How does a change in the car's size affect its ability to drive around a circuit?

Introduction

A neural network is a computer program designed to model how a brain functions and learns.It is a form of AI (Artificial intelligence) and is capable of progressively learning lots of different, difficult and complex tasks, some examples being solving an XOR gate or balancing a pole, or doing both at the same time. The Implementation of Neural Networks more readily into society could have massive benefits in wide range of industries and places.

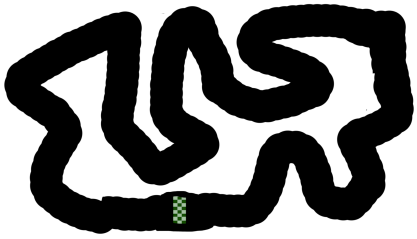
One way a Neural Network can learn is by driving a simulated car on a simulated race track Normally when driving a Real life car, the ratio for the car to road ratio would be roughly 2:3.5, but how much easier or more difficult would it be to drive when the size of the car is changed?

Variables

- **Independent variables**

The Independent variables in this experiment is the size of the car, which can be found in the *newcar.py* file and under the variables, CAR_SIZE_X & CAR_SIZE_Y and changing the number that comes after by a certain percentage (e.g. the base size is a value of 60, so if i wanted 50% of that i would change it to 30)

- **Controlled variables**

Track 	This track was specifically made to be difficult for the cars but able for the bigger cars to still fit
Rest of newcar.py	The apart from the CAR_SIZE_X and CAR_SIZE_Y functions, nothing else has been changed about the file between each generation, this is so the cars have a level of consistency with each other and the only difference being the size
Config file	The config.txt file has been left untouched, this allows for the testing to be equal with all the cars and the only differing factors being the size

- **Dependant variables**

The Dependent Variables in this experiment are the amount of generations it takes for a car to reach the end of the track, this will be measured by observing when the car reaches the finish line.

Aim

To determine if a car's size has an effect on its ability to drive around a circuit.

Hypothesis

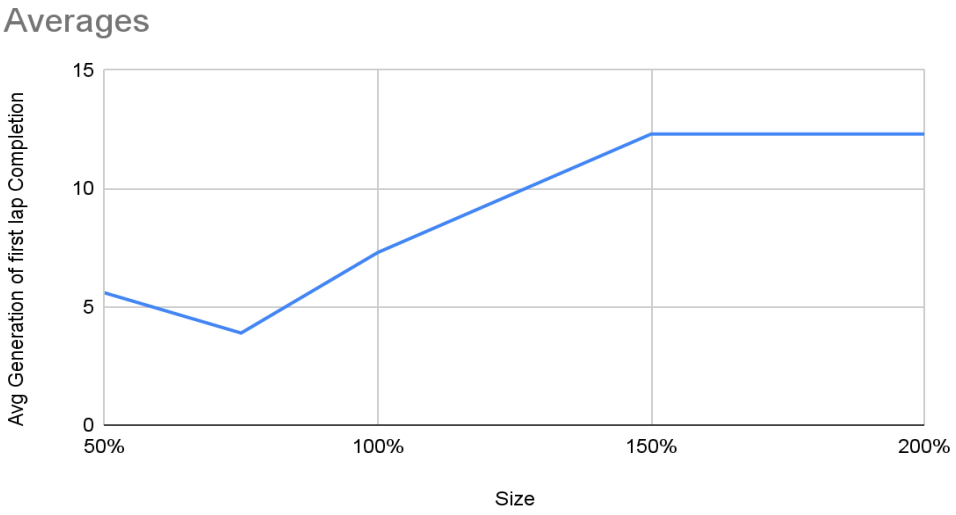
If a car's size is smaller, it will be more likely to successfully drive around a track, and vice versa.

Method

1. Download the Repo from here
2. Extract and Open the file in your code editor of your choice
3. Open the newcar.py file and locate the CAR_SIZE_X and CAR_SIZE_Y variables
4. Change the CAR_SIZE_X and CAR_SIZE_Y to 30 (50%)
5. Run the programs 8 times, noting down whenever the car reaches the finish line by writing what generation reached the end and Restart the program.
6. Write down your results, repeat steps 4 and 5 until you have done it for all percentages.

Results

	Generation of First Lap of Completion								
	Trial 1	Trial 2	Trial 3	Trial 4	Trial 5	Trial 6	Trial 7	Trial 8	Avg
50% (30)	5	4	6	6	6	5	10	3	5.6
75% (45)	3	3	5	5	2	7	3	3	3.9
100% (60)	2	2	6	10	5	8	12	13	7.3
150% (90)	14	14	39	4	5	11	7	4	12.3
200% (120)	9	16	11	4	15	11	22	14	12.8



(Graph Representation of the Averages in the table above)

Discussion

The results obtained by the trials supported the hypothesis by a certain extent, due to the randomness of the experiment there were a few outliers in the dataset most notably trial 3 in the 150% data set, completing on generation 39 which moved the average for the dataset up by a fair amount.The data obtained by the experiment was reliable and we know this due to the consistent variables and amount of trails done.The data obtained through the data sets proved that Size had a correlation with the number of generations needed to get around a track, as shown in the averages chart above.

As seen in the graph, there is an initial decline before a jump upwards then a stagnation. The reasons for this could be that the cars were so small they couldn't make a correct judgement about the distance and therefore were not as successful. But the reason why the smaller cars still had a much better chance of getting around the track was due to the fact they had a larger margin of error. When on the track the smaller cars had space to move around and take wider or tighter corners with the ability to make more errors, whereas the bigger cars had a minor margin of error, where one error would cause the car to terminate.

Overall this experiment was able to show the correlation between the size of a car and it’s ability to successfully navigate around a circuit