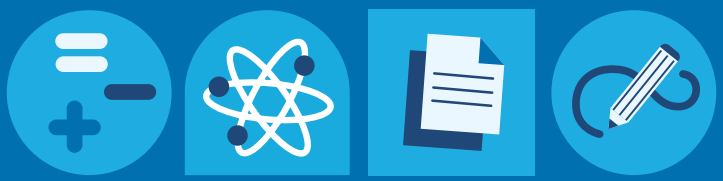
Suitable for 3-7 years

- Solo
- Pairs
- Groups

Paul's activity

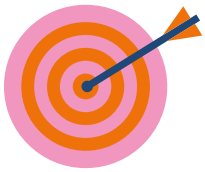
Computer vision game

How to guide



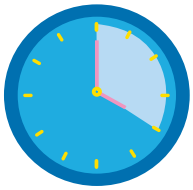
Paul's activity guide

Computer vision game



Aim

The aim of this activity is to explore visual patterns or similarities and think about how we recognise and classify objects. Our brain is very good at this process and engineers are trying to learn from how our brains work to help computers and robots learn how to be better at recognising things in images.



Time required

There are different games that can be played with the cards, individually and in groups. Allow ~10:00 minutes per activity.

Story to guide activity

Shark in the Park by Nick Sharratt

Materials

- **Set of cards** (print out and laminate)

Instructions

Spotting patterns connections

1. Read the story Shark in the Park (follow on books, Shark in the Park: on a windy day and Shark in the Dark)
2. Discuss how it can be difficult to identify what something is, especially if only looking at a small part of it
3. Ask the children to look at the pages of Shark in the Park and identify what other objects are in the pictures. As a way to introduce the cards show the relevant cards from the game when the object is mentioned (note - not all objects pictured in the book have a card). When objects are mentioned, e.g. a cat, ask the children how they know it is a cat (to get them to start thinking about what are the features they use to recognise something). You could also show a card and ask children what is the most important feature to recognise the image, e.g. fin for a shark, and find that feature in other images. See how it works for further discussion points.
4. Using a piece of card with a hole cut out to represent the view from the telescope. Cover up the object only revealing one feature and see if you can see what the object is from this limited viewpoint.
5. Having seen many features and objects ask how they know that the shark was a shark and not a cat even if both objects have a similar feature (the fin of the shark and the ears of the cat). By using a combination of features together you can get a better understanding of the object. This is exactly what a computer or robot does, it identifies all the features it can then makes the decision based on this. Play a game based on linked features using two or three features to now identify objects on the cards. Extend this to other objects you can think of that have the same two or three features.

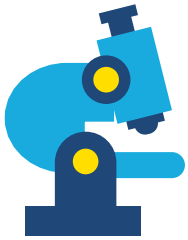
Using the cards to play games

Domino style game where you have to add a card based on some kind of visual connection to another, e.g. by colour, shape, pattern etc. Encourage the children to explain their reasoning when adding a card (encourage them to focus on visual elements although they might find other interesting connections like concepts of flying or materials, e.g. stating that the bench and fence are both made of wood). As an example the shark can match the cat, the bird and the hairstyle just like in Shark in the Park or you could match the kite and the girl via the dots on both or the triangle shapes on the kite tail or in her pigtails...there are many more – what will you find?

Matching pairs game where any connection between two images allows for a match (you could set additional rules, e.g. only matches based on colour or on shape)

Lay out a 3 by 3 grid with cards face up and ask the children to come up with a way to connect as many images as possible, e.g. are there 4 cards with red, or 5 cards with a circle shape...., or to find a characteristic which only connects 3 of the cards. If desired, this could be competitive with the person who answers fastest getting to keep the identified cards and the person with the most cards at the end wins

Do you or the children have other ideas of how to play?



Background information

Our brain usually recognises things for us without us having to think through the process – scientists and engineers are trying to work out how the brain does this so that they can apply the same principles to computers and robots. It can be hard to come up with a set of rules to help a computer recognise a picture, i.e. thinking about how do we know something is a cat, example children might say 4 legs or whiskers but other animals also have four legs and whiskers. Or they might not know and in fact we often learn by looking at lots of pictures of different things, and being told what they are, and our brain works out how to figure out 'the rules' to recognise something, without us really being aware of it. Computers can 'learn' in just the same way, i.e. by being shown lots of different pictures of cats they figure out how to recognise a cat in an image in a process called 'machine learning'. Computers and robots that can recognise images are useful in medicine (helping doctors check scans or X-rays), manufacturing (inspecting and controlling processes), navigation (like in driverless cars or Rovers for space missions), facial recognition (for security purposes) etc. See for more information: https://kids.kiddle.co/Computer_vision.

Current state of the art for machine learning used in many applications involves showing millions of labelled images of things like cats and dogs for it to be able to accurately identify these. However, humans can often learn new objects with one or few instances of seeing it, this is even true if the new object in question is view from a different angle or has changed slightly. A feat that machine learning has yet to overcome. This highlights just how far aware we are from truly intelligent robots that have human levels of intelligence. Through a combination of Neuroscience, Psychology, Computer Science and Electrical Engineering research the problem is trying to be solved.

Prompt questions

- How do these cards link together?
- How can you sort the images? Colour, shape, pattern are the most obvious visual ways and would be easiest for a computer to recognise but there are other possibilities like presence of certain features (e.g. wings, eyes, shark fin..) which a computer can learn (e.g. it would learn common characteristics of images with eyes like the shape, colour/ contrast differences etc) or concept categories (e.g. animals, girls, trees...)

Extensions

- Link this activity with our juggling activity – what vision processing skills do we need to juggle well?! For the youngest children this activity is broken down to simple throwing and catching activities.
- Further matching activities (why not try our Engineering Structures matching pairs game by Fionah) or other computer type games (see Emilyann for a game of Simon Says and coding and to find out all about robots)
- For older children you could purchase the game OuiSi to explore further connections between a different range of images.