# Satellites and Snow Leopards

Leopard Spotting

Satellite technology can be useful in so many ways in modern life from finding your way, to communications. Many satellites look down on Earth to tell us important things about how our planet is changing. One such way scientists are using satellites is to monitor snow leopards, but how does the technology work?

Machine Learning

The words machine learning (ML) and artificial intelligence (AI) are everywhere in the modern world but what do these terms actually mean? AI is the ability for a computer program or machine to think and learn and machine learning is the process it uses to do so. Examples of machine learning include image recognition like spotting the difference between a cat and a dog in images.

The result of this training is known as a model. In order for the model to be accurate, the computer needs thousands of images of cats and dogs of all different types (and in all sorts of positions).
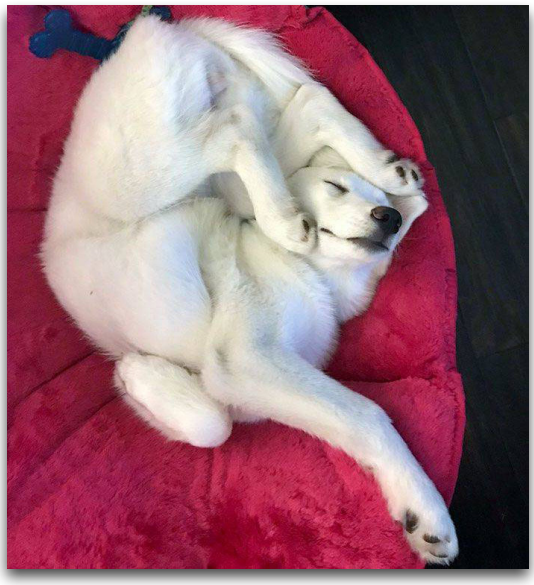
This is because the model needs to be able to tell the different animals apart by grouping together different parts of the image (pixels) and the more variety supplied to the model the better it gets at doing this job. The machine learning diagram at the end of this booklet shows this process in more detail.

To learn more about training Machine Learning models, and to see if you can solve the different scenarios [click here](#)!

Tracking snow leopards using satellite data

Now that we understand a little bit about how to train Machine Learning models, we can explore all of the wonderful research currently going on to help the elusive snow leopard. One such initiative is being undertaken by WWF where they have fitted a number of these cats with collars that emit a tracking signal that is picked up by satellites. Scientists then study this data to look for patterns in the animal's movements. They look for what adversely affects the cats, for example:

- Habitat loss due to human activity, which includes breaking up their living space with more human settlements meaning the cats can no longer roam as far. This especially affects their ability to find a mate.
- Snow leopards that get too bold and come into conflict with people, which is often a result of the first point as the cats no longer have enough wild prey in their territory to sustain them.
- Effects of climate change can cause the cats to have to travel further from their suited terrain.
- The illegal wildlife trade and poaching. Unfortunately, many people still want to own a snow leopard's pelt/fur and this is further threatening these cats.

By using satellite data, scientists can recognise these trends and intervene when they see a snow leopard coming into an area where they are likely to get into conflict with people. They locate the animal and do their best to capture and release them far from known problem zones. Machine learning can be helpful here as a model can be trained to predict the movements of these collared snow leopards and alert scientists before the cats reach known problem zones allowing them to prepare.

Another project is being undertaken by The Snow Leopard Trust where they have placed camera traps throughout the snow leopard's natural habitat. Camera traps are triggered by any movement, so any wildlife in the area will be photographed, meaning that it is difficult to find the shots of snow leopards. The Snow Leopard Trust used cloud technology to create a Machine Learning model capable of spotting snow leopards in images, allowing researchers valuable insights without having to spend hours searching through thousands of images.

To learn more about this innovative solution click here!

Snow leopard facts

- They are extremely agile, able to chase prey down the steep mountains of the Himalayas.
- They are long jump champions able to jump 9 metres - 6 times their body length!
- Their usual prey are mountain goats or Ibex
- They have natural snowshoes - Snow leopards have wide fur covered feet that help distribute their weight across soft snow and as a bonus protect them from the cold.
- Despite being called 'leopard' snow leopards are more closely related to tigers than to leopards.
- They are very well camouflaged. This can make them tricky for scientists to spot!

Try your hand at being a snow leopard scientist - can you track down the snow leopard in these images? Answers on the next page.

Visit WWF to learn more about these amazing animals and what you can do to help out!

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We have collaborated with our Planetarium sponsors Leidos to create these learning materials. Leidos and Dynamic Earth both work to inspire people of all ages and backgrounds with an interest in the science of our world, with a strong focus on STEM (Science, Technology, Engineering and Maths) engagement.

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Answers

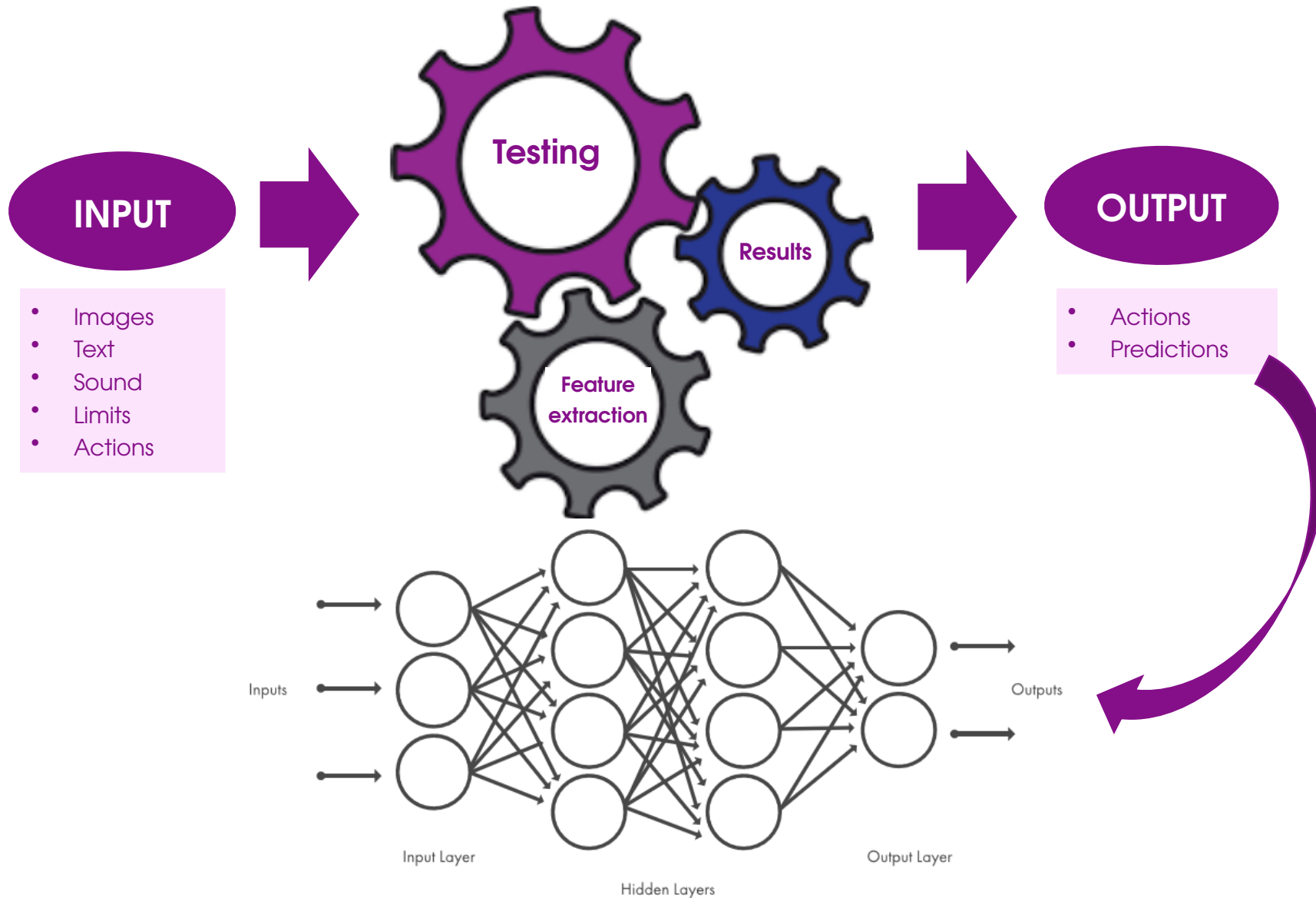Captured by Nirali Mehta, a student from Mumbai. (Credit: Caters News Agency)

This one was tricky! Can you see his eyes peeking out from behind the rocks?

Machine Learning

Learning through experience…

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INPUT

- Images
- Text
- Sound
- Limits
- Actions

Testing

Results

Feature extraction

OUTPUT

- Actions
- Predictions

Inputs

Input Layer

Hidden Layers

Outputs

Output Layer

Machine Learning in Real Life

Below are some examples of machine learning in real life

Voice Recognition

Chat Bots

Fraud Detection

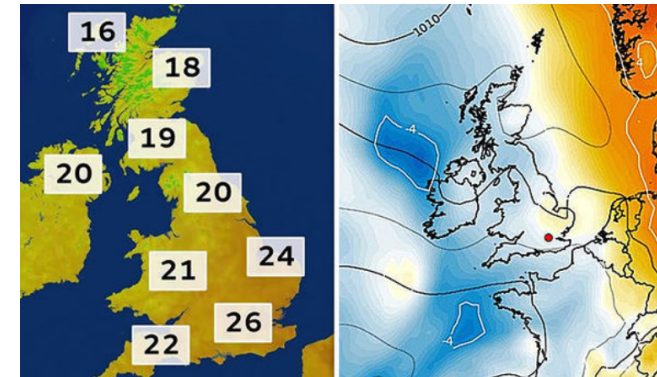**Weather Forecasting**

Videogames / Apps

Face Recognition / Photo Tagging

Product Recommendations