Lesson Plan

Date: **Term:** **Week:**

Time/length: 1 hour **Subject**: Digital Technologies 5/6

Topic/focus: Machine Learning - How Neural Network Weights work in classification

Resources and equipment

Slides (+ projection device)
Neuron City Game Boards + Instructions
Dice

Outcomes

Content descriptors/curriculum outcomes

- **ACTDIP017 - Define problems in terms of data and functional requirements drawing on previously solved problems**
- **ACTDIP019 - Design, modify and follow simple algorithms involving sequences of steps, branching, and iteration (repetition)**
- **ACTDIK015 - Examine how whole numbers are used to represent all data in digital systems**

Cross Curriculum Priorities in Literacy (Sciences and Digital Technologies) and Numeracy (Estimating and calculating with whole numbers, Statistical reasoning, Computational Thinking)

Lesson outcomes	**Assessment of lesson outcomes**
Students will: 1. Investigate and understand systems that learn - including biological and machine based on neural network models	Observation of discussions Successful Completion of Game Student reflections

Procedure

Time	**Steps**	**Key questions/Resources** **Provision for extension/special support**
1 min	**Getting focussed** Mark Roll; Projector setup;	**Projector**
1 min	**Overview** We are going to look at Machine Learning (how computers learn things) - and how animals (including humans) learn. You should understand at the end of the lesson: ● How neurons work ● How learning is possible through neural activity ● How neurons can help us make decisions	
4 min	**What is Learning?** ● Classroom discussion on learning ● Invite students to contribute their ideas and understanding of how they learn and what is happening.	**Unpack student understanding(s) of what learning is. What is involved - focus on biological learning.**

3 min	**Videos** to explain neurons and how our brains work	2 minute neuroscience https://www.youtube.com/watch?v=6qS83wD29PY&vl=en 3D visualisation of neural activity https://www.youtube.com/watch?v=8Dotiqbtvoo
10 min	**Presentation + Q&A** **What do neurons have to do with learning?** Learning is about the change of the strength of connections Paths that are important get strengthened Less important paths become less used and thus less important to the system The strength of connections changes over time	Slides
5 min	**Presentation + Q&A** **How does this work with Machine Learning?**	Slides Artificial Neural Networks: One key type of ML is based on ANN. This mimics (to some extent) the function of neurons.
15 min	**Game Introduction + Play Game** **Students play the classification game using dice** **Students play GAME A (first side) only** **Demonstrate one game turn.** **If they get a repeat - roll again.**	Game boards + Instructions Check student calculations and understanding Extension: What happens with a 5? What happens if you change a weighting? What would be the easiest way to make numbers 7 and below "sad" and numbers above "happy"?
2 min	**Check progress - what did students find?** Q&A about which numbers were classified which way	Are all numbers classified Which numbers are happy, which are sad? Why? How did these numbers get here? Any surprises?
10 min	**Play alternate game**	Classification of odd and even numbers - same network - different weights. Extension: Make your own network for classifying different outcomes.
5 min	**Wrap Up Discussion** Same network -different classification Changed strengths of connection create a different "learned" system	Same network - different weights. Changing weights changes the learned outcome How do we change the weights? Is this how we learn? Can we have more than 2 end points? Do we need the middle layer?

1 min	Collect boards + instructions	