

# MACHINE LEARNING WITH CHOMP

**CHOMP** is a machine made of plastic boxes that can be *taught* how to play a simple game. Each box contains different coloured beads which represent different moves. Over time, through a process called *reinforcement learning*, **CHOMP** discovers the best moves to play in each situation. Whether **CHOMP** wins or loses, it still learns and improves, so play now!

## A PILE OF PLASTIC BOXES THAT CAN LEARN...



### HOW TO PLAY CHOMP...

Take it in turns to 'Chomp' blocks of chocolate, by picking a square and removing all squares **below** and to the **right**. The aim is to force your opponent into eating the poisoned square in the top left corner.



Chomp starts by picking a bead from the starting box.

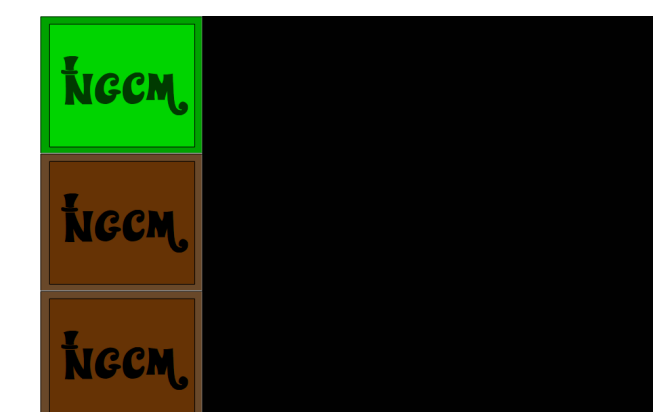
	Red	Orange	Yellow
Green	Blue	Purple	Pink
Black	Grey	White	Tan

Chomp picked **Purple**, so eat all squares below and to the right. Place the **Purple** bead on the lid of the first box.



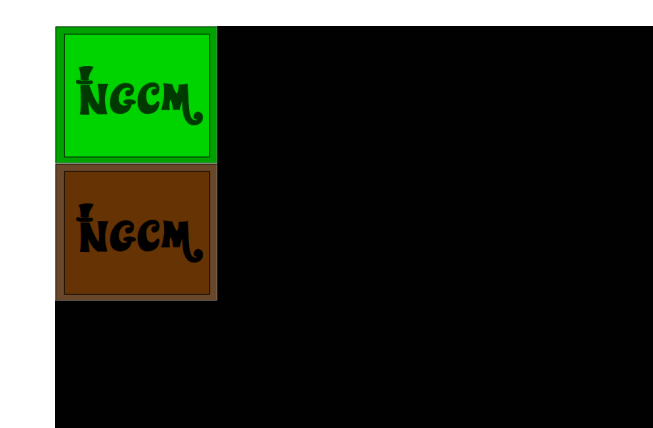
	Red	Orange	Yellow
Green	Blue	Purple	Pink
Black	Grey	White	Tan

Your turn! Pick a square and remove all the squares below and to the right. We picked **Red**. Place a **Red** bead on the previous box.



	Red	Orange	Yellow
Green	Blue	Purple	Pink
Black	Grey	White	Tan

Chomp's turn – Chomp picked **Black** so we remove this square (No more squares below or to the right). Place the **Black** bead on the lid of the previous box.



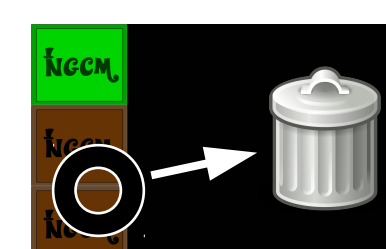
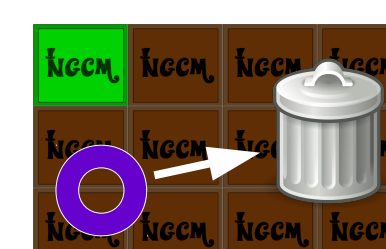
	Red	Orange	Yellow
Green	Blue	Purple	Pink
Black	Grey	White	Tan

Your turn – remove the last safe chocolate square, represented by the **Green** bead. Place this bead on the lid of the last box.

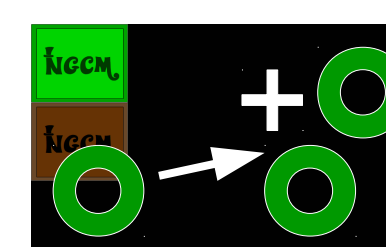
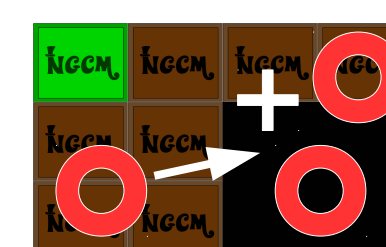
With this move, you win because Chomp has to eat the poison!

Now it's time to teach the machine. The winning boxes get the original bead, plus a bonus two because these were good moves. The losing boxes contained mistakes which we don't want Chomp to make again, so these beads are removed from the losing boxes.

Chomp's Moves  
(Loser)



Your Moves  
(Winner)



In the next game, Chomp will be more likely to make good moves and less likely to make bad moves!



**EPSRC**

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[github.com/dw-ngcm/chomp](https://github.com/dw-ngcm/chomp)