



National Computing Education Accreditation Council NCEAC



NCEAC.DOC.001-E

COURSE DESCRIPTION

NAME OF INSTITUTION	Lahore Garrison University
PROGRAM (S) TO BE EVALUATED	Computer Science , Spring 2022

Course Description : Machine Learning is a key to develop intelligent systems and analyze data in science and engineering. Machine learning engines enable intelligent technologies such as Siri, Kinect or Google self driving car, to name a few. At the same time machine learning methods help unlocking the information in our DNA and make sense of the flood of information gathered on the web, forming the basis of a new Science of Data. This course provides an introduction to the fundamental methods at the core of modern machine learning. It covers theoretical foundations as well as essential algorithms for supervised and unsupervised learning. Classes on theoretical and algorithmic aspects are complemented by practical lab sessions.

Course Code	CSC368															
Course Title	Machine Learning															
Credit Hours	3+0															
Prerequisites by Course(s) and Topics	Good knowledge of Mathematics, Statistics and probability Multivariable calculus, Linear algebra, Matrices programming, Preferably some knowledge of image processing															
Assessment Instruments with Weights (homework, quizzes, midterms, final, programming assignments, lab work, etc.)	SESSIONAL (Quizzes, Assignments, Presentations) =25 % Midterm Exam =25 % Final Exam = 50%															
Course Coordinator	Muhammad Faraz Manzoor															
URL (if any)																
Current Catalog Description																
Textbook (or Laboratory Manual for Laboratory Courses)	1. Elements of Statistical Learning 2. Pattern Recognition & Machine Learning, 1st Edition, Chris Bishop 3. Machine Learning: A Probabilistic Perspective, 1st Edition, Kevin R Murphy 4. Applied Machine Learning, online Edition, David Forsyth,															
Reference Material	http://luthuli.cs.uiuc.edu/~daf/courses/LearningCourse17/learning-book-6-April-nn- revision.pdf															
Course Goals	The aim of this course is to study, learn, and understand Machine learning / Deep learning. It enables computers to learn from examples and understand Machine learning / Deep learning Deep learning techniques have been used successfully for variety of applications, including: automatic speech recognition, image recognition, natural language processing, age estimation, crack detection, etc.															
Course Learning Outcomes (CLOs):	<table><tr><td>At the end of the course the students will be able to:</td><td>Domain</td><td>BT Level*</td></tr><tr><td>Understand and describe how computers can learn from experience</td><td>BT</td><td>1</td></tr><tr><td>Use statistical techniques for classification and measuring their accuracy</td><td>BT</td><td>2</td></tr><tr><td>Apply supervised learning techniques for classification</td><td>BT</td><td>3</td></tr><tr><td colspan="3">* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain</td></tr></table>	At the end of the course the students will be able to:	Domain	BT Level*	Understand and describe how computers can learn from experience	BT	1	Use statistical techniques for classification and measuring their accuracy	BT	2	Apply supervised learning techniques for classification	BT	3	* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain		
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Topics Covered in the Course, with Number of Lectures on Each Topic (assume 15-week instruction and one-hour lectures)	Week	Lecture	Topics Covered
	Week 1	1	- Class introduction - Class overview: Class organization, topics overview, software etc.
		2	Introduction: what is ML; Problems, data, and tools; Python (I)
	Week 2	3	Machine Learning Fundamentals
		4	Examples/Applications
	Week 3	5	Linear regression; Logistic regression, Neural Networks
		6	- gradient descent; features - Overfitting and complexity; training, validation, test data
	Week 4	7	Introduction to Neural Networks (model of a biological neuron, activation functions, neural net architecture, Perceptron)
		8	Building Neural Networks (data preprocessing, loss functions, weight initialization, regularization, dropout, batch normalization, Linear classification, Soft max) and Regularization, Gradient Descent & Stochastic Gradient Descent (SGD), Back propagation
	Week 5	9	Classification problems; decision trees,
		10	nearest neighbor methods
	Week 6	11	Linear classifiers, Bayes' Rule
		12	Naive Bayes Model
	Week 7	13	Unsupervised learning: clustering
		14	k-means Clustering Latent space methods; PCA
	Week 8	1 hours	Mid Term
	Week 9	15	Support vector machines and large-margin classifiers Time series;
		16	Markov models;
	Week 10	17	Introduction to Convolutional Neural Networks (CNN) and its components (Convolution and Pooling Layers),
		18	Convolutional Neural Network case studies (Imagenet/ AlexNet/ Minist/Iris),
	Week 11	19	Introduction to Natural Language Processing (NLP)
		20	Learning word and sentences embedding
	Week 12	21	Learning word and sentences embedding (Continued)
		22	Case Study (Deep Learning based Chatbot)
	Week 13	23	Introduction to recurrent networks (RNNs, LSTMS, etc.)
		24	Applications of Recurrent neural networks to different NLP tasks
	Week 14	25	Autoencoders
		26	Autoencoders
	Week 15	27	GANs
		28	GANs
	Week 16	29	
		30	
	Week 17	2 hours	Final Term
Laboratory Projects/Experiments Done in the Course			

Programming Assignments Done in the Course	
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Instructor Name	Muhammad Faraz Manzoor
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Instructor Signature

Date
