COURSE SYLLABUS

COURSE INFORMATION
TITLE: Mechanics and Applications of Machine Learning in the Cloud (Microsoft AZURE)
NUMBER: WLF       
CREDITS: 3    
PREREQUISITES: None
LOCATION: 419 Irving I
MEETING TIME: Wednesday 1-4 PM

INSTRUCTOR
NAME: Falk Huettmann
OFFICE LOCATION: 419 Irving I
OFFICE HOURS: Wednesday 1-3 PM
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COURSE READINGS/MATERIALS

COURSE DESCRIPTION
This course teaches the applications of machine learning software in wildlife studies, primarily in predicting species distributions and habitats using ‘cloud-based’ methods. It also teaches the use of relevant software- running MS AZURE ML Studio, Salford Predictive Modeler and R.

COURSE GOALS
This course is designed to make use of machine learning (ML) programs to predict species distributions using the ‘cloud’. It will teach the basics of model inputs and how different factors affect the outputs/ final models and will present the differences in models from different modeling methods and programs.

STUDENT LEARNING OUTCOMES
Students will be able to navigate and effectively use and interpret models formed using machine learning techniques online (cloud-based). Students will also understand the more complex workings of models.

INSTRUCTIONAL METHODS
This course will utilize a combination of individual instruction and research assignments such as discussions, labs, and homework assignments. Because this class is based on a MS AZURE grant it makes use of that software and gets technical input from Microsoft as well.
COURSE CALENDAR
Week 1: Introduction to Machine Learning- how it works in AZURE and when linked with SPM8
Week 2: GIS Classification review- supervised vs. unsupervised, inference from predictions
Week 3: Importance of presence and absence and pseudo-absence/background data points in ‘presence’ 
models
Week 4: Workings of decision trees
Week 5: Working in ML Studio AZURE- from data to models
Week 6: Working in ML Studio (cont.)- a workflow from data to models
Week 7: Working in SPM- from data to models
Week 8: Interpreting spatial prediction index models
Week 9: Working in R- from data to models from personalized codes
Week 10: Ecology: Variation in models from medium type (primarily marine, terrestrial, disease  
and atmospheric)
Week 11: SQL database creation and management, and how to link it with MS AZURE
Week 12: Principal component analysis (PCA), Independent component analysis (ICA) run in the cloud
Week 13: VarClust and Clustering techniques run in the cloud
Week 14: Model evaluation methods (e.g. “jack-knifing”, error matrices, ROCs) in the cloud
Week 15: Introducing adversarial data (inclusion of worst-case perturbations)

COURSE POLICIES
Student is expected to have initiative to keep pace and produce results in accordance with course 
calendar and its assigned topics. Instructor will be available to address student 
questions/concerns on as needed basis. Flexibility is expected on both ends; this class is self-
paced by the student.

EVALUATION
Pass/fail, dependent on completion of student’s final product (a classified remote sensing image, 
corrected for atmosphere, geometrically corrected and classified ready to be used in GIS; all 
documented with compliant metadata).

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