Raspberry Pi Foundation

Lesson 6: Model cards and careers

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Introduction

In this lesson, students will complete the final stages of the AI project lifecycle: evaluating and explaining a model. To help them explain their model, students will be introduced to model cards, which are a way for the developers of a model to share important information about how to use the model, the results of testing, and any limitations relating to the accuracy of the model.

In the final activities in this lesson, students will explore a range of careers both in the field of AI and in other fields in which AI applications are used. Students will learn more about the staff members at DeepMind who have featured in the videos they have watched throughout the unit, as well as exploring how AI applications and machine learning can be used in fields they are interested in.

Learning objectives

- Evaluate a machine learning model
- Produce a model card to explain an ML model
- Recognise the range of opportunities that exist in AI-related careers

Key vocabulary

AI project lifecycle, machine learning model, model cards, class, label, training, testing, accuracy, confidence score, confidence threshold

Preparation

You will need:

- Slides
- Activity 1 worksheet (optional)
- Activity 2 worksheet
- Activity 3 worksheet
- Students' completed project documentation worksheets from Lesson 5

- Summative assessment (optional)

Subject knowledge:

In this lesson, students will learn about **model cards**. Model cards are an approach proposed by Google (modelcards.withgoogle.com/about) as a way to outline essential facts about machine learning models. In the same way that you can expect to find nutritional information about food or warnings on household cleaning products, a model card helps people evaluate whether or not the model is suitable for their application. The audience for a model card is not the consumer, but the people responsible for the application that uses the model.

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Assessment opportunities

In this lesson, the students will finish the project they started in Lesson 5. During Activity 2, they will explain their model using a model card. This will give you an opportunity to assess their understanding of all of the concepts covered in the unit. Have discussions with the students to see how well they have consolidated their learning about training and test data, evaluating accuracy, and bias.

This unit also includes a summative assessment with multiple choice questions covering the concepts from all six lessons. Delivering this assessment is not part of this lesson, but you could ask the students to complete it the next time you see them to assess their overall understanding of the learning in the unit.

Outline plan

Please note that the slide deck labels the activities in the top right-hand corner to help you navigate the lesson.

**Timings are rough guides*

Starter activity (Slide 2) 5 mins	**Predicting future crime** As the students enter the classroom, display slide 2 and ask them to read the scenario and question on the slide and think about their answers independently. Once the class has settled, take answers. Ask probing questions to allow discussion to be focused around the potential for bias and the impact that using a model that produces biased predictions might have on individuals and society.
Introduction (Slides 4–8) 8 mins	**Evaluation and explainability** Display slide 4 to show the students a visual representation of the progress they have made through the AI project lifecycle and the stages they are yet to complete (evaluating and explaining the model). Play the video on slide 5 to explain these two stages. Display slide 6. This slide reinforces what was covered in the video, but focuses on the evaluation stage. Explain that the students have already started this stage, by working out the accuracy of their model in the previous lesson. Discuss the other questions that they need to consider during this stage. Answering these questions will help inform what they will write on their model cards in Activity 2. Use slides 7 and 8 to introduce model cards and explain their purpose.
Activity 1 (Slide 9) 10 mins	**Using a model card** Use slide 9 to introduce a scenario in which a music venue wants to use a model in an application to help them with crowd management. The students need to explore a model card to help the music venue decide if they should use this particular model. Click on the slide to display prompt questions for the students to think about. If you like, you could hand out the worksheet and ask the students to record their thoughts. Allow 4 to 5 minutes for the students to read the model card and think about their answers independently. Allow a further 2 minutes for the students to discuss their thoughts with the person next to them, then stop the discussions and take responses from the class. Students should debate some of the limitations outlined in the model card. Some of the limitations might be too much of an issue for the music venue, such as the performance of the model potentially being impacted by poor lighting, movement, or faces being obstructed.

Activity 2 (Slide 10) 15 mins	**Create your own model card** Display slide 10 and tell the students that in this activity, they need to produce a model card for the model they created in the previous lesson. Instruct the students to open the Activity 2 worksheet and use the template to help them create their model cards. The template includes prompts for them to use, which the students should delete before they write their own content. **Note:** The students will need their project documentation worksheets from the previous lesson to be able to complete the section outlining the accuracy of the model.
Activity 3 (Slides 11—18) 10 mins	**Careers in AI and machine learning** This unit has included several references to careers, and the students will have seen how AI applications and machine learning models are being used in a number of fields. In this activity, the students will focus their attention on the careers available in the fields of AI and machine learning, by hearing from the experts at DeepMind who have featured in the videos they have watched. They will also briefly hear about other types of careers in which AI applications are used. Show slide 11 and explain to the students that there are many different careers that are related to or will be impacted by the use of AI applications. Share the following examples. Designers and developers of AI applications: • Professionals like the staff members at DeepMind they have been hearing from • Professionals who train and test models • Engineers who create new types of models or develop new techniques for existing models Subject experts: • Data scientists who help gather and clean data • Specific domain experts, such as biologists working on climate science projects, lawyers considering the use of models in the field of law, etc. • Ethicists who ensure models are created with equality in mind Users of AI applications:

	• Professionals in any career that involves using AI applications Move on to slide 12 and explain that you are going to focus on the designers and developers of AI applications for now. The students are going to hear from staff members at DeepMind to help answer the questions “What is a career in AI actually like?” and “What should we be excited about for the future?” Play the video on slide 13. This is a compilation of insights about a career in AI and ML from people who work in those fields. Move on to slide 14. Explain that careers in the fields of AI and ML can broadly be split into three categories: ‘social and ethical’, ‘applications’, and ‘models’. The students have encountered topics relating to all of these categories throughout the unit. Distribute the worksheet and show slide 15. The students’ first task is to match the descriptions to each of the three categories. Give the students 1 to 2 minutes to do this. Display slide 16 to reveal the correct descriptions of the categories, and spend 1 minute discussing all three categories. It is important to make a clear distinction between the ‘applications’ and ‘models’ categories. Careers in the ‘applications’ category involve **implementing** models into a piece of software so they can be used. Careers involving any training are considered part of the ‘models’ category. You should make it clear to the students that these categories overlap and everyone working in the fields of AI and ML will be thinking about aspects of each one to a certain extent. Move on to slide 17. Explain that the rest of the pages in the students’ worksheet are profiles completed by staff members at DeepMind, giving some more information about themselves and their jobs. The students’ task is to sort the profiles into the categories, based on the description of the staff member’s job. It is likely that some jobs will fit into multiple categories, so the students can place the icons on the line in between categories if they think it is best. Give the students around 5 minutes to read the profiles and sort them, then bring the class back together and show slide 18. Ask the students to discuss with a neighbour which category or job role they are most interested in, and whether they have noticed any similarities between themselves and the people working at DeepMind.

	After 1 to 2 minutes, take some answers from the class about what resonates with them. The main point of this exercise is for the students to engage with the profiles, with the aim of finding something they can relate to, either in the job roles and categories or in the details about the people themselves. The intention of this is to support the students to see that they could have a career in the field of AI if they want to.
Plenary (Slides 19–21) 5 mins	**The use of AI applications in other fields** Show slide 19 and remind the students that there are many other careers involving the use of AI applications, in addition to careers in companies like DeepMind. Throughout these lessons, the students have heard about examples of these other careers. Move on to slide 20, which shows some examples of careers in fields that have featured in the unit (climate science, medicine, art, and retail) and also in a couple of fields that some students might be interested in (journalism and fashion). Display slide 21 and ask the students to reflect on their own interests. For example, they might think about music, sports, art, or video games. Tell the students to pick one of the careers on the slide or a different career that they are interested in and to try to think of a way to use ML models to solve a problem in that area. Ask them to discuss their thoughts with a partner, sharing an idea for a problem to solve, the data they would need to use, and who the solution would help. Use probing questions to encourage the students to think more deeply about the problems they want to solve, although a problem such as ‘how to make something easier’ is fine for this exercise. The intention of this activity is for the students to not only have understood that they could work in AI if they want to, but also to see how they could apply what they have learned in this unit in a field that they are interested in.