

How can we tell when a pet is happy?

Year level: Years 3-6 or 5-6



Summary

How can you tell when a pet is happy? This lesson explores this very question and how Artificial Intelligence (AI) can help.

AI Computer Recognition technology involves teaching computers to “see”. Facial recognition technology is one application which is increasingly used for security and identification of humans (e.g. security cameras, passports, social media photo tagging and social media filters).

This lesson is inspired by AI undertaken by University of Melbourne graduates and students to develop the app Happy Pets. It explores how AI can be used to help humans measure the emotions of their pets (currently cats and dogs) with computer vision technology.

In this lesson students consider and investigate how pets display emotions, in comparison to humans. They use an AI app Happy Pets while learning that they are part of a project to train a real AI model that aims to help humans understand their pets.

A possible extension could be for students to create their own AI Model using Cognimates in a future lesson or a Scratch program relating to identifying emotions in pets.

Required Resources

The following resources are required:

1. Tablet device or smartphone with the App *Happy Pets*:
 - a. Android: <https://play.google.com/store/apps/details?id=au.edu.unimelb.eresearch.happypet>
 - b. iOS: <https://apps.apple.com/au/app/happy-pets/id1515202735>
2. A variety of digital photographs of students’ pets or sourced creative commons images of pets (cats or dogs) from the Internet. Aim for at least 3 per student.
3. [Optional]: Pens and paper or digital collaboration tool (e.g. Google Slides or Google Doc) to brainstorm and record information.

Recommended Reading/Viewing

- “Ever wondered what your pet is thinking?” by Prof Uwe Aickelin, Yunjie Jia, Pei-Yun Sun and Rio Susanto, University of Melbourne:
pursuit.unimelb.edu.au/articles/ever-wondered-what-your-pet-is-thinking

Required Learning

Students have:

- A general understanding of Artificial Intelligence.
 - **View or revisit an AI Explainer video:** For example by Digital Technologies Hub:
digitaltechnologieshub.edu.au/resourcedetail?id=95f44c98-09f9-6792-a599-ff0000f327dd#/

Suggested steps

The following are some suggested lesson sequences. Please adapt to suit your class and needs.

1. **Class Discussion:** Ask students: How can AI detect the way a human person feels? As a whole class, brainstorm observable examples of human emotion on the board according to the following emotions - happy, neutral, unsettled, sad, anxious.

Next, consider: Can AI detect the way a dog or cat is feeling? Have a class discussion. Consider observable emotions in cats or dogs.

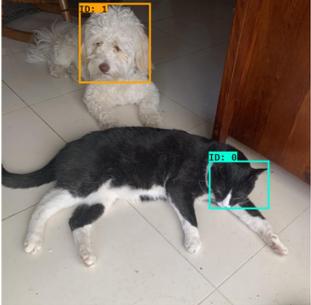
2. **Introduce the App Happy Pets.** Share the work being done by University of Melbourne graduate researchers and the app “Happy Pets”.

Explain that this App has been trained on a large dataset of many photos of cats and dogs with humans labelling photos as either - happy, neutral, unsettled, sad, anxious. Now whenever someone uploads a new photo to the App, it will predict how the pet is feeling based on all the examples it has seen before.

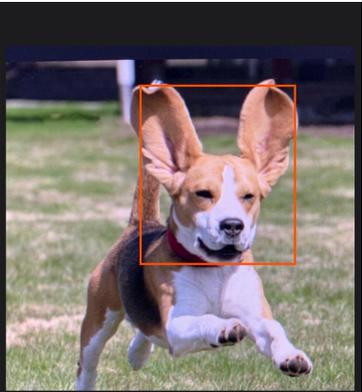
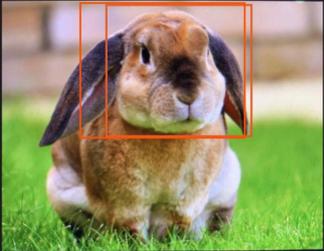
Demonstrate an example of using the App with a photograph of a pet (Note - only dogs and cats are currently available). Before you use the App, have students predict which of the following emotions the pet shows: happy, neutral, unsettled, sad, anxious.

Submit the photo and see the result! Check if the type and the breed are correct. Ask the students if they are surprised or not about the emotion prediction and discuss why/why not.

Notice the app asks for feedback (see below). In Machine Learning, point out that this means you are helping to improve the model by providing feedback on whether the image is classified correctly or not. The more it is able to learn, the better predictions can get.

<p>Prediction: Happy</p>  <p>Type: Dog Breed: Havanese (95.0%) Emotion: Happy (78.0%) Happy (78.0%), Neutral (22.0%), Unsettled (0.0%), Sad (0.0%), Anxious (0.0%)</p> <p style="text-align: center;">+ Add Feedback</p>	<p>Prediction: Both are neutral.</p>  <p>ID: 0 Type: Cat Breed: Ragdoll (35.0%) Emotion: Happy (90.0%) Happy (90.0%), Neutral (9.0%), Sad (1.0%), Unsettled (0.0%), Anxious (0.0%)</p> <hr/> <p>ID: 1 Type: Dog Breed: Havanese (93.0%) Emotion: Happy (50.0%) Happy (50.0%), Neutral (50.0%), Unsettled (0.0%), Sad (0.0%), Anxious (0.0%)</p>
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Below we have a correct and incorrect example of an incorrectly classified image. The Rabbit has been misclassified as a Beagle because it looks very similar. If you can find or have an opportunity to see an incorrectly classified photo, invite students to explain why the AI has predicted incorrectly based on what they know about how AI works. Consider colour, shape, size, features, etc.

 <p>Type: Dog Breed: Beagle (63.0%) Emotion: Happy (95.0%) Happy (95.0%), Neutral (5.0%), Unsettled (0.0%), Sad (0.0%), Anxious (0.0%)</p> <p style="text-align: center;">+ Add Feedback</p> <p>Correct example - this is a beagle and he looks happy!</p>	 <p>Type: Dog Breed: Beagle (46.0%)</p> <p style="text-align: center;"> <input checked="" type="checkbox"/> <input type="checkbox"/> </p> <p>Emotion: Neutral (81.0%)</p> <p style="text-align: center;"> <input type="checkbox"/> <input checked="" type="checkbox"/> </p> <p>Neutral (81.0%), Happy (17.0%), Unsettled (1.0%), Sad (0.0%), Anxious (0.0%)</p> <p style="text-align: center;">- Hide Feedback</p> <p style="text-align: center;">Send Feedback</p> <p>Incorrect example - this is not a Beagle. This is because the App has only trained for cats or dogs.</p>
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3. **Students use the Happy Pets App:** Students use digital photos of their pets taken before class, or take some time to find images of creative commons pets online (Note: You can [ccermocs.adelaide.edu.au](https://creativecommons.org/licenses/by-sa/4.0/) | Creative Commons CC-BY-SA

have students practice saving/taking photos on a digital device, or you could have students take a photo of the computer screen using the app on the digital device).

Before uploading the photos, have students predict how the pet is feeling by allocating percentages against each of the key emotions: happy, neutral, unsettled, sad, anxious.

Have students upload their photos and review the accuracy of their results. Students can take screenshots to record their results or record their results on paper. Have students record and reflect on their outcomes. As a class, students share their results. Were they surprised by some results? Were they correct? Is it difficult or easy to detect emotions?

Notice the patterns across all of the recorded results students have shared. Are there similarities and differences? Invite students to critique the accuracy of the App and what predictions could be improved.

Discussion

This activity and the Happy Pets App provides an interesting context to discuss the use of datasets and bias in Machine Learning, along with the benefits and challenges of detecting emotions in pets. Some of the following questions could provide a springboard for some discussions around Digital Technologies concepts.

- What and who might use an App like Happy Pets? What are some benefits in using an App for detecting emotions in pets? What could be a risk of relying on the App?
- If this App was to be expanded to include other pets, what would the project team need to do? Which pets would be easy and difficult to identify emotions? Why?
- If Apps like Happy Pets rely on pet owners to upload images of their pets and provide feedback, what biases might this introduce to the app?
- How effective is the Happy Pets App at correctly identifying the type of pet and predicting emotions? What needs to be improved? How could it be improved? Students should be thinking about the use of datasets and training in Machine Learning.

Why is this relevant?

AI and ML are emerging technologies, increasingly being used in society. By including these examples and how they work within the Australian Curriculum: Digital Technologies, students are keeping pace with the most current technology.

In this lesson, students learn about how AI Computer Vision technology is trained to classify images of pets along with their emotions. Within the context of using the Happy Pets App, students learn about the use of data and datasets in Machine Learning (ML) and AI, predictions and accuracy of AI, and feedback mechanisms to improve ML/AI. Students consider bias in datasets and ML training. The assessment activity presents an opportunity for students to also consider the design of the app, including user interface, and to critique the solution.

Students consider how the App and this type of AI technology could be used, along with the social and ethical implications.

Assessment

This assessment includes a creative review for the App. We have included a suggested criteria, however, students could be involved in identifying what criteria they deem as important to include in a review. Please find the project brief below.

You have been selected to provide an exclusive user review for the Happy Pets App!



You can choose to provide a written review or you can submit a video review.

What to include in your review:

Provide a description of the Happy Pets App for the reader/viewer. Let them know about who made it, what it does, and how it works.

For each of the following criteria, present your ratings out of 5 stars:

- Fun and entertainment
- Ease of Use
- Visual Appeal
- Credibility
- Accuracy
- Overall satisfaction

Provide an explanation and justification for your ratings for each of the criteria. Use examples from the app, including your experience and results to support your explanation.

Lastly, end your review with what you hope the Happy Pets 2.0 App will be like. Identify what features and functionality you hope to see. Explain what you think will be needed to expand the App.

Feedback - Year 4 example

Students could be provided feedback on their review based around the following adapted achievement standard content:

- Students describe how social, technical and sustainability factors influence the design of the Happy Pets App and how it meets present and future needs.
- Students describe features of the Happy Pets App and how the App can be used.
- Students outline and define opportunities or problems with the App.

The assessment should also consider the students' ability to use the App, including sourcing, saving and uploading images of pets as well as collecting data about the App's performance to compare and contrast with others.

For advice on assessment refer to the Digital Technologies hub Guides and templates:
<https://www.digitaltechnologieshub.edu.au/teachers/assessment/guides-and-templates>

Curriculum links

Links with the Digital Technologies curriculum area

Strand	Content description
Knowledge and Understanding	<p>Yr 3-4: Identify and explore a range of digital systems with peripheral devices for different purposes, and transmit different types of data (ACTDIK007)</p> <p>Years 3-4: Recognise different types of data and explore how the same data can be represented in different ways (ACTDIK008)</p> <p>Yr 5-6: Examine the main components of common digital systems and how they may connect together to form networks to transmit data (ACTDIK014)</p>
Processes and Production Skills	<p>Yr 3-4: Collect, access and present different types of data using simple software to create information and solve problems (ACTDIP009)</p> <p>Yr 3-4: Explain how student solutions and existing information systems meet common personal, school or community needs (ACTDIP012)</p> <p>Yr 5-6: Acquire, store and validate different types of data, and use a range of software to interpret and visualise data to create information (ACTDIP016)</p> <p>Yr 5-6: Explain how student solutions and existing information systems are sustainable and meet current and future local community needs (ACTDIP021)</p>

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