COURSE INFORMATION
TITLE: Machine Learning in Ecology
NUMBER: WLF697
CREDITS: 3
PREREQUISITES: None (Graduate Program)
LOCATION: 419 Irving I
MEETING TIME: Wednesday 11:30 am -1:30 pm and online sessions

INSTRUCTOR
NAME: Falk Huettmann
OFFICE LOCATION: 419 Irving I
OFFICE HOURS: Wednesday 2-4 PM
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COURSE READINGS/MATERIALS
3. Selected publications (as assigned)

COURSE DESCRIPTION
This course teaches the underlying concepts, selected software and applications of machine learning software in ecology and wildlife studies, primarily for inference from predictions as well as data mining. It also teaches the use of relevant software- MS AZURE ML Studio running Salford Predictive Modeler and R packages.

COURSE GOALS
This course is designed to make use of machine learning (ML) programs to predict for inference and data mining. It will teach the basics of model inputs and how different factors affect the outputs/ final models. Further it will present the differences in statistical models from different modeling methods, programs and approaches.

STUDENT LEARNING OUTCOMES
Students will be able to navigate and effectively use and interpret models formed using machine learning techniques online (cloud-based and PC-based). Students will also understand the more complex workings of models and how inference is achieved from predictions and data mining.

INSTRUCTIONAL METHODS
This course will utilize a combination of individual instruction and research assignments such as discussions, labs, and homework projects. Because this class is based on software it makes use of several coding packages as well.

COURSE CALENDAR
Week 1: Introduction to Machine Learning (CART-based) and Artificial Intelligence
Week 2: Contrasting Linear Regressions with Boosting, Bagging and Ensemble Models
Week 3: Machine Learning- how it works in SPM8, R and the cloud
Week 4: Classification review- supervised vs. unsupervised, inference from predictions
Week 5: Typical and specific quantitative analysis applications in Ecology and Behavioral Sciences
Week 6: Databases, SQL and Data Mining
Week 7: The Inner Workings of decision trees, boosting and bagging
Week 8: Working ML in the Cloud (Microsoft Studio AZURE, and AMAZON)
Week 9: Workflows: From data to models I
Week 10: Specifics of working in SPM: From data to models II
Start of model project for final delivery at class end
Week 11: Working in R: From data to models with personalized codes
Week 12: VarClust, correlation and interaction issues and non-issues in ML
Week 13: Model evaluation methods (e.g. “jack-knifing”, error matrices, ROCs, variances, outlying’ness)
Week 14: Introducing adversarial data and complex data (e.g. too big too small, gappy)
Week 15: Interpret, present, defend and document your model and data mining project with compliant metadata

COURSE POLICIES
Student is expected to have initiative to keep pace and produce results in accordance with the course calendar and its assigned topics. Instructor will instruct the weekly topics and be available to address student questions/concerns on as needed basis. It is important that all class materials are fully comprehended, discussed and understood for moving on to the next class topic. Flexibility is expected on both ends; this class is self-paced by the student.

EVALUATION
Pass/fail, dependent on understanding, mastering and discussion of all 15 lecture topics. Those will be confirmed with the lecturer in each subsequent session as a requirement (3.33% for each topic adding to 50% of points). There is also a student’s final technical product (a first biological dataset to be ‘data mined’ and predicted with machine learning software for robust inference in R and SPM) which is to be handed in with data, metadata, code and basic documentation and interpretation (50% of points). For a pass, all lecture topics need to be processed by the student and discussed with the instructor. In addition, an overall of 70% needs to be achieved in this class for the student to pass.

Your instructor follows the University of Alaska Fairbanks Incomplete Grade Policy: “The letter “I” (Incomplete) is a temporary grade used to indicate that the student has satisfactorily completed (C or better) the majority of work in a course but for personal reasons beyond the student’s control, such as sickness, has not been able to complete the course during the regular semester. Negligence or indifference are not acceptable reasons for an “I” grade.”
TECHNOLOGY REQUIREMENTS
Student is required to access the internet, create pdfs, specific software, play video/audio, record video/audio, bandwidth, access to phone line, etc. as per UAF campus computer labs.

STUDENT PROTECTION AND SERVICES STATEMENT
Every qualified student is welcome in my classroom. As needed, I am happy to work with you, disability services, veterans' services, rural student services, etc to find reasonable accommodations. Students at this university are protected against sexual harassment and discrimination (Title IX), and minors have additional protections. For more information on your rights as a student and the resources available to you to resolve problems, please go the following site: www.uaf.edu/handbook/

SUPPORT SERVICES
UAF Help Desk
Click here (http://www.alaska.edu/oit/) to see about current network outages and news. Reach the Help Desk at:
- e-mail at helpdesk@alaska.edu
- fax at (907)-450-8312
- phone in the Fairbanks area is 450-8300 and outside of Fairbanks is 1-800-478-8226

Students who have difficulties with oral presentations and/or writing are strongly encouraged to get help from the UAF Department of Communication’s Speaking Center (907-474-5470, speak@uaf.edu) and the UAF English’s Department’s Writing Center (907-474-5314, Gruening 8th floor), and/or CTC’s Learning Center (604 Barnette st, 907-455- 2860).

DISABILITIES SERVICES
The UAF Office of Disability Services operates in conjunction with CDE. Disability Services, a part of UAF's Center for Health and Counseling, provides academic accommodations to enrolled students who are identified as being eligible for these services. If you believe you are eligible, please visit their web site (http://www.uaf.edu/apache/disability/) or contact a student affairs staff person at your nearest local campus. You can also contact Disability Services on the Fairbanks Campus by phone, 907-474-7043, or by e-mail (fydso@uaf.edu).

Additional Class Details
UA is an AA/EO employer and educational institution and prohibits illegal discrimination against any individual: alaska.edu/nondiscrimination.