

SRM VALLIAMMAI ENGINEERING COLLEGE

**(An Autonomous Institution)
SRM Nagar, Kattankulathur – 603 203**

DEPARTMENT OF COMPUTER SCIENCE AND ENGINEERING

QUESTION BANK



VIII SEMESTER

1904801 DEEP LEARNING

Regulation – 2019

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Prepared by

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SUBJECT :1904801 DEEP LEARNING

SEM/YEAR : VIII/IV

UNIT - I: INTRODUCTION TO MACHINE LEARNING BASICS			
Scalars – Vectors – Matrices – Tensors – Identity and Inverse Matrices – Linear Dependence and Span – Eigen Decomposition – Probability – Random Variables – Conditional Probability – Expectation – Variance – Covariance – Bayes’ Rule – Supervised Learning Algorithm – Unsupervised Learning Algorithm – Stochastic Gradient Descent.			
PART – A			
Q.No	Question	BT Level	Competence
1	What is Deep Learning?	BTL-1	Remember
2	Differentiate scalar and vector.	BTL-2	Understand
3	Compare Deep Learning and rule based system.	BTL-4	Analyze
4	What is Auto encoder?	BTL-1	Remember
5	List out the special kind of matrices.	BTL-1	Remember
6	What is representation learning?	BTL-1	Remember
7	Compare Deep Learning with Machine learning.	BTL-5	Evaluate
8	State the Bayes rule.	BTL-1	Remember
9	List out some supervised learning algorithms.	BTL-1	Remember
10	Can principle component analysis viewed as unsupervised learning algorithm? Examine.	BTL-3	Apply
11	Discuss about supervised learning algorithms.	BTL-2	Understand
12	Give Venn diagram for Deep Learning.	BTL-2	Understand
13	Specify the formula for conditional probability.	BTL-6	Create
14	Illustrate support vector machine.	BTL-3	Apply
15	Show the formula for Variance.	BTL-3	Apply
16	Differentiate Independence and Conditional Independence.	BTL-2	Understand
17	Analyze Eigen Decomposition.	BTL-4	Analyze
18	Analyze random variable.	BTL-4	Analyze

19	Probability theory is a fundamental tool of many disciplines of science and engineering. Justify .	BTL-5	Evaluate
20	Develop a formula for unbiased sample covariance matrix associated with an $m \times n$ dimensional matrix X . Assume $E[x] = 0$.	BTL-6	Create
21	Analyze about tensor.	BTL-4	Analyze
22	Illustrate identity matrix?	BTL-3	Apply
23	Discuss about matrix inverse.	BTL-2	Understand
24	Assess linear dependence of vectors.	BTL-5	Evaluate
PART – B			
1	i. What is Deep Learning? (3) ii. Describe how different parts of an Artificial Intelligence system relate to each other within different AI disciplines in detail with diagram.(10)	BTL-1	Remember
2	Describe how deep learning is a kind of representation learning with the Venn diagram. (13)	BTL-1	Remember
3	List and explain the historical trends in Deep Learning.	BTL-1	Remember
4	i. Discuss about scalars.(7) ii. Give detail description of vectors. (6)	BTL-2	Understand
5	i. Give the Difference between deep learning and machine learning.(7) ii. Give the various concepts of probability. (6)	BTL-2	Understand
6	i. Demonstrate linear dependence and independence of vectors.(7) ii. Explain span of vectors. (6)	BTL-3	Analyze
7	Analyze and write short notes on the following. i. Vectors. (6) ii. Matrices.(7)	BTL-4	Analyze
8	Explain the following in detail. i. Eigen Decomposition. (7) ii. Tensors.(6)	BTL-4	Apply
9	Assess the following. i. Expectation .(5) ii. Variance.(4) iii. Covariance . (4)	BTL-5	Evaluate
10	Extrapolate conditional probability and Develop a summary of various common probability distribution. (13)	BTL-6	Create
11	Describe Stochastic Gradient Descent. (13)	BTL-1	Remember
12	i. Illustrate the importance of principal components analysis. (6) ii. Explain support vector machines in detail. (7)	BTL-3	Analyze
13	Explain supervised learning algorithm. (13)	BTL-4	Apply

14	Discuss unsupervised learning algorithm. (13)	BTL-2	Understand
15	Discuss Normal distribution. (13)	BTL-2	Understand
16	Explain Probability Mass function and Probability Density function. (13)	BTL-3	Analyze
17	Explain Principal Components Analysis. (13)	BTL-5	Evaluate
PART – C			
1	Develop short notes on following with respect to deep learning with examples. i) Scalar and Vectors. (6) ii) Matrices. (7)	BTL-6	Create
2	Assess the following with respect to deep learning examples. i) Random Variables. (6) ii) Probability. (7)	BTL-5	Evaluate
3	Develop a supervised learning algorithm and explain in detail.(15)	BTL-6	Create
4	Assess unsupervised learning algorithm.(15)	BTL-5	Evaluate
5	Assess the historical developments in deep learning. (15)	BTL-5	Evaluate
UNIT - II: DEEP NETWORKS			
Deep Feed Forward Network: Learning XOR – Gradient Based Learning- Hidden Units – Architecture Design – Back Propagation Algorithms. Regularization for Deep Learning: Parameter Norm Penalties – Regularization and unconstrained Problems – Dataset Augmentation – Noise Robustness – Semi supervised Learning – Challenges in Neural Network Optimization.			
PART – A			
Q. No	Questions	BT Level	Competence
1	Point out different set of layers in Feed forward networks.	BTL-4	Analyze
2	Point out the default activation function for modern neural networks.	BTL-4	Analyze
3	Compare linear models and neural networks.	BTL-5	Evaluate
4	Develop three generalizations of rectified linear units based on using a non-zero slope.	BTL-6	Create
5	What is Deep Feed Forward networks?	BTL-1	Remember
6	List reasonably common hidden unit types.	BTL-1	Remember
7	Give the drawback of rectified linear units.	BTL-2	Understand
8	Describe gradient descent.	BTL-2	Understand
9	Give example of a feed forward neural network.	BTL-2	Understand
10	Define chain rule of calculus.	BTL-1	Remember
11	List some classification problems where Data augmentation is used.	BTL-1	Remember
12	Define universal approximation theorem for feed forward network.	BTL-1	Remember

13	What critical points or stationary points in derivative illustration of a function?	BTL-1	Remember
14	Describe regularization for deep learning.	BTL-2	Understand
15	Illustrate semi supervised learning.	BTL-3	Apply
16	Illustrate the derivative function used in gradient descent algorithm.	BTL-3	Apply
17	Explain importance of dataset augmentation.	BTL-3	Apply
18	Analyze and write chain rule of calculus.	BTL-4	Analyze
19	Reason for calling Feedforward neural networks as networks— Justify .	BTL-5	Evaluate
20	Develop a computational graph for any function.	BTL-6	Create
21	Give reason for the term “feed forward” used in the feed forward networks.	BTL-2	Understand
22	Explain XOR operation.	BTL-3	Apply
23	Analyze cost function.	BTL-4	Analyze
24	Justify the application of Dataset Augmentation various tasks	BTL-5	Evaluate
PART – B			
1	Describe Deep feed forward networks. (13)	BTL-1	Remember
2	Explain cost function in gradient based learning. (6) Explain learning conditional distributions with maximum likelihood. (7)	BTL-3	Apply
3	i. Describe about learning conditional statistics in gradient based learning.(7) ii. Explain linear units for Gaussian Output Distributions.(6)	BTL-1	Remember
4	Explain output units of feed forward networks. (13)	BTL-3	Apply
5	i. Explain sigmoid units for Bernoulli Output Distributions.(8) ii. Justify the importance of Rectified linear units in Hidden units. (5)	BTL-5	Evaluate
6	i. Give Softmax units for Multinoulli Output Distributions. (7) ii. Discuss about Hidden Units. (6)	BTL-2	Understand
7	i. Describe Rectified linear units and their generalizations. (7) ii. Describe Logistic Sigmoid and Hyperbolic Tangent. (6)	BTL-2	Understand
8	i. Write a short notes on Radial Basis function, Softplus and Hard tanh(7) ii. Write a short notes on Architecture Design. (6)	BTL-4	Analyze
9	i. Describe Back Propagation algorithm. (7) ii. Explain regularization for deep learning. (6)	BTL-1	Remember
10	Briefly describe Universal Approximation Properties and Depth. (13)	BTL-1	Remember
11	Analyze and write short notes on Dataset Augmentation. (13)	BTL-4	Analyze
12	Develop a data set and demonstrate Noise Robustness. (13)	BTL-6	Create
13	Discuss in detail about chain rule of calculus. (13)	BTL-2	Understand

14	Illustrate Computational graphs. (13)	BTL-4	Analyze
15	Give the applications of Dataset Augmentation. (13)	BTL-2	Understand
16	Explain Multi-Task Learning. (13)	BTL-3	Analyze
17	Assess Computational graphs with necessary diagrams. (13)	BTL-5	Evaluate
PART – C			
1	Develop a Deep Feed forward network and explain. (15)	BTL-6	Create
2	Assess the routines to implement forward propagation computation. (15)	BTL-5	Evaluate
3	Assess the difference between linear models and neural networks. (15)	BTL-5	Evaluate
4	Develop your own scenarios to demonstrate computational graph. (15)	BTL-6	Create
5	Develop Chain Rule of Calculus. (15)	BTL-6	Create

UNIT - III: CONVOLUTIONAL NETWORKS			
The Convolution Operation – Motivation – Pooling – Variants of the Basic Convolution Function – Structured Outputs – Data types – Efficient Convolution Algorithm – Random or Unsupervised Features.			
Q.No	Questions	BT Level	Competence
PART – A			
1	An essential feature of any convolutional network implementation is the ability to implicitly zero-pad the input V. Justify	BTL-5	Evaluate
2	The output layer of convolutional network is usually relatively inexpensive to learning layer. Justify .	BTL-5	Evaluate
3	What is convolutional networks?	BTL-1	Remember
4	Create a chart that demonstrates convolution with a stride.	BTL-6	Create
5	How pooling handles inputs of varying size?	BTL-4	Analyze
6	What is meant by convolution?	BTL-1	Understand
7	List three important ideas that help to improve a machine learning system.	BTL-1	Remember
8	What is unshared convolution?	BTL-2	Understand
9	Define primary visual cortex.	BTL-1	Remember
10	How to reduce the cost of convolutional network training?	BTL-2	Understand
11	Simulate the idea behind reverse correlation.	BTL-6	Create
12	Discuss about parameter sharing in neural network.	BTL-2	Understand
13	Give three properties of V1 that a convolutional network layer is designed to capture.	BTL-2	Understand
14	Explain feature map.	BTL-4	Analyze
15	Explain how a convolutional layer have a property called equivariance to translation?	BTL-3	Apply

16	List three stages of a convolutional network.	BTL-1	Remember
17	List out various formats of data that can be used with convolutional networks.	BTL-1	Remember
18	Illustrate pooling stage in convolutional network.	BTL-3	Apply
19	Differentiate complex layer terminology and simple layer terminology in convolutional network.	BTL-4	Analyze
20	Show three basic strategies for obtaining convolution kernels without supervised training.	BTL-3	Apply
21	Give example for convolution.	BTL-2	Understand
22	Illustrate reverse correlation.	BTL-3	Apply
23	Explain complex layer terminology.	BTL-4	Analyze
24	Examine equivariance to translation.	BTL-5	Evaluate
PART – B			
1	Write an example function for Convolution operation and explain in detail. (13)	BTL-1	Remember
2	Explain the following with suitable diagram. i. Sparse interactions. (6) ii. Parameter sharing. (7)	BTL-4	Analyze
3	Describe Pooling with suitable example. (13)	BTL-1	Remember
4	Write an expression for Unshared convolution with explanation and explain Tiled convolution. (13)	BTL-1	Remember
5	Discuss in detail the variants of the Basic Convolution Function. (13)	BTL-2	Understand
6	Construct an architecture that show complex layer terminology and Simple layer terminology in convolutional neural network.	BTL-5	Evaluate
7	Discuss local connections, convolution and full connections with diagram? (13)	BTL-2	Understand
8	Develop a table with examples of different formats of data that can be used with convolutional networks. (13)	BTL-6	Create
9	Describe in detail about the following. i. Parameter Sharing. (7) ii. Equivariant representation. (6)	BTL-1	Remember
10	Differentiate locally connected layers, tiled convolution and standard convolution with suitable examples and diagram. (13)	BTL-4	Analyze
11	i. Write short notes Max Pooling. (6) ii. Explain Pooling with downsampling. (7)	BTL-2	Remember
12	Explain random or Unsupervised Features. (13)	BTL-4	Analyze
13	Illustrate unshared convolution with suitable examples. (13)	BTL-3	Apply
14	i. Show three properties of V1 that a convolutional network layer is designed to capture. (6) ii. Prove the working learned invariances with necessary example and diagram. (7)	BTL-3	Apply
15	Discuss parameter sharing. (13)	BTL-2	Understand

16	Illustrate Equivariant representation. (13)	BTL-3	Analyze
17	Evaluate the working learned invariances with necessary example and diagram. (13)	BTL-5	Evaluate
PART – C			
1	Construct a graphical demonstration for sparse connectivity and explain it in detail. (15)	BTL-5	Evaluate
2	Create a graphical demonstration for parameter sharing and explain it in detail. (15)	BTL-6	Create
3	Evaluate variants of the basic convolution function. (15)	BTL-5	Evaluate
4	Construct a convolutional network to demonstrate the effect of zero padding on network size. Explain Neuro scientific basis for Convolutional Networks. (15)	BTL-6	Create
5	Create a table with examples of different formats of data that can be used with convolutional networks. (15)	BTL-6	Create

UNIT - IV: SEQUENCE MODELING: RECURRENT AND RECURSIVE NETS

Unfolding Computational Graphs – Recurrent Neural Networks – Bidirectional RNNs – Encoder Decoder Sequence to Sequence Architectures – Deep Recurrent Networks – Recursive Neural Networks – The Challenge of Long- Term Dependencies – Echo State Networks – The Long-term memory and other Gated RNNs – Optimization for Long Term Dependencies – Explicit Memory.

PART – A

Q.No	Questions	BT Level	Competence
1	What is Recurrent Neural Networks?	BTL-1	Remember
2	What is Encoder?	BTL-1	Remember
3	Give the blocks of decomposition of computation of most Recurrent Neural Networks.	BTL-2	Understand
4	What is Bidirectional Recurrent Neural Networks?	BTL-1	Remember
5	Give the advantage of recursive nets over recurrent nets.	BTL-2	Understand
6	What is decoder?	BTL-1	Remember
7	Describe Recursive Neural Networks.	BTL-1	Remember
8	Predict the concept of gated RNNs.	BTL-2	Understand

9	Compare echo state network and liquid state machines.	BTL-4	Analyze
10	Distinguish content based addressing and location based addressing in memory networks.	BTL-2	Understand
11	Classify the different strategies for Multiple Time Scales.	BTL-3	Apply
12	Develop a block diagram for LSTM.	BTL-6	Create
13	Illustrate important design patterns for recurrent neural networks.	BTL-3	Apply
14	Summarize about echo state networks.	BTL-5	Evaluate
15	Point out the advantage of introducing depth in Deep recurrent Networks.	BTL-4	Analyze
16	Compare gradient descent with and without gradient clipping using diagram.	BTL-4	Analyze
17	Justify the major advantages of unfolding process in computational graphs.	BTL-5	Evaluate
18	Illustrate block diagram of LSTM recurrent network “cell”.	BTL-3	Apply
19	What are leaky units?	BTL-1	Remember
20	Develop a schematic diagram of a network with an explicit memory.	BTL-6	Create
21	Give a block diagram for Long Short Term Memory.	BTL-2	Understand
22	Illustrate echo state networks.	BTL-3	Apply
23	Explain liquid state machines.	BTL-4	Analyze
24	Assess explicit memory.	BTL-5	Evaluate
PART – B			
1	i. Describe Unfolding Computational Graphs. (6) ii. Explain Bidirectional RNNs. (7)	BTL-1	Remember
2	Describe the following. i. Teacher Forcing in Recurrent Neural Networks. (7) ii. Networks with Output Recurrence. (6)	BTL-1	Remember
3	i. Describe Echo State Networks. (7) ii. Explain challenge of Long-Term Dependencies.(6)	BTL-1	Remember
4	Discuss Recurrent Neural Networks in detail.(13)	BTL-2	Understand
5	Describe Deep Recurrent Networks in detail.(13)	BTL-2	Understand
6	Illustrate Encoder-Decoder sequence-to-sequence Architecture. (13)	BTL-3	Apply
7	Explain Leaky Units and Other Strategies for Multiple Time Scales. (13)	BTL-4	Analyze
8	Point out various features of Echo state networks. (13)	BTL-4	Analyze
9	Explain Optimization for Long-Term Dependencies. (13)	BTL-5	Evaluate
10	Compute the gradient in a Recurrent Neural Network. (13)	BTL-6	Create

11	i. Illustrate Clipping Gradients. (7) ii. Illustrate Regularizing to Encourage Information Flow.(6)	BTL-3	Apply
12	Describe the following. i. Long Short-Term Memory. (7) ii. Other Gated RNNs. (6)	BTL-1	Remember
13	Explain in detail about the following. i. Adding Skip Connections through Time. (6) ii. Leaky Units and a Spectrum of Different Time Scales .(7)	BTL-4	Analyze
14	Describe Explicit memory. (13)	BTL-2	Understand
15	Discuss Echo State Networks. (13)	BTL-2	Understand
16	Illustrate Bidirectional RNNs.(13)	BTL-3	Analyze
17	Explain challenge of Long-Term Dependencies. (13)	BTL-5	Evaluate
PART – C			
1	Develop an example for Unfolding Computational Graphs and describe the major advantages of unfolding process. (15)	BTL-6	Create
2	Explain how to compute the gradient in a Recurrent Neural Network.(15)	BTL-5	Evaluate
3	Explain a modeling sequences Conditioned on Context with RNNs. (15)	BTL-5	Evaluate
4	Prepare an example of Encoder- Decoder or sequence-to-sequence RNN architecture.(15)	BTL-6	Create
5	Explain various Gated RNNs. (15)	BTL-5	Evaluate

UNIT - V: DEEP LEARNING APPLICATION			
Linear Factor Models – Auto Encoders - Representation Learning – Structured Probabilistic Models for Deep Learning - Monte Carlo Methods.			
PART – A			
Q.No	Question	BT Level	Competence
1	What is Probabilistic PCA and Factor Analysis?	BTL-1	Remember
2	Define Linear Factor Model.	BTL-1	Remember
3	Give the various generalizations of ICA.	BTL-2	Understand
4	What is Independent Component Analysis?	BTL-1	Remember
5	Give major advantage of slow feature analysis.	BTL-2	Understand
6	Name the various tasks than can be done by probabilistic models.	BTL-1	Remember
7	What is Denoising Autoencoders?	BTL-1	Remember
8	Predict the primary disadvantage of the non-parametric encoder.	BTL-2	Understand
9	Point out the trade-off faced in representation learning problems.	BTL-4	Analyze

10	Distinguish between one-shot learning and zero-shot learning.	BTL-2	Understand
11	Classify the different Graphical models.	BTL-3	Apply
12	Develop distribution equation for energy based model.	BTL-6	Create
13	Which are undirected models?	BTL-3	Apply
14	Summarize Distributed representations.	BTL-5	Evaluate
15	Point out the reason for why Greedy layer-wise pre-training called Greedy.	BTL-4	Analyze
16	Compare directed models and undirected models.	BTL-4	Analyze
17	Slow Feature Analysis is an efficient application of slowness principle? Justify.	BTL-5	Evaluate
18	How many task does the learner must perform in transfer learning?	BTL-3	Apply
19	List the two different ideas combined by Unsupervised pre-training.	BTL-1	Remember
20	Develop an example for distribution equation that represent a Boltzman distribution.	BTL-6	Create
21	Give an example of learning algorithm based on non-distributed representations.	BTL-2	Understand
22	Compare distributed representation and a symbolic one.	BTL-4	Analyze
23	Illustrate the reasons for which Modeling a rich distribution is not feasible in unstructured modeling.	BTL-3	Apply
24	Evaluate Undirected models.	BTL-5	Evaluate
PART – B			
1	Describe Sparse Coding. (13)	BTL-1	Remember
2	Describe the following i. Probabilistic PCA and. (6) ii. Factor Analysis. (7)	BTL-1	Remember
3	Describe the following. i, Independent Component Analysis.,(5) ii, Slow Feature Analysis. (8)	BTL-1	Remember
4	Discuss Manifold interpretation of PCA. (13)	BTL-2	Understand
5	Discuss Autoencoders. (13)	BTL-2	Understand
6	Write in detail about Undercomplete Autoencoders. (13)	BTL-3	Apply
7	Explain Regularized Autoencoders. (13)	BTL-4	Analyze
8	Compare Structured Probabilistic Model and Unstructured Modeling (13)	BTL-4	Analyze
9	Summarize usage of various Graphs to describe Model Structure.(13)	BTL-5	Evaluate
10	Develop an example distribution equation for energy-based model and explain in detail. (13)	BTL-6	Create
11	i. Write short notes Sparse Autoencoders.(7) ii. Illustrate Denoising Autoencoders. (6)	BTL-4	Analyze
12	Describe the following. i. Representation learning.(6) ii. Greedy Layer-Wise Unsupervised Pretraining.(7)	BTL-1	Remember

13	Discuss in detail about transfer learning and Domain Adaptation. (13)	BTL-3	Apply
14	Describe Distributed Representation.(13)	BTL-2	Understand
15	Discuss about Slow Feature Analysis. (13)	BTL-2	Understand
16	Write about representation learning. (13)	BTL-3	Analyze
17	Explain Markov random fields. (13)	BTL-5	Evaluate
PART – C			
1	Develop a short notes on Separation and D-Separation.(15)	BTL-6	Create
2	Explain Monte Carlo methods.(15)	BTL-5	Evaluate
3	Explain Autoencoders.(15)	BTL-5	Evaluate
4	Develop a various graphs to describe Model Structure. (15)	BTL-6	Create
5	Assess Independent Component Analysis. (15)	BTL-5	Evaluate