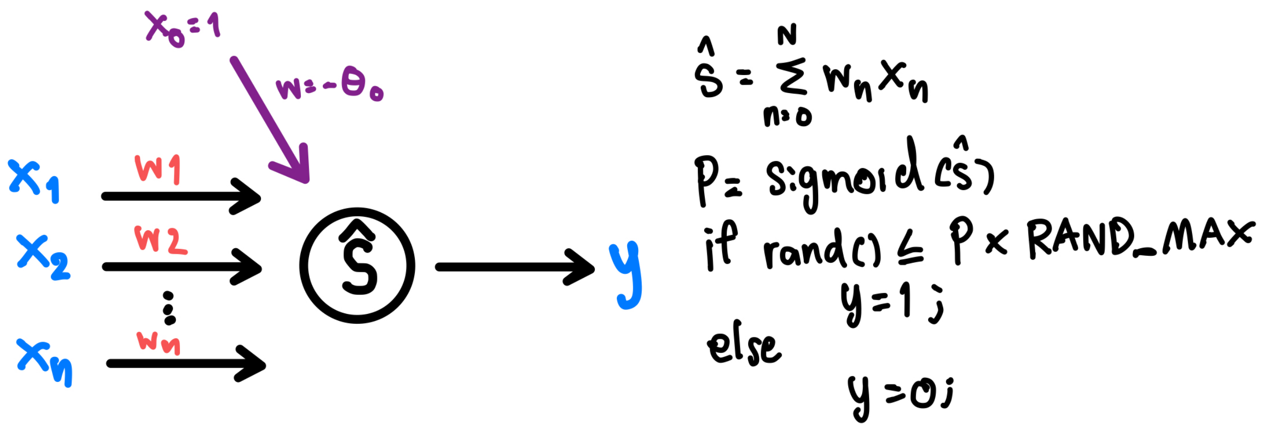
Artificial Intelligence Report

Task 1 - Simulation of Probabilistic Binary Model



Procedure

1. Create 1 neuron which has 5 inputs and use a probabilistic Binary Model (Using random generator to create probabilistic model).
2. Execute the neuron with parameters defined in table.
3. Repeatdly execute and count when `y = 1` for the experimental result
4. Calculate the theoritical result by `Trials * P`
5. Calculate a ⋆percent error(pe) between the experimental result and the theritical result
6. Calculate a ⋆average of percent error(mean) from each trail

```
⋆How to get percent error and average
# Percent error can be negative to show more or less of result
pe = ((theoritical-experimental)/th)*100
# Mean is calculated from absolute values to show only a margin of result
mean = statistics.mean([abs(pe_100), abs(pe_1000), abs(pe_10000)])
```

Parameter table

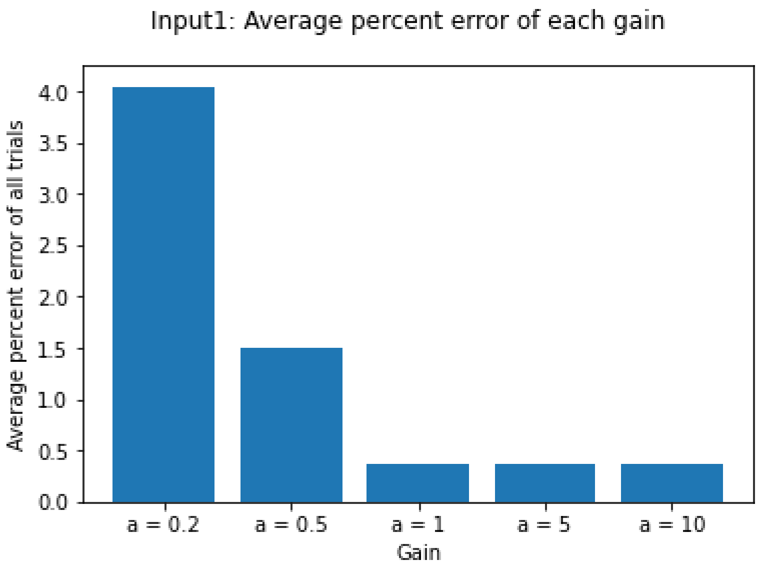
Name	Description	value
a	Gain of the sigmoid function	0.2, 0.5, 1, 5 10
Trials	Repeatly execute the neuron	100, 1000, 10000ฅ
RAND_MAX	Maximum range of a random generator	RAND_MAX = 10000
SEED	Seed of a random generatot	SEED = 0
Input	Input of a neuron	x1 = [1, 0, 1, -1, 0.5, -0.5]

Name	Description	value
		x2 = [1, -1, 1, 1, -0.5, 1]
weight	Weight of a neuron	w = [1, -1, 2, -1, 2, -1]

*x[0], w[0] is dummy

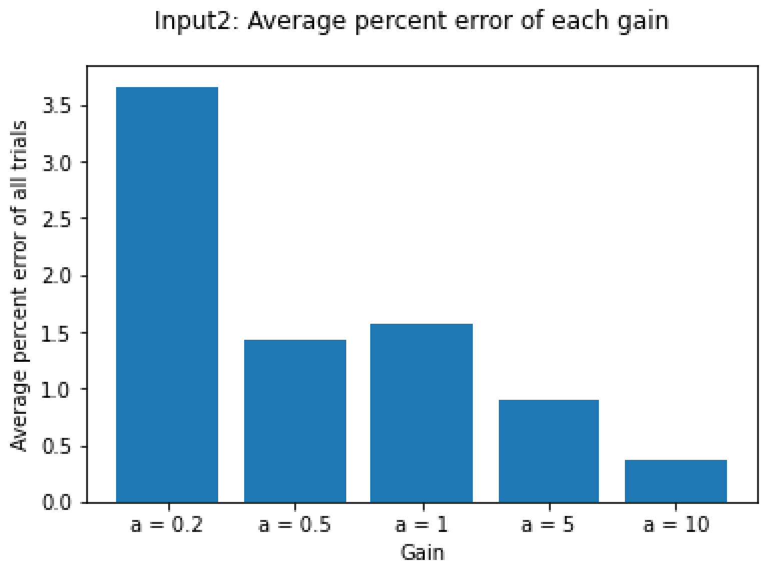
1. Input x1 = [1, 0, 1, -1, 0.5, -0.5]

Gain(a)	Trials	Percent error	Average of 3 Trials
0.2	100	-8.73 %	**4.04 %**
↑	1000	2.69 %	↑
↑	10000	0.71 %	↑
0.5	100	-3.29 %	**1.51 %**
↑	1000	1.17 %	↑
↑	10000	0.07 %	↑
1	100	-0.60 %	**0.37 %**
↑	1000	-0.50 %	↑
↑	10000	-0.02 %	↑
5	100	-1.01 %	**0.38 %**
↑	1000	-0.10 %	↑
↑	10000	-0.02 %	↑
10	100	-1.01 %	**0.37 %**
↑	1000	-0.10 %	↑
↑	10000	-0.01 %	↑



2. Input x2 = [1, -1, 1, 1, -0.5, 1]

Gain(a)	Trials	Percent error	Average of 3 Trials
0.2	100	-7.82 %	3.66 %
↑	1000	2.51 %	↑
↑	10000	0.66 %	↑
0.5	100	-2.04 %	1.44 %
↑	10000	1.20 %	↑
↑	1000	1.07 %	↑
1	100	-2.97 %	1.57 %
↑	1000	1.74 %	↑
↑	10000	0.01 %	↑
5	100	-2.40 %	0.90 %
↑	1000	-0.23 %	↑
↑	10000	0.07 %	↑
10	100	-1.01 %	0.37 %
↑	1000	-0.10 %	↑
↑	10000	-0.02 %	↑



Summary*

Trials: As the result, the percent error will be minimum when `Trial = 10000`, so we can conclude that **the more trial, the less error**.

Gain(a): As the result, the percent error will be minimum when `a = 10`, so we can conclude that **the more gain, the less error**.

For my opinion, this conclusion could not apply for all situation. It may suitable for these set of input and weigth only.