



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 :

Course Code	CSC																											
Course Title	Advanced Machine Learning																											
Credit Hours	3																											
Prerequisites by Course(s) and Topics																												
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																												
URL (if any)																												
Current Catalog Description																												
Textbook (or Laboratory Manual for Laboratory Courses)	Marco Gori , Machine Learning: A Constraint-Based Approach, Morgan Kaufmann. 2017 Ethem Alpaydin, Machine Learning: The New AI, MIT Press-2016																											
Reference Material	Ryszard, S., Michalski, J. G. Carbonell and Tom M. Mitchell, Machine Learning: An Artificial Intelligence Approach, Volume 1, Elsevier. 2014 , Stephen Marsland, Taylor & Francis 2009. Machine Learning: An Algorithmic Perspectiv																											
Course Goals	After completing this course, the student will be able to Appreciate the importance of visualization in the data analytics solution Apply structured thinking to unstructured problems Understand a very broad collection of machine learning algorithms and problems Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory Develop an appreciation for what is involved in learning from data.																											
Course Learning Outcomes (CLOs):	<table><tr><td></td><td></td><td>BT Level*</td></tr><tr><td>At the end of the course the students will be able to:</td><td>Domain</td><td></td></tr><tr><td>To understand the basic theory underlying machine learning</td><td></td><td></td></tr><tr><td>be able to formulate machine learning problems corresponding to different applications.</td><td></td><td></td></tr><tr><td>understand a range of machine learning algorithms along with their strengths and weaknesses.</td><td></td><td></td></tr><tr><td>To be able to apply machine learning algorithms to solve problems of moderate complexity.</td><td></td><td></td></tr><tr><td>To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.</td><td></td><td></td></tr><tr><td>Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory</td><td></td><td></td></tr><tr><td>* BT= Bloom's Taxonomy, C=Cognitive domain, P=Psychomotor domain, A= Affective domain</td><td></td><td></td></tr></table>			BT Level*	At the end of the course the students will be able to:	Domain		To understand the basic theory underlying machine learning			be able to formulate machine learning problems corresponding to different applications.			understand a range of machine learning algorithms along with their strengths and weaknesses.			To be able to apply machine learning algorithms to solve problems of moderate complexity.			To apply the algorithms to a real-world problem, optimize the models learned and report on the expected accuracy that can be achieved by applying the models.			Learn algorithmic topics of machine learning and mathematically deep enough to introduce the required theory			* 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	introduction to machine learning and its applications
		2	supervise, unsupervised and reinforcement learning
	Week 2	3	Linear Regression with One Variable
		4	Linear Regression with Multiple Variables
	Week 3	5	Logistic Regression and its application
		6	Regularization and its description
	Week 4	7	Neural Networks: Representation
		8	ANN and its applications
	Week 5	9	Perceptron's ,Multilayer Networks and Back Propagation Algorithms
		10	Advanced Topics , Genetic Algorithms, Hypothesis Space Search,Genetic Programming , Models of Evolution and Learning
	Week 6	11	Advice for Applying Machine Learning
		12	Machine Learning System Design
	Week 7	13	Support Vector Machines
		14	Support Vector Machines and its variants
	Week 8	1 hours	Mid Term
	Week 9	15	Support Vector Machines and its application
		16	Random Forest classifier
	Week 10	17	Naïve Bayes Classifier
		18	BayesianBelief Network – EM Algorithm – Probability Learning – Sample Complexity
	Week 11	19	K- Nearest Neighbour Learning
		20	Locally weighted Regression – Radial Bases Functions – Case Based Learning.
	Week 12	21	Unsupervised Learning
		22	Dimensionality Reduction
	Week 13	23	Anomaly Detection
		24	Recommender Systems
	Week 14	25	Large Scale Machine Learning
		26	Application of AML
	Week 15	27	earning Sets of Rules – Sequential Covering Algorithm – Learning Rule Set – First Order Rules – Sets of First Order Rules
		28	Induction on Inverted Deduction – Inverting Resolution – Analytical Learning
	Week 16	29	Explanation Base Learning – FOCL Algorithm
		30	Reinforcement Learning – Task – Q-Learning – Temporal Difference Learning. “Current Streams of Thought
	Week 17	2 hours	Final Term
Laboratory Projects/Experiments Done in the Course			
Programming Assignments Done in the Course	Research paper regrading the machine learning algorithm		

Instructor Name

Instructor Signature

Date