

ce-5319-syllabus-2022-3

February 1, 2023

1 CE 5319 Machine Learning for Civil Engineers

1.1 Course Catalog Description:

CE 5319: Machine Learning for Civil Engineers (3:3:0). Application of machine learning concepts and algorithms in Civil Engineering.

1.2 Prerequisites:

Graduate Standing CE 5315 or or instructor permission

1.3 Course Sections

Lesson time, days, and location:

1. Section 001; CRN 43344; 1500-1620 T,Th ; Mechanical Engineering South 207A
2. Section D01; CRN 45974; 1500-1620 T,Th ; asncronous distance (recordings on mediasite)

1.4 Course Instructor:

Instructor: Theodore G. Cleveland, Ph.D., P.E., M. ASCE, F. EWRI

Email: theodore.cleveland@ttu.edu (put CE 5319 into the subject line for email related to this class)

Office location: CECE 203F

Office hours: 1630-1730 M,T,W,Th ; CE 203F

1.5 Teaching Assistant:

Teaching Assistant: none authorized

Email :

Office location:

Office hours:

1.6 Course Schedule

Date	Lesson	Readings	Homework
25 AUG 2022	Machine Learning Concepts 0. Introduction - Jupyter Notebooks - iPython	- Installing Anaconda - Google Collaboratory - Build your own JupyterHub	- Get a Jupyter-Lab/Hub/Notebook iPython computation environment built and tested
30 AUG 2022	1. Overview - What is Machine Learning? - A Prediction Engine Example - Machine Learning Workflow	- Machine Learning Theory and Algorithms pp 19-22 - Machine Learning Techniques for Civil Engineering Problems	EC1 Due (allocate about 10 hours)
01 SEP 2022	2. Prediction Engines - A Simple Linear Engine - Discrete Choice	- Structural Response Prediction Engine to Support Advanced Seismic Risk Assessment - Two-Stage Degradation Assessment and Prediction Method for Aircraft Engines... - Machine Learning Theory and Algorithms pp 22-27 - Applying Regression Analysis to Predict and Classify Construction Cycle Time	
06 SEP 2022	3. Classification Engines - A Simple Classification Engine -subtopic 2	- Applying Regression Analysis to Predict and Classify Construction Cycle Time - subtopic 2	
08 SEP 2022	4. Supervised Learning - Description -subtopic 2	Ch 2 - 2.3-2.7 - subtopic 2	
13 SEP 2022	5. Unsupervised Learning - Description -subtopic 2	Ch 2 - 2.8 -subtopic 2	

Date	Lesson	Readings	Homework
15 SEP 2022	6. Reinforcement Learning - subtopic1 -subtopic 2	Ch 3 - Applied Dynamic Programming Bellman and Dreyfus (1962) pp. 1-21 -subtopic 2	
20 SEP 2022	7. Exploratory Data Analysis - Common Data Types - Visual Exploration - Downloading data	- -subtopic 2	
22 SEP 2022	8. Probability Distributions - subtopic1 -subtopic 2	- subtopic1 -subtopic 2	
27 SEP 2022	9. Optimization Principles - subtopic1 -subtopic 2		
29 SEP 2022	10. Linear Regression - subtopic1 -subtopic 2		
04 OCT 2022	11. Non-Linear Regression - subtopic1 -subtopic 2		
06 OCT 2022	12. Logistic Regression - subtopic1 -subtopic 2		
11 OCT 2022	13. KNN Classification - subtopic1 -subtopic 2		
13 OCT 2022	14. Decision Tree Classification - subtopic1 -subtopic 2 Machine Learning by Example		
18 OCT 2022	15. Ensemble Learning - subtopic -subtopic 2		
20 OCT 2022	16. Solution Stacking - I - Bagging -subtopic 2		
25 OCT 2022	17. Random Forests - subtopic1 -subtopic 2		
27 OCT 2022	18. Solution Stacking - II - Boosting -subtopic 2		

Date	Lesson	Readings	Homework
01 NOV 2022	19. Topic - subtopic1 -subtopic 2		
03 NOV 2022	20. Neural Network Perceptron - Biological Analogy - Activation Functions		
08 NOV 2022	21. Multi-Layer Perceptrons (MLP) - subtopic1 -subtopic 2		
10 NOV 2022	22. Multinomial Classification by MLP - subtopic1 -subtopic 2		
15 NOV 2022	23. Regression by MLP - subtopic1 -subtopic 2		
17 NOV 2022	24. Image Processing - subtopic1 -subtopic 2		
22 NOV 2022	25. Convolution Neural Networks - I - subtopic1 -subtopic 2		
29 NOV 2022	26. Convolution Neural Networks - II - subtopic1 -subtopic 2		
01 DEC 2022	Project Presentations - subtopic1 -subtopic 2	topic name - subtopic1 -subtopic 2	
06 DEC 2022	Project Presentations - subtopic1 -subtopic 2	topic name - subtopic1 -subtopic 2	
13 DEC 2022	Exam 3 Due	Submit on Blackboard	

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