

DIT821 - example of exam questions	
Part 1: theoretical questions (questions 1 and 2)	
1	Explain cost function for a linear regression
2	Explain how to find a minimum of a cost function
3	Explain principles of Gradient Descent
4	Explain why and how to use learning rate in Gradient Descent
5	Explain multiple linear regression - explain hypothesis, features, cost function, normal equation
6	Explain multiple linear regression - explain hypothesis, features, cost function, gradient descent
7	Explain polynomial regression, hypothesis, cost function
8	Explain underfitting and overfitting
9	Explain how the regularization factor influence the overfitting
10	Explain a process of modelling, validation and testing, and cost functions when changing size of training data set, regularization factor, degree of polynomial
11	Explain confusion matrix principles
12	Explain meaning of accuracy, recall, precision and possible actions to increase the quality of the prediction
13	Explain principles for classification, hypothesis and its interpretation
14	Explain logistic regression, and decision boundary
15	Explain logistic regression cost function
16	Explain how to calculate minimum of logistic regression function
17	Explain how to deal with underfitting and overfitting for logistic regression function
18	Explain multi-class classification
19	Explain decision tree principles and decision boundary
20	Explain the principles of building a decision tree
21	Explain the principles for splitting attributes
22	Explain the principles of random forest
23	Explain the k-mean algorithm
24	Explain principles of artificial neural network (perceptron, activation function, the network)
25	Explain classification principles when using neural networks
26	Explain principles of convolution operation
27	Explain principles of reinforcement learning and the difference with supervised learning
28	Explain Markov Decision Process
29	Explain the principles of the Bellman Equations
30	Using the example "Career Options" explain terms Reward, Return, State value
31	What is Discounting and why is it used?
	Explain: Reward, Return, Value function vs Action-Value Function
	What does it mean to solve the MDP? Explain the difference between Online/Offline Model-based/Model-free Active/Passive RL
	Explain Value Iteration algorithm
	Explain Q-learning algorithm
32	Describe the different stages of machine learning workflow.
33	You are a team lead responsible for developing a machine learning system that helps bank managers understand which loans to approve. Your team is provided with a data set containing over 3000 records of loan applicants. This dataset contains decision information of whether the loan was approved or not, as well as others (e.g., age, profession and credit) for each applicant. Describe the how you would go about developing such a system.
34	Describe what feature "usefulness" means?
35	Give one example when it is useful to apply Log Transform in dataset?
36	What is the difference between filters, wrappers and embedded feature selection methods?
37	In data labelling, what is inter-annotator agreement and how would you measure it?
38	What is data drift? Give an example and state how it can be detected in a deployed ML-enabled application?
39	Which are the basic principles of AI ethics - explain them
Part 2: some questions to calculate, or to understand a program (question 3)	
40	<i>You are expected to be able to run jupyter notebook and you will be given a code snippet that you would need to write or modify to find a solution</i>
41	<i>Or you can use of other means of tools to get some calculations (calc, excel/google sheet)</i>
42	
43	For given dataset find the hypothesis.
44	For a given dataset and the weight vector calculate the cost function
45	Suppose you want to optimize regularization parameter. For given dataset find the optimal value of the parameter.
46	Show how cost function is changing in realted to number of examples

47	Show how cost function is changing in the test set in related to number of examples
48	Analyse how cost function is changing by adding polynomial level
49	Analyse how cost function is changing by adding/removing some features
50	Accuracy of alcohol testing and a probability of tests. Giving the accuracy of the instrument, calculate the probability if positive-tested example is true positive.
51	For given dataset find clusters if 3 clusters are supposed to be found
52	For given dataset estimate how many clusters you would define (use elbow principle)
53	For a given data set calculate cost function of training set and test set.
54	For given "dirty" data set apply the methods needed to get a clean data set
55	Using $T(s,a,s')$ and $R(s,a,s')$ write the expression relating $Q(s,a)$ with the value function $V(s)$
56	Given the reward r for taking action a from state s and leading to state s' , the learning rate α and the Q-table containing the Q-values for each state-action pair (i.e. $Q(s,a)$), Write down the update rule for the Q-learning algorithm, that is you have to update $Q(s,a)$.
57	For a given MDP, compute the Values for each state using the Value Iteration Algorithm