



Complete, fold and seal
(see note 2 below)

12 Pages

SURNAME:

Simons

FORENAME(S):

Ashleigh

1. Please give the information requested in the boxes below.
2. Enter your name in the space provided to the right, fold over and seal down (using the label provided) to hide your name.
3. The answers must be legibly written. The Examiners cannot ignore illegible script or have it typed and the expense of typing charged to the candidate.
4. Write your answers in ink.
5. Begin each answer on a fresh page. Do all rough work in the answer book and cross it through.
6. No part of this book is to be torn out; it must be handed in complete.
7. If more books than one are used, fasten them together using the tags available from the invigilator(s).
8. **Every book must be handed in. In no circumstances may answer books, used or unused, be taken out of the examination venue.**

1	Student Number	2003948
2	Title of Examination Paper	Artificial Intelligence and machine learning
3	Module Code	ACCA6011
4	Date and Time of Examination	08/01/2024
5	Examination Venue	Swansea IQ310
6	Seat Number	008
7	Number of Answer Books handed in	1

List the numbers of the questions you have attempted	Office Use
1.A	~~702~~ 2/11/25 J
1.B	
3.A }	
3.B } .11/25	
3.C }	
4.A	
4.B	19'2 / 2
4.C	
Total	52'½

(Gweler yr ochr arall am y fersiwn Cymraeg)

$52\frac{1}{2} \div 75\%$
 $52\frac{1}{2} \div 75\%$
 70%
Agreed

1.a)

Your Skill	= Medium
Opponents Skill	= High
Opponents Rank	= Normal
Your Ranking	= High

WINProbability of winning = $9/15$ ✓Your Skill when winning = $4/9$ Opponents Skill when winning = $2/9$ Opponents Rank when winning = $6/9$ Your Rank when winning = $3/9$

$$P = \frac{9}{15} \times \frac{4}{9} \times \frac{2}{9} \times \frac{6}{9} \times \frac{3}{9}$$

$$P = 0.01316872428$$

$$P = 0.0131 \text{ ✓ of winning}$$

LOSEProbability of Losing = $6/15$ ✓Your Skill when Losing = $1/6$ Opponents Skill when Losing = $2/6$ Your rank when Losing = $4/6$ Opponents rank when Losing = $2/6$

$$\frac{20}{20}$$

$$P = \frac{6}{15} \times \frac{1}{6} \times \frac{2}{6} \times \frac{4}{6} \times \frac{2}{6}$$

$$P = 4.938271605 \times 10^{-3}$$

$$P = 0.00498 \text{ ✓ of Losing}$$

$$\frac{20}{20}$$

Based on the results of a win being 0.0131 and a loss of 0.00498, you are more likely to win. ✓

1. B)

A way that you can reduce numerical errors when using very small probability values is to reduce the number of probabilities you are calculating. Eliminating the ~~the~~ calculation of the full formula and working with less ~~per~~ probabilities will reduce the chance of misplacing mathematical operators and the correct use of Brackets, to make sure values are in the correct places.

Q1 $\frac{2.2}{25}$ Agreed

 $\frac{2}{5}$
 $\frac{2}{5}$
 $\frac{2.2}{25}$

3. a)

Supervised learning - This is the process that a machine uses Labels given to data to run an algorithm. Having these Labels gives the algorithm data that it knows what ~~the~~ its looking for and will test the data based ~~on~~ on test data ~~with~~ with similar labels.

Unsupervised learning - This is the process in which a computer is given data without labels and so the algorithm searches for patterns and values that could be used to form results and findings that are valuable to the users.

3. B)

The synaptic weights are the values that are used to be calculated with the input signals. forming these results then allows you to add the bias to produce an ~~output~~ output.

 $\frac{1}{2}$
 $\frac{1}{2}$

3. c)

$$x_1 = 0.9$$

$$\text{Bias} = 0.2$$

$$x_2 = -0.42$$

$$x_3 = 0.02$$

$$0.9 \times 0.2 = 0.18$$

$$-0.42 \times (-0.3) = 0.126$$

$$0.02 \times 0.42 = 8.4 \times 10^{-3} = 0.0084$$

$$Y = 0.18 + 0.126 + 0.0084 + 0.2$$

$$Y = 0.5144 \quad \checkmark$$

$$\phi(y) = \frac{1}{1+e^{-y}}$$

$$\phi(y) = \frac{1}{1+e^{-(0.5144)}}$$

$$\phi(y) = \frac{1}{1+1.67263462} \quad 1+0.59786$$

$$\phi(y) = \frac{1}{2.67263462}$$

$$\phi(y) = 0.3741626306$$

$$\phi(y) = 0.374 \quad (3dp)$$

$$3dp = 0/6$$

$$2d = 0/6$$

$$\phi(y) = 11/25$$

$$11/25$$

4.A)

Fuzzy logic procedure

1. Fuzzify - use the numbers you are provided to calculate the x values that you need to test the rules. 11/2
2. Defuzzify - use the rules you have to test the values x to create a graph ~~or~~ or calculate the values required to calculate the center of gravity. 11/2
3. Center of gravity - you then use the center of gravity formula to calculate the middle value of the environment occupied by the values. 4

4.B)

one defuzzification technique is to create a graph and use the values you have calculated to populate the graph and then calculate the center of gravity to defuzzify the values. If the value is between 0.1 and 1.0 it is accepted but the higher the value is closer to 1.0 the better it is. 0/3

4.c) Incidence of breathlessness score of : 12 units
Wheeziness index of : 6 units

Incidence of breathlessness:

Frequent	Moderate	Infrequent
$x = 0$ as $x \leq 2.5$	$x = \frac{12-10}{5}$ $x = 0.4$ as $x = 10 < x \leq 15$	$x = \frac{15-12}{5}$ $x = 0.6$ as $x = 10 \leq 15$

Degree of Wheeziness:

Mild	Severe
$x = \frac{7-6}{2}$ $x = 0.5$ as $x = 5 < x \leq 7$	$x = \frac{6-5}{5}$ $x = 0.2$ as $x = 5 < x \leq 10$

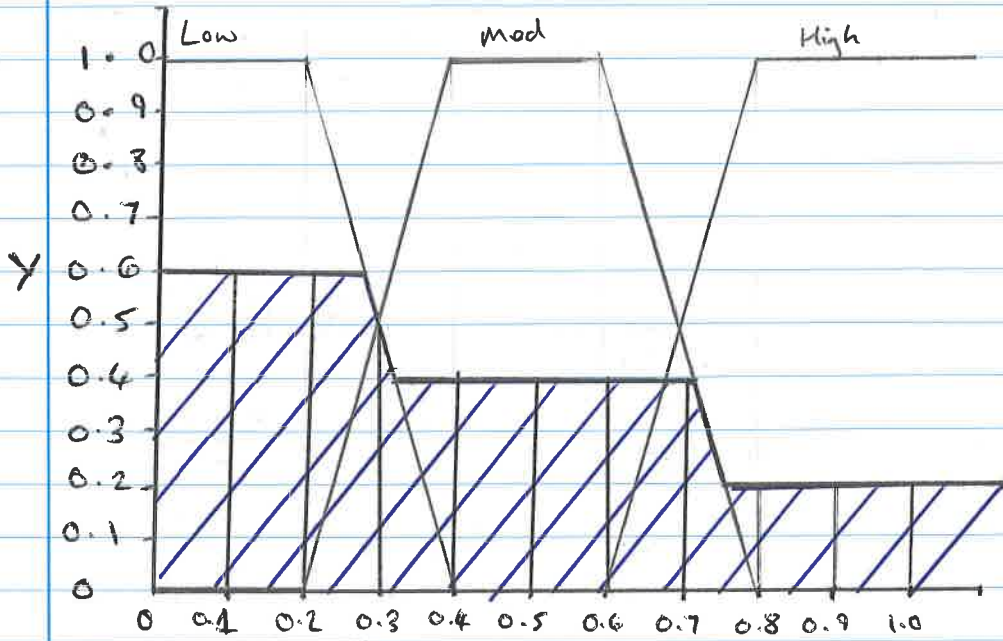
Confidence

Low	Medium	High
0.6 As infrequent breathlessness is 0.6.	0.4 As moderate breathlessness is 0.4 and the Min value.	0.2 As wheeziness is the Max and Severe at 0.2

Rules

1 High	2 Medium	3 Low
frequent = 0 wheeziness = 0.2	moderate = 0.4 wheeziness = 0.5	infrequent = 0.6

4.C)



$$\frac{18}{18}$$

x	y
0.1	0.6
0.2	0.6
0.3	0.5
0.4	0.4
0.5	0.4
0.6	0.4
0.7	0.4
0.8	0.2
0.9	0.2
1.0	0.2

$$\begin{aligned} \text{Cog} &= (0.1+0.2) \times 0.6 + \\ & (0.3) \times 0.5 + \\ & (0.4+0.5+0.6+0.7) \times 0.4 + \\ & (0.8+0.9+1.0) \times 0.2 \\ & (0.2) \times 3 + (0.4) \times 4 + (0.5) \times \\ & + (0.6) \times 2 \end{aligned}$$

$$\text{Cog} = \frac{1.75}{3.9}$$

Well done.

$$\text{Cog} = 0.4487179487$$

$$\underline{\underline{\text{Cog} = 0.449 \text{ (3dp)}}}$$

$$\frac{19\frac{1}{2}}{25}$$

$$\frac{44 \frac{1}{2}}{25}$$