinguish a cat from a pangolin.
And its decision tree looks like this:



The computer accumulates the information about objects in the form of a 'yes/no' decision tree. Successive rounds of the game cause the tree to grow as more questions and objects are added.