

COURSE DESCRIPTION FORM

INSTITUTION National University of Computer and Emerging Sciences
PROGRAM (S) TO BE EVALUATED Data Science

A. Course Description

(Fill out the following table for each course in your computer science curriculum. A filled-out form should not be more than 2-3 pages.)

Course Code	CS4045		
Course Title	Deep Learning for Perception		
Credit Hours	3		
Prerequisites by Course(s) and Topics			
Assessment Instruments with Weights (quizzes, midterms, final, programming assignments, lab etc.)	Assessment with the weight.		
	Assessment Type	Weight	
	Assignments	10	
	Quiz	10	
	Mid-Term	30	
	Project	10	
	Final	40	
Course	Mr. Syed Irtaza Muzaffar		
CLO#	CLO description		
CLO 1	Understand the theoretical foundations of deep learning, including neural networks and optimization techniques.		
CLO 2	Implement deep learning models using popular frameworks (e.g., TensorFlow, PyTorch).		
CLO 3	Apply deep learning algorithms to solve real-world problems such as image classification, object detection, and natural language processing.		
CLO 4	Evaluate the performance of deep learning models using appropriate metrics and techniques.		
CLO 5	Demonstrate teamwork and effective communication through group projects and presentations.		

PLO No	PLO Name	PLO Description
PLO 2	Knowledge for Solving Computing Problems	Apply knowledge of computing fundamentals, knowledge of a computing specialization, and mathematics, science, and domain knowledge appropriate for the computing specialization to the abstraction and conceptualization of computing models from defined problems and requirements.
PLO 4	Design/ Development of Solutions	Design and evaluate solutions for complex computing problems, design and evaluate systems, components, or processes that meet specified needs with appropriate public health and safety, cultural, societal, and environmental considerations.

Textbook	<p>There is no standard "textbook" for this course. The following book will be used as a primary text to guide some discussions, but it will be heavily supplemented with lecture notes and reading assignments from other sources.</p> <ul style="list-style-type: none"> Neural Networks and Deep Learning by Michael Nielsen <ul style="list-style-type: none"> http://neuralnetworksanddeeplearning.com/ Deep Learning, An MIT Press book, by Ian Goodfellow and Yoshua Bengio and Aaron Courville <ul style="list-style-type: none"> http://www.deeplearningbook.org/
Reference Material	<ul style="list-style-type: none"> https://www.deeplearningbook.org/ Book: http://neuralnetworksanddeeplearning.com/ Deep Learning with Python, by Francois Challet, Manning Publications Introduction to Machine Learning by Ethem Alpaydm (latest edition). Machine Learning: A Probabilistic Perspective by Kevin P. Murphy

Week #	Topics to be covered	Reading
1	Introduction to Deep Learning Introduction and motivation, supervised learning and unsupervised learning, linear and logistic regression, gradient descent	
2	Basics of Neural Networks Single and Multi-layer Perceptron, Gradient Descent in MLPs, Activation functions, Back-propagation	
3-4	Optimization algorithms, Hyperparameter tuning, and practical aspects of Deep learning Optimization algorithms (Gradient descent with momentum, mini-batch gradient descent, Adam optimization algorithm, etc.), regularization, Disappearing / Exploding gradients, Batch normalization, Hyperparameter tuning, programming frameworks, etc.	
5	Convolution Neural Networks (CNNs) Motivation for CNNs, basics of convolution, Convolution, and pooling	
First Mid-Term Exam		

7	CNN Architectures and Transfer Learning Classic CNNs: ResNet, Alex Net, VGG, and Google Net etc. Data Augmentation, Transfer Learning	Research paper
8-9	Deep Learning for Computer Vision: Image Localization, Object Detection, and Image Segmentation Object localization, bounding box prediction, anchor boxes, Object detection, and image segmentation (semantic segmentation, instance segmentation) algorithms: YOLO, RCNN, Mask CNN, etc.	Research paper
10	Sequence Models Intro to Recurrent Neural Networks (RNNs), Gated Recurrent Unit (GRU), Long Short-Term Memory (LSTM), Bidirectional RNN, Adam, Dropout, Batch Norm, language models, Image Caption Generation, etc.	
Second Mid-Term Exam		
12-13	Generative Deep Learning Variational Autoencoders, Adversarial Generative Networks	
14	Advanced Topic Deep Learning Auto ML and Graph neural networks	Research paper
15-16	Presentations	
Final Examination		

Programming Assignments	A programming assignment where students are expected to develop models of deep learning.			
Class Time Spent on (in credit hours)	Theory	Problem Analysis	Solution Design	Social and Ethical Issues
	40	25	25	10
Oral and Written Communications	Every student is required to submit at least _____2_____ written reports for the given assignments and to make _____1_____ oral presentation of typically _____10_____ minutes duration for the project. Include only material graded for grammar, spelling, style, and so forth, as well as for technical content, completeness, and accuracy.			

Instructor Name: Mr. Syed Irtaza Muzaffar

Instructor Signature:



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