

Assignment 1

Q.1	What wis learning? Explainedifferent types
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\Rightarrow	apprile atroing it with example blind of
2 100	Machine learning isota subset of Ast, which
androm	enables the machine to automatically learn
too o	rofrance data it improve performance From part
	experiences pand maker productions
India.	Learning contains has cet of algorithms that
0 2	work on a buge amount of datal. !
radia.	Datasis bed ato these balgos throat to train
-	them, and on the books of training , they
bao	abuild with and perform a specific
	tackers reportionly on image classisation
	Types of Learning:
	2) Unsupervised Learning.
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meterns	20 DEX VISEC - AD SUPERVISED : 100 MI - 300 100 KEINDA CEMEN
	bearing saint earning saint aperised to bearning
Qrins	of besignance former pasifications.
pladel di	es attissels att empired arland financh
	1) Supervised Learning , Lugtur to toprot
	=> Supervised learning is defined as when a model
	gets trained on at labetted Datasetting
	Habelled Dortaset have both inputs and outputs
	parameters. Aside, Abot att intico
	the supervised learning algorithms learn to map
shoul pr	points pieturent in puts and correct woutputs.
•	It has both training and volidation datasals
	labelled.



Assignment I

ofor eig , considien the scenario where dyou have to build andimage classifier into differentiale between cats and dogs. The you feed the datasets not dogs and cons Plablelled minages to ite enalgorthmilithe machine Las collection ton classify word tweeks a dog for a cat From their explabeladi images es nairages hat When some inputes new sting or catilinages that it has nevertuseen before, it soull use inch thentlearned salgorithms band predicts whether them, and on the hoporose got a retiring is they This is how supervised meaning himselver and this is particularly an image classification. 2) Unsupervised Learning > Unsupervised learning is a type of machine learning man red itechnique - instabilità ianqualgorithm discoveres patterns printpand beloationships prising lunlabeled idatal. Unlike isupervised learning, unsupervised learning doesn't involve providing the algorithm with labele target outputs. enineral basiveaux (labore Theorprimary goal of pursupervised rearring dans involve providing! the en Ishoftent to this cover struction hiddenstupatteins, sainitaritass oraldusters within the data, which can be then used good for vorious purposes, such as data - but the exploration provisualization, which ensionality reduction -lass tobanditanione. bor prinisate and and to



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	Deminsapervis ed his a machine learning
	algorithm withat is works between is upervised
70	and inapervised I downing so it was both
	labelled and: Hunlabelled data itides
	It's particularly useful when obtaining
	labeled data is costly , time - consuming,
	or resource - indensive. prittidisvo
The same of the sa	This approach sisonuseful twhen the dataset
	is expensive and Himetronaming 1000
	Semind supervice do learning bas chosen when
	labeled data require schills and relevant
	tresources im order to that or least from
	and inaccurate data entries in this
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24125	4) Reinforcement bearing to and both
24.25	4) Reinforcement bearing to and both
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(20b)	A) Reinforcement bearning to all by a learning and algorithm is a learning method without hat hat exacts with the environment by approbleting actions and discovering dermors.
(20b)	A) Reinforcement bearning to all both the learning method without interfacts with the environment by reproducing actions and discovering terrors. Trial, every and delay are the most relevant
(20b) (0,001)	Reinforcement bearning to but by Reinforcement learning algorithm is a learning method rethat intertacts with the environment by approiducing actions and discovering terrors. Trial error and delay are the most relevant characterstics of reinforcement theorning.
O osi	Reinforcement bearing to algorithm is a learning method rather tinteracts coith the environment by reproducing actions and discovering derrors. Trial error and delay are the most relevant characterstics of reinforcement ilearning.
O asi	Reinforcement bearing to be be a learning to be Reinforcement learning algorithm is a learning method rethat hintertacts coits the environment by approiducing actions and discovering terrors. Trial error and delay are the most relevant characteristics of reinforcement tearning. For leasing consider that your are thairing
Operithingle	Reinforcement bearning to be but a learning to be Reinforcement learning valgorithm is a learning method to that interacts coith the environment by a probleming actions and discovering terrors. Trial error and delay are the most relevant characteristics of seinforcement dearning: Force learning consider that your are thousing. The learning explores all the like chest.
Openition of the state of the s	Reinforcement bearning of algorithm is a learning method retacts could discovering terrors. Trial, error and delay are the most relevant characteristics of reinforcement learning. Force leaging considerations and and in your are discovering. The largent explores different moves and leaves the chess.
Olasi,	Reinforcement learning to de bat is a learning method of that intertacts coits the environment by approbations actions and discovering terrors. Trial error and delay are the most relevant characteristics of reinforcement dearning. For leasing consider that your are though an AI agent to play and are like these. The largent explores different moves and breed are the positive people of the largest moves and largest moves and the larges
Olasi,	Reinforcement learning to algorithm is a learning method that interiors and discovering lerrors. Trial error and delay are the most relevant characteratics of reinforcement learning. Force learning consider that your are though charing. The learning explores different moves and learning the learning of the chest. The largent explores different moves and learning the largent positive or riegatives feedback based learning the largent buttomed the largent learning to the largent learning to the largent based learning the largent learning also finds applications in the
Olasi,	Reinforcement bearing to all so learning to the Reinforcement learning algorithm is a learning method athation interacts coits the environment by a proiducing actions and discovering terms. Trial error and delay are the most relevant characteristics of reinforcement dearning. For leasing consider that your are thorizing and I agent the play acquare like chess. The largent explores different moves and a received positive feedback based to the investigations in the shirt buttoned also finds applications in the which they learn to perform darks by interacting which they learn to perform darks by interacting
Olasi,	Reinforcement learning to algorithm is a learning method that interiors and discovering lerrors. Trial error and delay are the most relevant characteratics of reinforcement learning. Force learning consider that your are though charing. The learning explores different moves and learning the learning of the chest. The largent explores different moves and learning the largent positive or riegatives feedback based learning the largent buttomed the largent learning to the largent learning to the largent based learning the largent learning also finds applications in the



0.2	Define overfitting and under fitting i How
pr	evaluate danne models for gover fitting or
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- 120	measures meed to be taken in more of
	over hitting to landa under Atting & halladal
b	sintated sallo ligaso plantitos of LT -
	labeled data is rectly , time - consum
•	Overhitting eneive. Onthitaso
1920+	Attetation model discould to be
	overfitted when the model does not make
- 0	accusates predictions on testing doitas.
Lo	when a smodel gets trained with and much
MIT P	data in its starts elearning from the noise
	and inaccurate data entries in our data
	set.
•	And when testing od ithentest idata frents
(pigroal	= In High variance! Them their model does
	not scategorizes both a boid ato bear techtion
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•	charlithuans rathing to satisfactions
2/	=> A statistical models or machine learning algorithm
. 2	ois eaid to have under Fitting Pahen A a model is
	too simple to capture dota complexities.
	It represents the model to
	learn the training data effectively result in
3-11-01	-pook performance both on the training and
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-	agailbauverses via to His



In simple terms on under ht model's are inaccurate, especially when applied to new, unseen examples.

ablume Lanta santa 20 strong ant avormas (= Techniques to it evolvates Oversitting of under Fitting. to seduce the model complexity) Cross-validation > Usiepaikingold alemose abolidation to account the model's performance. The dataset is divided into la subsets, and althou model Mis strained and validated by post times to each time wing a different subset as the tivalidation bet and the tremoining as a training sot. Average a three performance metrics acrossitive k trials. woll 2) to Learning Survey of labor anto diente de > Ploto-dearning curves for both atraining tond test errors. Learning curves shows the model's performance on the training set and validation set as Function of the number of training examples or straining epochs. Measures to Address overfitting:) Increase Training Data = Gather more training data to help the model generalize better. Use data augumentation techniques to artificially



	increase the straining datacet.
1	loccounds, especially when applied in re-
	2) Runing
	=> Remove the parts of tree that provide
	Hittle power to the prodict target variables
	to reduce the model complexity.
	Donas validation
• ,	Measurest to inaddress : Under Ethings : U
sta: h	model's performance. The dodocot is divide
Lhilov	Do Increase Model complexity 21920102 x1
Josef	Use more complex minodels or algorithms that
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	data.
0	Increase the number of features or parameters
7	· 2 Dista
	2) Train Longer
	=> Train the model for more epochs to allow
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	anothon	- language we make use of home Fu



0.3	Thirties of control about in the
)	descent process of learning with the gradient
	descent for a universate linear regression,
	using a bell shaped curve. Function. Explain
	now a step size is modulated on every
()	Iteration.
	Gradient descent is an iterative optimization
	algorithm that tries to find the optimum
	values of an objective function.
•	The male aim of a livel dead in
	find the head - and control to
	find the best parameters of a model which
	gives the highest accuracy on training data
	as well as treating appoint
pr	Steps required in the Gradient Descent Algorithm:
) We first initialize the parameters of
	the model randomly.
	2) computer the gradient of cost function
	with respect to each parameter.
	3) Update the parameter of the models by
	taking step in the opposite direction of
	the model.
	4) Report step 2 and 8 the stick to sall
	a) Repeat step 2 and 3 iteratively to get the
ď	best parameter for defined model.
•	To able andical donal
	To apply gradient-descent using programming
	language we make use of from Functions:



Di) gradient descent under more und =) We make predictions on adotaset and compute the difference between predicted and actual of argets value land accordingly update the parameter to returnait as it computes predictions plants onti ant O. b. 799 In sithis of Functionpicula willit compute the prodiction using the parameters at each iterations. iii) compute-gradient =) Here, we compute the error which is differen nce between the actual and predicted target value and then compute the gradient using this error and training data. W) update parameter

The update the parameters using learning

Iring traiter and gradient that we got from

compute-gradient function. - Let's evaluate the process of bell-shaped error curve to visualize the optimization. as a function of the model parameter a and b

CALE



The error eurface might looks like a bellochaped curveil. the minimum point on this corre represents the optimal values of a land b howhere the orier provide iso aminimised it states + Gradient descent moves the parameters the iteratively downhill on this surface until the minimum point is reached. (MSE) Export of one on the start indade promother point point of the properties of the point o 12.11 de 2000 : Patrameters (a,b) al. ()) very some file published aniporal is



<i>y</i>	
8.4	Explain the following performance revolution
	parameters with the help of confusion matrix.
31304	Illustrate using appropriate example.
Labih	Illustratemusing appropriate example:
a)	Accuracy
=	without at the many of setesibility
-	A confusion materix rois à table ethat is often
	used to describe the performance of a
	alassification model on a set of test
	data for which The true values are known.
-	It consists of four outcomes:
	i) True Positive (TP): The modellocorrectly
	predicts the positive valuelclass.
1	- Recall measures the propostion of actu
10444	ii) The model correctly
	predicts the negotive class, id
	m Histograf on mulanal solo of IT?
\bigcirc	iii) False Positive (FP): The model incorrectly
	predicts the positive class.
	in) False Negative (FN): The model incorrectly
	predicts the negative class.
	9,002-17 (6
	Accuracy is the ratio of correctly predicted
. 19	observations to the total observations.
	meen of Precicion and agail.
gritting	Accordaged = = 101TP9+0TN-CA 911
	· Louis das STRATAN+FB# FNO



S. G Exploin the following perfectorions of parameters with the help of annision in the positive predictions in the total predicted positives. positives.

It indicates how many of the positively of clodelfied instanceston were actually o to possitive advagation advantage of base plassification madel on a cet of etert data for which attended and applied to the =: 29 mostus ruffet AFP 2+ sie nus +T ples Pecallabora anti: (177) evitizati anti (i predicts the positive valuelelass. - Recall measures the proportion of actual without positives athat: (wiere Hook Meating of dentified by three modélopen atto stoiband It is also known as Sensitivity or illosofostines postive (Saltavition asis? (iii Recall = TP Monopoli labora arti : TAHEN: Lopoli aslos (ii predicts the negative closes. edited it store after of correctly political Totheras Fa - score is the hammonic score mean of Precision and recall. The F1450000 THOLO both Folse positive and false-negative into arount.



	Transferred to the same of the
	Faliscore = 2x Recision xxerall
	Precision + Recall
	97 7 Firms a Holong soln F.
	V117+97
e)	Specificity
\$	Specificity That it is the ambarton of
ariey!	The second of th
0	0.047 0/3 WEGO 4162
	Tt is also known as the True Negative
	Rate.
34	
	Specificity = TN
	TN+FP
t,	ROC-AUC CURVE
\Box	
	The ROC curve is a graphical representation
	of model's performence across all
	classification thresholds.
	It plats the True Positive Recall (Rate)
	against the False positive Rate at
	various threshold settings.
	The AUC provides on aggagrate measure
	of performance across all possible
	classification threshold.



	True positive Route = TP
. Has	True positive Rate = TP
	Parcision of Rec
TI TI	Folce positive Rate = FP
	FP+TEV
	e) Specificity
-	The higher the AUC, the bedter the
3	modellar ability to disbouich between
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	F) ROC-AUC CURVE
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