

02

GOOD MONKEY,  
BAD MONKEY!WHICH MONKEY BITES,  
WHICH NOT?

**What does a decision model for biting and non-biting monkeys have to do with artificial intelligence (AI)?**

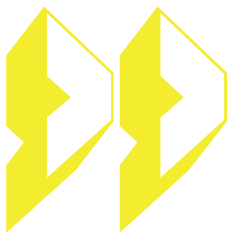
AI-supported computer systems often have to make decisions. For example, they rate whether a person can get a loan or whether dogs or cats are shown in pictures. Indeed, they can make such decisions with similar models as you have just developed them for our monkeys. These are also called **decision trees**.



*Decide: cat or dog?*

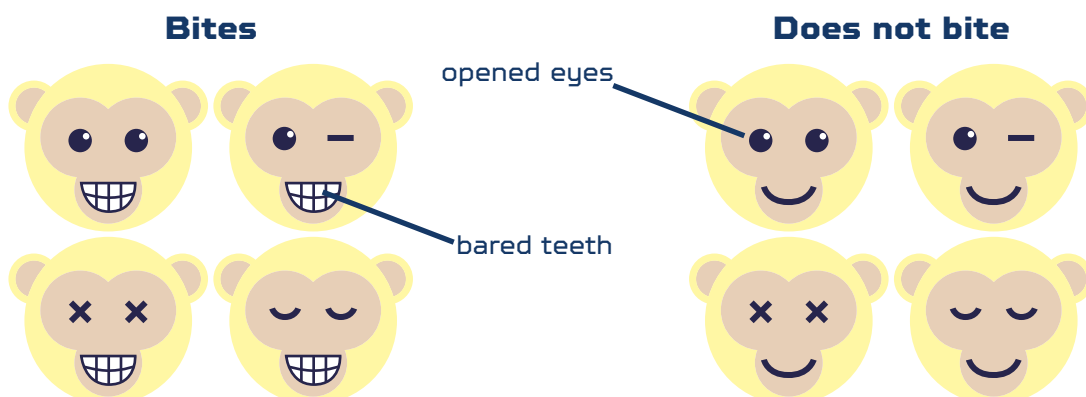
First of all, you need **a lot of examples** for the categories to be distinguished, for instance, pictures of biting and non-biting monkeys.

For a real AI system, a wide variety of data can be used: Bank details of many people or pictures of dogs and cats. Each example must be classified in a category. In our example, we might use: "Monkey bites" / "Monkey does not bite" or "dog" / "cat". These sample data are called **training data** because the AI system learns from them.



### Why is that essential?

By classifying them in this way, the AI system can find **characteristics** that only occur in one category. In the example, you can see bared teeth only with the biting monkeys.



*In this example, only monkeys with bared teeth are biting.*

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With the help of such characteristics, you are (or the AI system is) now also able to decide if a new monkey bites or not: "Ah, this monkey bares its teeth, so it probably bites!" In most cases, however, you don't just need one feature and a corresponding rule to make good decisions, but quite a few. You have already created several rules in your decision model. A real AI system often uses **thousands of different features and rules** for its decisions. Creating rules with the help of labelled examples is also called **supervised learning**.



However, it can happen that the sample data is not well chosen. For example, if only sample images of very large dogs are available, an AI system could develop the rule: "If the animal is large, then it is a dog!" and immediately classify all small dogs as cats. Such errors can be dangerous if the AI system's decisions treat people unfairly or even put them in danger.

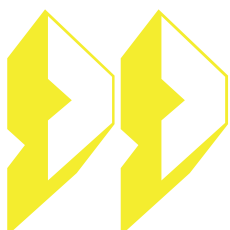
That's why it's important to test the decision model. You have already tested yours with other monkeys. A real AI system is also shown further examples, called **test data**, after it has designed a decision model. It uses its decision tree to evaluate the test data and you can determine how many errors it makes.

Of course, a system that makes too many mistakes cannot be used in practice. It then has to continue learning: a self-driving car should be able to distinguish between a pedestrian and a tree without making any errors.

Important! AI systems are never perfect! Some features are not included in the training data and then the system has to guess. For example, a dog may look like a cat when it curls up to sleep. A rabbit image is also classified as a dog or a cat by a dog-cat decision system because it does not recognize the category "rabbit".



*Definitely a cat?*



**As you can see, decision-making systems are not really clever at all, but stubbornly apply the rules they have learned.**



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## SOURCES

"Decide: cat or dog?"

Picture created by Annabel Lindner

"Definitely a cat!?"

<https://pixabay.com/de/photos/kaninchen-hase-haustier-373691/>

Monkey graphics

Designed by Sonja Gagel

