											, -	04/2023
										Score	e:	/ 3
A robot in	ı a lumher	vard			_					_		
		-		#	Der	sity		Grain	Н	ardness		Class
the appea	rance of a g	given		1	Lig	ght	;	Small		Hard		Oak
ie aside ta	able shows	s the		2	He	avy	ا	Large		Hard		Oak
				3	Li	ght		Large		Hard		Oak
_				4	He	avy		Small	ľ	Medium		Oak
_						-		0		M = =1i=		Dime
				5	LI	gnt	•	Small	ľ	vieaium		Pine
				6	He	avy		Large		Soft		Pine
	_			7	Li	ght		Large		Soft		Pine
ler.				8	He	avv		Small		Soft		Pine
itos and cir	clo the att	rihuto t				-			tho		ion	
1			<u> </u>	3 3010			σοι	lioue or	uic			ti ee.
dataset	Heavy		nt	La			ll	Hard				Soft
	-											
		I										
at still con	tains a mi	xture o	of po	sitive	and r	negativ	е ех	amples,	eva	aluate the	rei	maining
e the attril	oute that is	s selecte	ed fo	<u>r the</u>	next n	ode (yo	ou n	nay leave	e irr	elevant ce	ells	<u>blank).</u>
Whole	Der	nsity			Gra	ain			ı	Hardness		
subset	Heavy	Ligh	nt	La	rge	Sma	II	Hard		Medium	١	Soft
Give an exa	mple of the	e classif		_				-	em	context. S	tate	e clearly
	D3 algoritements which is resulted at still confect the attributed at a stil	nate Oak wood from the appearance of a great aside table shows the aside table shows the aside table shows the given data. For a subset of the attribute that is the attribute that is the attribute that is the complete decision of the attribute of the attribute that is the attribute decision of the attribute decision of the attribute decision of the attribute of the attribute decision of the attribute at a subset of the attribute decision of the attribute decision of the attribute at a subset of the attribute decision of the attribute at a subset of the attribute decision of the attribute at a subset of the attribute at	Whole dataset Heavy Light Heav	nate Oak wood from Pine I the appearance of a given I the aside table shows the D3 algorithm to build a I tom the given data. Fill in I tables with your numerical I which is rounded to three I the attributes having the I the attribute that in I the attribute that in I the attribute that is selected for the attribute that is selected for I the attribute that is selected for the attribute that is sele	the appearance of a given the aside table shows the aside table sho	the appearance of a given are aside table shows the large and table shows the large are aside	the appearance of a given he aside table shows the deast table shows table shows the deast table shows the dea	ate Oak wood from Pine the appearance of a given the appearance of a given the aside table shows the 2 Heavy 3 Light 3 Light 3 Light 4 Heavy 3 Light 5 Light 6 Heavy 7 Light 8 Heavy 1 Heavy 2 Heavy 3 Light 4 Heavy 4 Heavy 5 Light 6 Heavy 6 Heavy 6 Heavy 7 Light 8 Heavy 1 Heavy	nate Oak wood from Pine I the appearance of a given The aside table shows the I the appearance of a given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to given The aside table shows the I to give ta given The aside table shows the I to give ta given The aside table shows the I to give ta given The aside table shows the I to give ta given The aside table shows the I to give ta give	ate Oak wood from Pine I the appearance of a given The aside table shows the I Light Small I Light Small I Light Small I Light Large 3 Light Large 3 Light Large 4 Heavy Small I Light Small I Heavy Large I Light Large I L	the appearance of a given the aside table shows the saide table shows the late aside table shows the late as a la	the appearance of a given the appearance of a given the appearance of a given the aside table shows the saide table shows the teasification problem. Describe the problem context. State the appearance of a given the appearance of a given the appearance of a given the aside table shows the teasification problem. Describe the problem context. State and care the classification problem. Describe the problem context. State and example of the classification problem. Describe the problem context. State and example of the classification problem. Describe the problem context. State and example of the classification problem. Describe the problem context. State as and example of the classification problem. Describe the problem context. State as the appearance of a given the assistance of a given the assistance as the appearance of a given the assistance as t

Student ID:		<u>-</u>			Duration	: 15 mins	Date: 12	/04/2023
Student name:							Score:	/ 3
Question 1 (2pts)	A robot	in the ac	nuarium			1		
section of a pet stor			-	#	Fins	Tail	Body	Class
fish from Blue fish				1	Thin	Tiny	Slim	Red
parts. The aside tal	-	_	-	2	Wide	Big	Slim	Red
set.				3	Thin	Big	Slim	Red
a) (1.5pts) Use II	D3 algor	ithm to	build a	4	Wide	Tiny	Medium	Red
decision tree fro	•			5	Thin	Tiny	Medium	Blue
following tables each of which is	-					-		
places. Attribut				6	Wide	Big	Fat	Blue
metric values a	are chose	n in alph	abetical	7	Thin	Big	Fat	Blue
order.				8	Wide	Tiny	Fat	Blue
Evaluate all attribut	tes and cir	cle the att	ribute that	is selecte	ed for the ro	ot node of th	<u>ne ID3 decisio</u>	on tree.
	Whole	F	ins		Tail		Body	1
	dataset	Thin	Wide	Big	Tiny	Fat	Medium	Slim
Entropy								
Average Entropy	$\geq \leq$							
Information Gain	> <							
For the branch tha	<u>t still con</u>	<u>tains a mi</u>	xture of p	ositive ar	<u>nd negative</u>	<u>examples, e</u>	valuate the	remaining
attributes and circle	e the attril	bute that is	s selected t	or the ne	<u>xt node (yoι</u>	ı may leave i	<u>rrelevant cel</u>	<u>ls blank).</u>
	Whole	F	ins		Tail		Body	
	subset	Thin	Wide	Big	Tiny	Fat	Medium	Slim
Entropy								
Average Entropy	\nearrow							
Information Gain	\nearrow							
Question 2 (1pt) (State clearly the list	Give an ex	ample of tl	he unsupe				-	n context.

Student ID:					Duratio	n: 15 mins	Date: 1	12/04/2023
Student name:							Scor	e: <u>/ 3</u>
Question 1 (2pts)				#	Color	Toughness	Fungus	Class
to discriminate Info			-	1	Green	Hard	No	Infected
table shows the train	•		ie aside	2	Green	Hard	Yes	Infected
a) (1.5pts) Use I	_			3	Brown	Soft	No	Infected
decision tree fro	•			4	Brown	Hard	Yes	Infected
each of which i	-			5	Orange	Hard	No	Healthy
places. Attribut	tes having	g the san	ne best	6	Green	Soft	No	Healthy
metric values	are chose	n in alpha	abetical	7	Green	Soft	Yes	Healthy
order.				8	Orange	Hard	No	Healthy
Evaluate all attribu	toe and cir	clo the attr	ibuto that		_			_
Evaluate all attribu	Whole		hness		Fungus		Color	SIOII LI EE.
	dataset	Hard	Soft	No	Yes	Brown	1	Orange
Entropy								
Average Entropy			l .		I			I.
Information Gain								
For the branch tha	t still con	tains a mix	xture of p	ositive a	nd negativ	e examples,	evaluate the	remaining
attributes and circl	<u>e the attril</u>	bute that is	selected t	for the ne	xt node (yo	<u>ou may leave</u>	<u>irrelevant c</u>	ells blank).
	Whole	Toug	hness		Fungus		Color	
	subset	Hard	Soft	No	Yes	Brown	Green	Orange
Entropy								
Average Entropy								
Information Gain								
Question 2 (1pt) (State clearly the rev	Give an exa	ample of th	e reinforc				-	

Student ID:					Duration	: 15 mins	Date: 1	2/04/2023
Student name:							Score	e: <u>/ 3</u>
				-	+			
Question 1 (2pts) to determine whet				#	Shape	Skin	Hardness	Class
Bad by observing th			-	1	Round	Rough	Soft	Tasty
aside table shows th	ne training	g data set.		2	Round	Rough	Hard	Tasty
a) (1.5pts) Use I	D3 algor	ithm to l	build a	3	Oval	Smooth	Soft	Tasty
decision tree fro	•			4	Oval	Rough	Hard	Tasty
following tables each of which i	-			5	Long	Rough	Soft	Bad
places. Attribut		_		6	Round	Smooth	Soft	Bad
metric values a order.	are chose	n in alpha	abetical	7	Round	Smooth	Hard	Bad
				8	Long	Rough	Soft	Bad
Evaluate all attribu	tes and cir	cle the attr	ibute that	t is select	ed for the ro	ot node of th	ie ID3 decisi	on tree.
	Whole	ı	kin	1	Hardness		Shape	
	dataset	Smooth	Rough	Hard	Soft Soft	Long	Oval	Round
Entropy								
Average Entropy			1		<u> </u>		<u>'</u>	
Information Gain								
For the branch tha	t still con	tains a mix	xture of p	ositive a	nd negative	examples, e	valuate the	remaining
attributes and circle	e the attri	bute that is	selected	for the ne	ext node (you	ı may leave	<u>irrelevant ce</u>	<u>lls blank).</u>
	Whole		<u>cin</u>	ŀ	lardness		Shape	
	subset	Smooth	Rough	Hard	d Soft	Long	Oval	Round
Entropy								
Average Entropy								
Information Gain	><							
Question 2 (1pt)				l learning	g and reinfor	cement lear	ning.	

SOLUTION

Student ID:					I	Duration	: 15 mins	Date:	12/04/2023
Student name:				·····				Sco	re: <u>/ 3</u>
Question 1 (2pts)				#	Der	nsity	Grain	Hardness	Class
learns to discrimin wood by observing				1	Li	ght	Small	Hard	Oak
piece of wood. Th		_		2	He	eavy	Large	Hard	Oak
training data set.				3	Li	ght	Large	Hard	Oak
c) (1.5pts) Use ID	_			4		eavy	Small	Medium	Oak
decision tree fro	O								
the following ta results, each of				5	LI	ght	Small	Medium	Pine
decimal places				6	Не	eavy	Large	Soft	Pine
same best met		O		7	Li	ght	Large	Soft	Pine
alphabetical ord	ler.			8	Не	eavy	Small	Soft	Pine
Evaluate all attribu	tes and cir	cle the attr	ibute t	hat is sel	ected f	or the ro	ot node of	the ID3 deci	sion tree.
	Whole	Den	sity		Gra	ain		Hardnes	S
	dataset	Heavy	Ligh	nt L	arge	Small	Hard	Mediui	m Soft
Entropy	1	1	1		1	1	0	1	0
Average Entropy	><	1	l		1	1		0.25	
Information Gain		()		()		0.75	
For the branch tha									
attributes and circl				ed for the			<u>ı may leave</u>	<u>e irrelevant (</u>	<u>cells blank).</u>
	Whole	Den				ain			
	subset	Heavy	Ligh	nt L	arge	Small			
Entropy	1	0	0		0	1			
Average Entropy		(1			
Information Gain	\nearrow	1	L		()			
d) (0.5pt) Draw th Hardness = Hard: Cl Hardness = Soft: Cla Hardness = Medium Density = He Density = Lig	ass = Oak ass = Pine avy: Class	= Oak	tree.						

Students do it by themselves

Student ID:					Duration:	15 mins	Date: 12,	/04/2023
Student name:							Score:	/ 3
Question 1 (2pts)			_	#	Fins	Tail	Body	Class
section of a pet stor fish from Blue fisl				1	Thin	Tiny	Slim	Red
parts. The aside ta	-	_	-	2	Wide	Big	Slim	Red
set.				3	Thin	Big	Slim	Red
c) (1.5pts) Use I	D3 algor	ithm to	build a			-		
decision tree fro	•			4	Wide	Tiny	Medium	Red
following tables	-			5	Thin	Tiny	Medium	Blue
each of which i				6	Wide	Big	Fat	Blue
places. Attribut metric values a	7	-		7	Thin	Big	Fat	Blue
order.		ii iii aipii	aboticai	8	Wide	Tiny	Fat	Blue
Evaluate all attribu	tes and cir	cle the att	ribute that	is selected	l for the ro	ot node of th	e ID3 decisio	n tree.
	Whole	Fi	ins		Tail		Body	
	dataset	Thin	Wide	Big	Tiny	Fat	Medium	Slim
Entropy	1	1	1	1	1	0	1	0
Average Entropy			1		1		0.25	
Information Gain			0		0	_	0.75	
For the branch tha			_		_	=		
attributes and circl	Whole		ins		t node (you Tail	<u> may leave l</u>	rrelevant cell	<u>s biankj.</u>
	subset	Thin	Wide	Big	Tiny			T
Entropy	1	0	0	0	1			1
Average Entropy			0		1			
Information Gain			1		0			
d) (0.5pt) Draw the Body = Slim: Class = B Body = Fat: Class = B Body = Medium Fins = Wide: Fins = Thin: (0 Question 2 (1pt) (0 State clearly the list Students do it by the	Red Blue Class = Red Class = Blue Give an exa	d ample of the	ne unsupe neir values	s) to group	data points	s into cluster	S.	ı context.

Student ID:					Ι	Duration	: 15 mins	Date: 1	12/0	4/2023
Student name:								Scor	e:	/ 3
Question 1 (2pts)				#		Color	Toughness	Fungus	(Class
to discriminate Info by observing the ap			-	1	(Green	Hard	No	In	fected
able shows the train	•		ic asiac	2	Green	Hard	Yes	In	ıfected	
c) (1.5pts) Use I	D3 algor	ithm to l	nuild a	3	I	Brown	Soft	No	In	fected
decision tree from	_			4		Brown	Hard	Yes	In	fected
following tables	-			5	(Orange	Hard	No	Н	lealthy
each of which i				6		Green	Soft	No		lealthy
metric values	_			7						<u> </u>
order.		•				Green	Soft	Yes		lealthy
	_			8		Orange	Hard	No		lealthy
Evaluate all attribu	r						oot node of t		sion	tree.
	Whole dataset	Hard	hness Soft	No	Fun	gus Yes	Brown	Color Green		Orange
Entropy	1	0.971	0.918	0.97	1	0.918		1		0 0
Average Entropy			951		0.9			0.5		
Information Gain		0.0)49		0.0)49		0.5		
For the branch tha	t still con	tains a mix	ture of p	ositive a	nd r	<u>negative</u>	examples, e	valuate the	e rer	naining
attributes and circl	e the attril	oute that is	selected	for the ne	xt n	ode (yo	u may leave	<u>irrelevant c</u>	ells	<u>blank).</u>
	Whole		hness		Fun					
	subset	Hard	Soft	No		Yes				
Entropy	1	0	0	1		1				
Average Entropy)							
Information Gain			1		()				
d) (0.5pt) Draw th Color = Brown: Clas Color = Orange: Cla Color = Green Toughness = Toughness =	s = Infected ss = Health Hard: Clas Soft: Class	d y s = Infected s = Healthy	I	nom ont lo	arni	ing prob	Jom Doscrik	., .,	om .	contovt
Question 2 (1pt)	liva an arr	mnia at th	D rointara					10 tha nrahi		

Student ID:	Duration: 15 mins	Date: 12/04	/2023
Student name:		Score:	/ 3

Question 1 (2pts) A robot in a fruit farm learns to determine whether an avocado is Tasty or Bad by observing the avocado's appearance. The aside table shows the training data set.

c) (1.5pts) Use **ID3 algorithm** to build a decision tree from the given data. Fill in the following tables with your numerical results, each of which is rounded to three decimal places. Attributes having the same best metric values are chosen in alphabetical order.

#	Shape	Skin	Hardness	Class
1	Round	Rough	Soft	Tasty
2	Round	Rough	Hard	Tasty
3	Oval	Smooth	Soft	Tasty
4	Oval	Rough	Hard	Tasty
5	Long	Rough	Soft	Bad
6	Round	Smooth	Soft	Bad
7	Round	Smooth	Hard	Bad
8	Long	Rough	Soft	Bad

Evaluate all attributes and circle the attribute that is selected for the root node of the ID3 decision tree.

	Whole	Skin		Hard	Iness	Shape			
	dataset	Smooth	Rough	Hard	Soft	Long	Oval	Round	
Entropy	1	0.918	0.971	0.918	0.971	0	0	1	
Average Entropy		0.951		0.951		0.5			
Information Gain		0.0	149	0.0)49	0.5			

For the branch that still contains a mixture of positive and negative examples, evaluate the remaining attributes and circle the attribute that is selected for the next node (you may leave irrelevant cells blank).

	Whole	Skin		Hard	ness		
	subset	Smooth	Rough	Hard	Soft		
Entropy	1	0	0	1	1		
Average Entropy		()	1	l		
Information Gain		1	l	()		

d) (0.5pt) Draw the complete decision tree.

Shape = Oval: Class = Tasty Shape = Long: Class = Bad

Shape = Round

|----- Skin = Rough: Class = Tasty |----- Skin = Smooth: Class = Bad

Question 2 (1pt) Distinguish between supervised learning and reinforcement learning.

A supervised learning agent receives the expected outputs during training so that it can precisely estimate the differences between the actual outputs and the expected outputs. A reinforcement learning agent receives rewards or penalties during the operation; however, this information only indicates whether the agent did properly, not a guide of "how far" it is from the desired goal.