Cover Sheet: Request 15466

ALS 3XXXC – AI in Agricultural and Life Sciences

Info

Process	Course|New|Ugrad/Pro
Status	Pending at PV - University Curriculum Committee (UCC)
Submitter	Bryan Kolaczkowski bryank@ufl.edu
Created	11/12/2020 11:15:02 AM
Updated	1/6/2021 2:02:29 PM
Description of request	Create a new 3-credit undergraduate course, "AI in Agricultural and Life Sciences" (ALS3xxxC).

Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	CALS - Microbiology and Cell Science 60100000	Eric Triplett		11/12/2020
AlinALS.projectRubric.pdf AlinALS.paperRubric.pdf CALSCCChecklistBK.pdf					11/12/2020 11/12/2020 11/12/2020
College	Approved	CALS - College of Agricultural and Life Sciences	Joel H Brendemuhl	Edits requested by the CALS CC have been addressed.	1/6/2021
AlinALS.syllabusV2.pdf					12/18/2020
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			1/6/2021
No document changes					
Statewide Course Numbering System					
No document changes					
Office of the Registrar					
No document changes					
Student Academic Support System					
No document changes					
Catalog					
No document changes					
College Notified					
No document changes					

Course|New for request 15466

Info

Request: ALS 3XXXC – AI in Agricultural and Life Sciences
Description of request: Create a new 3-credit undergraduate course, "AI in Agricultural and Life Sciences" (ALS3xxxC).
Submitter: Bryan Kolaczkowski bryank@ufl.edu
Created: 12/18/2020 2:35:53 PM
Form version: 2

Responses

Recommended Prefix
Enter the three letter code indicating placement of course within the discipline (e.g., POS, ATR, ENC). Note that for new course proposals, the State Common Numbering System (SCNS) may assign a different prefix.

    Response:
    ALS

Course Level
Select the one digit code preceding the course number that indicates the course level at which the course is taught (e.g., 1=freshman, 2=sophomore, etc.).

    Response:
    3

Course Number
Enter the three digit code indicating the specific content of the course based on the SCNS taxonomy and course equivalency profiles. For new course requests, this may be XXX until SCNS assigns an appropriate number.

    Response:
    XXX

Category of Instruction
Indicate whether the course is introductory, intermediate or advanced. Introductory courses are those that require no prerequisites and are general in nature. Intermediate courses require some prior preparation in a related area. Advanced courses require specific competencies or knowledge relevant to the topic prior to enrollment.

    Response:
    Intermediate

• 1000 level = Introductory undergraduate
• 2000 level = Introductory undergraduate
• 3000 level = Intermediate undergraduate
• 4000 level = Advanced undergraduate
• 5000 level = Introductory graduate
• 6000 level = Intermediate graduate
• 7000 level = Advanced graduate
• 4000/5000= Joint undergraduate/graduate
• 4000/6000= Joint undergraduate/graduate

*Joint undergraduate/graduate courses must be approved by the UCC and the Graduate Council)

Lab Code
Enter the lab code to indicate whether the course is lecture only (None), lab only (L), or a combined lecture and lab (C).

Response:
C

Course Title
*Enter the title of the course as it should appear in the Academic Catalog. There is a 100 character limit for course titles. *

Response:
AI in Agricultural and Life Sciences

Transcript Title
Enter the title that will appear in the transcript and the schedule of courses. Note that this must be limited to 30 characters (including spaces and punctuation).

Response:
AI in Ag and Life Sci

Degree Type
Select the type of degree program for which this course is intended.

Response:
Baccalaureate

Delivery Method(s)
Indicate all platforms through which the course is currently planned to be delivered.

Response:
Online

Co-Listing
Will this course be jointly taught to undergraduate, graduate, and/or professional students?

Response:
No

Effective Term
Select the requested term that the course will first be offered. Selecting "Earliest" will allow the course to be active in the earliest term after SCNS approval. If a specific term and year are selected, this should reflect the department's best projection. Courses cannot be implemented retroactively, and therefore the actual effective term cannot be prior to SCNS approval, which must be obtained prior to the first day of classes for the effective term. SCNS approval typically requires 2 to 6 weeks after approval of the course at UF.

Response:
Fall

Effective Year
Select the requested year that the course will first be offered. See preceding item for further information.

Response:
2021

Rotating Topic?
Select "Yes" if the course can have rotating (varying) topics. These course titles can vary by topic in the Schedule of Courses.

Response:
No

Repeatable Credit?
Select "Yes" if the course may be repeated for credit. If the course will also have rotating topics, be sure to indicate this in the question above.

Response:
No

Amount of Credit
Select the number of credits awarded to the student upon successful completion, or select "Variable" if the course will be offered with variable credit and then indicate the minimum and maximum credits per section. Note that credit hours are regulated by Rule 6A-10.033, FAC. If you select "Variable" for the amount of credit, additional fields will appear in which to indicate the minimum and maximum number of total credits.

Response:
3

S/U Only?
Select "Yes" if all students should be graded as S/U in the course. Note that each course must be entered into the UF curriculum inventory as either letter-graded or S/U. A course may not have both options. However, letter-graded courses allow students to take the course S/U with instructor permission.

Response:
No

Contact Type
Select the best option to describe course contact type. This selection determines whether base hours or headcount hours will be used to determine the total contact hours per credit hour. Note that the headcount hour options are for courses that involve contact between the student and the professor on an individual basis.

Response:

Regularly Scheduled

• *Regularly Scheduled [base hr]*
• *Thesis/Dissertation Supervision [1.0 headcount hr]*
• *Directed Individual Studies [0.5 headcount hr]*
• *Supervision of Student Interns [0.8 headcount hr]*
• *Supervision of Teaching/Research [0.5 headcount hr]*
• *Supervision of Cooperative Education [0.8 headcount hr]*

Contact the Office of Institutional Planning and Research (352-392-0456) with questions regarding contact type.

Weekly Contact Hours
Indicate the number of hours instructors will have contact with students each week on average throughout the duration of the course.

Response:
3

Course Description
Provide a brief narrative description of the course content. This description will be published in the Academic Catalog and is limited to 500 characters or less. See course description guidelines.

Response:
Artificial intelligence (AI) is used to solve problems in research and industry. This course provides students with understanding of and practical hands-on experience building and using AI systems. Students will obtain the skills and knowledge they need to use AI to solve real-world problems in agricultural and life sciences.

Prerequisites
Indicate all requirements that must be satisfied prior to enrollment in the course. Prerequisites will be automatically checked for each student attempting to register for the course. The prerequisite will be published in the Academic Catalog and must be formulated so that it can be enforced in the registration system. Please note that upper division courses (i.e., intermediate or advanced level of instruction) must have proper prerequisites to target the appropriate audience for the course.
Courses level 3000 and above must have a prerequisite.
Please verify that any prerequisite courses listed are active courses.

Response:
BSC2891 (C) or STA2023 (C) or STA3032 (C) or ENG3xxx Fundamentals of AI (C)

Completing Prerequisites on UCC forms:

• *Use "&" and "or" to conjoin multiple requirements; do not used commas, semicolons, etc.*
• *Use parentheses to specify groupings in multiple requirements.*
• *Specifying a course prerequisite (without specifying a grade) assumes the required passing grade is D-. In order to specify a different grade, include the grade in parentheses immediately after the course number. For example, "MAC 2311(B)" indicates that students are required to obtain a grade of B in Calculus I. MAC2311 by itself would only require a grade of D-.*
• *Specify all majors or minors included (if all majors in a college are acceptable the college code is sufficient).*
• *"Permission of department" is always an option so it should not be included in any prerequisite or co-requisite.*
• *If the course prerequisite should list a specific major and/or minor, please provide the plan code for that major/minor (e.g., undergraduate Chemistry major = CHY_BS, undergraduate Disabilities in Society minor = DIS_UMN)*

Example: A grade of C in HSC 3502, passing grades in HSC 3057 or HSC 4558, and undergraduate PBH student should be written as follows: HSC 3502(C) & (HSC 3057 or HSC 4558) & UGPBH

* *

Co-requisites
Indicate all requirements that must be taken concurrently with the course. Co-requisites are not checked by the registration system. If there are none please enter N/A.

Response:
N/A

Rationale and Placement in Curriculum
Explain the rationale for offering the course and its place in the curriculum.

Response:
UF is embarking on a university-wide initiative to "become a model for 'AI across the curriculum,' where any UF student who wishes to graduate equipped to engage AI in their discipline can do so, and, ... create a model for AI workforce development that can serve as a template for other colleges and universities in Florida and across the U.S." (ai.ufl.edu). The UF provost's office is supporting this effort by initially creating a 9-credit undergraduate AI certificate accessible to any interested UF undergraduate student and administered by the college of engineering ("Artificial Intelligence Fundamentals and Applications Certificate", currently in the approval process). The first 6 credits are to be supplied by ENG3xxx ("Fundamentals of AI", currently in the approval system) and PHI3681 (Ethics, Data and Technology). The final 3-credit 'capstone' courses are intended to be college- or department-specific courses that build on the 6-credit fundamentals/ethics and provide students with hands-on experience using AI in their chosen major field or a closely-related field. This course is being developed by a CALS team and would supply the 3-credit capstone experience for any interested CALS students. Approval of this course would not preclude development of alternative and/or additional AI courses in CALS departments.

Course Objectives
Describe the core knowledge and skills that student should derive from the course. The objectives should be both observable and measurable.

Response:
• Conceptual Learning Objectives (CLOs):
1. Identify applications of artificial intelligence in agricultural and life sciences disciplines
2. Explain the mathematics of how neural network models work
3. Describe the train-validate-test approach to supervised machine learning
4. Define the importance of bias-variance tradeoff in model selection
5. Differentiate the main causes of model overfitting
6. Compare and contrast approaches to reduce model overfitting of neural networks
• Practical Learning Objectives (PLOs):
1. Manage AI projects on remote computers using the UNIX command line interface
2. Build, evaluate and use AI models in Tensorflow
3. Plan, execute and report an AI inference

Course Textbook(s) and/or Other Assigned Reading
*Enter the title, author(s) and publication date of textbooks and/or readings that will be assigned. Please provide specific examples to evaluate the course and identify required textbooks. *

Response:
None

Weekly Schedule of Topics
Provide a projected weekly schedule of topics. This should have sufficient detail to evaluate how the course would meet current curricular needs and the extent to which it overlaps with existing courses at UF.

Response:
1. Introduction. Applications of AI in agricultural and life sciences overview. How to connect to UF VPN and course UNIX computer.
For more information about how AI is being used across disciplines, including applications in agricultural and life sciences, please read:
https://en.wikipedia.org/wiki/Applications_of_artificial_intelligence
You might be particularly interested in applications in precision agriculture:
https://en.wikipedia.org/wiki/Precision_agriculture
    or health sciences:
    https://en.wikipedia.org/wiki/Artificial_intelligence_in_healthcare
    But AI is making dramatic advances across the biological sciences:
        https://bmcbioinformatics.biomedcentral.com/articles/10.1186/s12859-019-3225-3
Really, no matter what your field of interest, just google "artificial intelligence applications in MY_FIELD", and you'll see that AI is being used where you will be working when you graduate.
Pre-Lab Quiz – AI applications; UF VPN.
Lab Exercise – connect to UF VPN and course UNIX computer (due next Monday).
2. Crash course in UNIX command line.
Pre-Lab Quiz – UNIX commands.
Lab Exercise – create your sandbox directory on the course UNIX computer (due next Monday).
3. Neural network 'theory'. Introduction to neural network modeling. Crash course in Python interpreter.
Introduction to Term Research Review Paper (due Wednesday of finals week)
No Pre-Lab Quiz or Lab this week.
4. Crash course in Python scripting.
Pre-Lab Quiz – Python scripting.
Lab Exercise – generate linear regression dataset and visualize it (due next Monday).
5. Linear regression via neural network. Introduction to Tensorflow and Keras.
Pre-Lab Quiz – linear regression using neural networks.
Lab Exercise – fit single-neuron model to linear regression dataset (due next Monday).
6. Model evaluation. Train-validate-test data splits.
Pre-Lab Quiz – model evaluation
Lab Exercise – evaluate single-neuron linear regression.
7. Higher-dimensional data. P-dimensional linear regression.
Pre-Lab Quiz – high-dimensional data.
Lab Exercise – evaluate single-neuron linear regression as P (number of input features) increases (due next Monday).
8. How much data do we need? Model complexity, number of parameters. Bias-variance tradeoff. Causes of overfitting.
Pre-Lab Quiz – model complexity, overfitting.
Lab Exercise – evaluate single-neuron and multiple-neuron linear regression as amount of training data is varied from small to large (due next Monday).
9. Classification problems.
Pre-Lab Quiz – classification.
Lab Exercise – single-neuron classification (due next Monday).
10. Classification with more complex models.
Pre-Lab Quiz – overfitting and model complexity.
Lab Exercise – multi-neuron classification. Evaluate overfitting (due next Monday).
11. Neural network methods to reduce overfitting.
Pre-Lab Quiz – dropout and batch normalization.
Lab Exercise – dropout vs batch normalization (due next Monday).
12. Introduction to available case studies for Final Case Study Project.
Final Term Research Review Paper Draft (due Friday)
Instructor will be available during the regularly-scheduled Lab meeting time to address student questions regarding the Final Case Study Project and/or Final Term Research Review Paper.
No Pre-Lab Quiz or Lab this week.

13. Students work on Final Case Study Project and Final Term Research Review Paper. Instructor will be available during the regularly-scheduled Lab meeting time to address student questions regarding the Final Case Study Project and/or Final Term Research Review Paper. No Pre-Lab Quiz or Lab this week.
14. Students work on Final Case Study Project and Final Term Research Review Paper. Instructor will be available during the regularly-scheduled Lab meeting time to address student questions regarding the Final Case Study Project and/or Final Term Research Review Paper. No Pre-Lab Quiz or Lab this week.
15. Students work on Final Case Study Project and Final Term Research Review Paper. Instructor will be available during the regularly-scheduled Lab meeting time to address student questions regarding the Final Case Study Project and/or Final Term Research Review Paper. No Pre-Lab Quiz or Lab this week.

Grading Scheme
List the types of assessments, assignments and other activities that will be used to determine the course grade, and the percentage contribution from each. This list should have sufficient detail to evaluate the course rigor and grade integrity. Include details about the grading rubric and percentage breakdowns for determining grades. If participation and/or attendance are part of the students grade, please provide a rubric or details regarding how those items will be assessed.

Response:
Weekly Pre-Lab Quizzes due each Thursday by 11:59pm – 10 points each, weeks 1,2,4-11 (100 points total)

Weekly Lab Exercises due Monday after lab by 11:59pm – 20 points each weeks 2,3,5-12 (200 points total)

Final Term Research Review Paper Draft due Friday of week 12 by 11:59pm (50 points total)

Final Case Study Project writeup due Wednesday of finals week by 11:59pm (200 points total)

Final Term Research Review Paper due Wednesday of finals week by 11:59pm (50 points total)

Assignment Descriptions:

Weekly Pre-Lab Quizzes: Students will complete a short quiz online covering the week's lecture materials prior to attending the week's laboratory meeting (due Thursday before lab meeting).

Weekly Lab Exercises: Students will complete laboratory exercises associated with the week's lecture materials (due Monday following the week's lab meeting).

Final Case Study Project: Students will choose a dataset from a variety of real-world datasets available for this course, which will be presented in week 12. Students will conduct an AI analysis of their chosen dataset during weeks 13-15 and turn in a written project report due Wednesday of finals week. A template/rubric for the project report will be provided.

Final Term Research Review Paper: Students will independently research a topic of their choice related to an AI application or AI method used in agricultural and/or life sciences. Students will write a 3-page review of their chosen application or method, using a minimum of 10 references from scientific literature. A draft will be due Friday of week 12, which will receive comments from the instructor for improvement. The final paper will be due Wednesday of finals week.

Final Case Study Project Template / Rubric (200pts total)
Briefly describe why your subject area and research question are important to a broad audience (10pts)
State the main research question of your project (20pts)
Briefly describe the data you will be using to answer your research question, including quantitative data summaries. How were the data collected or simulated? How many data samples are there in your data set? How many fields or columns are you using in your predictive model? What are the averages and standard deviations of each field? How many fields ore columns are you trying to

predict or model? What are the averages and standard deviations of these? How were the data pre-processed or normalized before analysis? (30pts)

Briefly describe the architecture of your model. What types of network layers are you using? How many neurons or filters in each layer? How are the layers connected? What types of activations are you using? What types of dropout or normalization layers are you using? (30pts)

Attach a schematic image of your network architecture (10pts)

Describe why you think the modeling approach you chose is appropriate to address your research question (10pts)

Describe any potential shortcomings, problems or issues in your modeling approach. Why might your modeling approach not be the perfect approach for addressing your research question? (10pts)

Briefly describe your training procedure. How did you split your data into training, validation and testing sets? How many data samples are in each set? What optimizer did you use to train your model? How long was the model trained? What was the loss function? (20pts)

Describe the results of your model training and evaluation. What was your model's accuracy on the training, validation and testing data? (10pts)

Interpret your results. Was your model successful in addressing your research question? Why or why not? (20pts)

Attach the code you used to train and evaluate your model, in a monspaced font such as courier (30pts)

Final Term Research Review Paper Template / Rubric (50 points for draft, 50 points for final turn in)

Briefly describe the application area in which AI is being used in your chosen field, and why this application area is important to a broad audience (10pts)

Briefly describe the current approaches being used in this application area without AI, and why these approaches are not adequate, suitable or ideal (10pts)

Describe how AI approaches are being used to overcome the shortcomings of current approaches in this application area (10pts)

Identify specific types of AI approaches that are being used in this application area (10pts)

Provide a Reference Bibliography for scientific papers cited in your review (10 references, minimum) (10pts)

Grading Scale

Course grades will be determined based on percentage of total possible points. The following grading scale will be used:

A 93.00 – 100.0
A- 90.00 – 92.99
B+ 87.00 – 89.99
B 83.00 – 86.99
B- 80.00 – 82.99
C+ 77.00 – 79.99
C 73.00 – 76.99
C- 70.00 – 72.99
D+ 67.00 – 69.99
D 63.00 – 66.99
D- 60.00 – 62.99
E 00.00 – 59.99

Instructor(s)
Enter the name of the planned instructor or instructors, or "to be determined" if instructors are not yet identified.

Response:
Bryan Kolaczkowski

Attendance & Make-up

Please confirm that you have read and understand the University of Florida Attendance policy.
A required statement statement related to class attendance, make-up exams and other work will be included in the syllabus and adhered to in the course. Courses may not have any policies which conflict with the University of Florida policy. The following statement may be used directly in the syllabus.

• Requirements for class attendance and make-up exams, assignments, and other work in this course are consistent with university policies that can be found at:
https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx

    Response:
Yes

Accomodations
Please confirm that you have read and understand the University of Florida Accommodations policy.
A statement related to accommodations for students with disabilities will be included in the syllabus and adhered to in the course. The following statement may be used directly in the syllabus:

• Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, www.dso.ufl.edu/drc/) by providing appropriate documentation. Once registered, students will receive an accommodation letter which must be presented to the instructor when requesting accommodation. Students with disabilities should follow this procedure as early as possible in the semester.

    Response:
Yes

UF Grading Policies for assigning Grade Points
Please confirm that you have read and understand the University of Florida Grading policies.
Information on current UF grading policies for assigning grade points is require to be included in the course syllabus. The following link may be used directly in the syllabus:

• https://catalog.ufl.edu/ugrad/current/regulations/info/grades.aspx

    Response:
Yes

Course Evaluation Policy
Course Evaluation Policy
Please confirm that you have read and understand the University of Florida Course Evaluation Policy.
A statement related to course evaluations will be included in the syllabus. The following statement may be used directly in the syllabus:

• Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at https://gatorevals.aa.ufl.edu/public-results/. Students will be notified when the evaluation period opens, and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via https://ufl.bluera.com/ufl/. Summaries of course evaluation results are available to students at https://gatorevals.aa.ufl.edu/public-results/.

* *

    Response:

Yes

Final Term Research Review Paper Template / Rubric (50 points for draft, 50 points for final turn in)

Briefly describe the application area in which AI is being used in your chosen field, and why this application area is important to a broad audience (10pts)

Briefly describe the current approaches being used in this application area without AI, and why these approaches are not adequate, suitable or ideal (10pts)

Describe how AI approaches are being used to overcome the shortcomings of current approaches in this application area (10pts)

Identify specific types of AI approaches that are being used in this application area (10pts)

<u>Provide a Reference Bibliography for scientific papers cited in your review (10 references, minimum) (10pts)</u>

Final Case Study Project Template / Rubric (200pts total)

<u>Briefly describe why your subject area and research question are important to a broad audience (10pts)</u>

<u>State the main research question of your project (20pts)</u>

<u>Briefly describe the data you will be using to answer your research question, including quantitative data summaries. How were the data collected or simulated? How many data samples are there in your data set? How many fields or columns are you using in your predictive model? What are the averages and standard deviations of each field? How many fields ore columns are you trying to predict or model? What are the averages and standard deviations of these? How were the data pre-processed or normalized before analysis? (30pts)</u>

Briefly describe the architecture of your model. What types of network layers are you using? How many neurons or filters in each layer? How are the layers connected? What types of activations are you using? What types of dropout or normalization layers are you using? (30pts)

Attach a schematic image of your network architecture (10pts)

Describe why you think the modeling approach you chose is appropriate to address your research question (10pts)

Describe any potential shortcomings, problems or issues in your modeling approach. Why might your modeling approach *not* be the perfect approach for addressing your research question? (10pts)

Briefly describe your training procedure. How did you split your data into training, validation and testing sets? How many data samples are in each set? What optimizer did you use to train your model? How long was the model trained? What was the loss function? (20pts)

Describe the results of your model training and evaluation. What was your model's accuracy on the training, validation and testing data? (10pts)

Interpret your results. Was your model successful in addressing your research question? Why or why not? (20pts)

Attach the code you used to train and evaluate your model, in a monspaced font such as courier (30pts)

Course Prefix and Number

ALS3XXXC

Course Title

AI in Agricultural and Life Sciences

Number of Credits

3

Meeting Days and Times

lectures – asynchronous online through UF e-learning (expected 2-3 hrs/week spent on online learning activities)

lab meetings – Fridays periods 8-9 (3pm – 4:55pm ET)

Prerequisites

BSC2891 or STA2023 or ENG3XXX (fundamentals of AI) or STA3032

Instructor Contact

Name Bryan Kolaczkowski

Office 1250 Microbiology & Cell Science

Telephone 352-392-5925

Email bryank@ufl.edu

Office Hours M3pm, Tu10am

Course Description

Artificial intelligence (AI) is used to solve problems in research and industry. This course provides students with understanding of and practical hands-on experience building and using AI systems. Students will obtain the skills and knowledge they need to use AI to solve real-world problems in agricultural and life sciences.

Course Learning Objectives

By the end of this course, students will be able to:

- Conceptual Learning Objectives (CLOs):
    1. Identify applications of artificial intelligence in agricultural and life sciences disciplines
    2. Explain the mathematics of how neural network models work
    3. Describe the train-validate-test approach to supervised machine learning
    4. Define the importance of bias-variance tradeoff in model selection
    5. Differentiate the main causes of model overfitting
    6. Compare and contrast approaches to reduce model overfitting of neural networks
- Practical Learning Objectives (PLOs):

1. Manage AI projects on remote computers using the UNIX command line interface
2. Build, evaluate and use AI models in Tensorflow
3. Plan, execute and report an AI inference

Weekly Schedule of Topics and Assignments

This course does <u>not</u> require previous experience in AI, computer programming or statistics, beyond the required prerequisites.

This course is part of a UF-wide initiative to support education and research in AI. More information about this initiative can be found at: https://ai.ufl.edu/

1. Introduction. Applications of AI in agricultural and life sciences overview. How to connect to UF VPN and course UNIX computer.

   For more information about how AI is being used across disciplines, including applications in agricultural and life sciences, please read:
   https://en.wikipedia.org/wiki/Applications_of_artificial_intelligence
   You might be particularly interested in applications in precision agriculture:
   https://en.wikipedia.org/wiki/Precision_agriculture
   or health sciences:
   https://en.wikipedia.org/wiki/Artificial_intelligence_in_healthcare
   But AI is making dramatic advances across the biological sciences:
   https://bmcbioinformatics.biomedcentral.com/articles/10.1186/s12859-019-3225-3
   Really, no matter what your field of interest, just google "artificial intelligence applications in MY_FIELD", and you'll see that AI is being used where you will be working when you graduate.

   Pre-Lab Quiz – AI applications; UF VPN.
   Lab Exercise – connect to UF VPN and course UNIX computer (due next Monday).

2. Crash course in UNIX command line.
   Pre-Lab Quiz – UNIX commands.
   Lab Exercise – create your sandbox directory on the course UNIX computer (due next Monday).

3. Neural network 'theory'. Introduction to neural network modeling. Crash course in Python interpreter.
   Introduction to Term Research Review Paper (due Wednesday of finals week)
   No Pre-Lab Quiz or Lab this week.

4. Crash course in Python scripting.
   Pre-Lab Quiz – Python scripting.
   Lab Exercise – generate linear regression dataset and visualize it (due next Monday).

5. Linear regression via neural network. Introduction to Tensorflow and Keras.
   Pre-Lab Quiz – linear regression using neural networks.
   Lab Exercise – fit single-neuron model to linear regression dataset (due next Monday).

6. Model evaluation. Train-validate-test data splits.
   Pre-Lab Quiz – model evaluation
   Lab Exercise – evaluate single-neuron linear regression.

7. Higher-dimensional data. P-dimensional linear regression.
   Pre-Lab Quiz – high-dimensional data.
   Lab Exercise – evaluate single-neuron linear regression as P (number of input features) increases (due next Monday).

8. How much data do we need? Model complexity, number of parameters. Bias-variance tradeoff. Causes of overfitting.
   Pre-Lab Quiz – model complexity, overfitting.
   Lab Exercise – evaluate single-neuron and multiple-neuron linear regression as amount of training data is varied from small to large (due next Monday).

9. Classification problems.
   Pre-Lab Quiz – classification.
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10. Classification with more complex models.
    Pre-Lab Quiz – overfitting and model complexity.
    Lab Exercise – multi-neuron classification. Evaluate overfitting (due next Monday).

11. Neural network methods to reduce overfitting.
    Pre-Lab Quiz – dropout and batch normalization.
    Lab Exercise – dropout vs batch normalization (due next Monday).

12. Introduction to available case studies for Final Case Study Project.
    Final Term Research Review Paper Draft (due Friday)
    Instructor will be available during the regularly-scheduled Lab meeting time to address student questions regarding the Final Case Study Project and/or Final Term Research Review Paper.
    No Pre-Lab Quiz or Lab this week.

13. Students work on Final Case Study Project and Final Term Research Review Paper.
    Instructor will be available during the regularly-scheduled Lab meeting time to address student questions regarding the Final Case Study Project and/or Final Term Research Review Paper.
    No Pre-Lab Quiz or Lab this week.

14. Students work on Final Case Study Project and Final Term Research Review Paper.
    Instructor will be available during the regularly-scheduled Lab meeting time to address student questions regarding the Final Case Study Project and/or Final Term Research Review Paper.
    No Pre-Lab Quiz or Lab this week.

15. Students work on Final Case Study Project and Final Term Research Review Paper.

Instructor will be available during the regularly-scheduled Lab meeting time to address student questions regarding the Final Case Study Project and/or Final Term Research Review Paper.

No Pre-Lab Quiz or Lab this week.

Critical Dates

Weekly Pre-Lab Quizzes due each Thursday by 11:59pm – 10 points each, weeks 1,2,4-11 (100 points total)

Weekly Lab Exercises due Monday after lab by 11:59pm – 20 points each weeks 2,3,5-12 (200 points total)

Final Term Research Review Paper Draft due Friday of week 12 by 11:59pm (50 points total)

Final Case Study Project writeup due Wednesday of finals week by 11:59pm (200 points total)

Final Term Research Review Paper due Wednesday of finals week by 11:59pm (50 points total)

Assignment Descriptions

Weekly Pre-Lab Quizzes: Students will complete a short quiz online covering the week's lecture materials prior to attending the week's laboratory meeting (due Thursday before lab meeting).

Weekly Lab Exercises: Students will complete laboratory exercises associated with the week's lecture materials (due Monday following the week's lab meeting).

Final Case Study Project: Students will choose a dataset from a variety of real-world datasets available for this course, which will be presented in week 12. Students will conduct an AI analysis of their chosen dataset during weeks 13-15 and turn in a written project report due Wednesday of finals week. A template/rubric for the project report will be provided.

Final Term Research Review Paper: Students will independently research a topic of their choice related to an AI application or AI method used in agricultural and/or life sciences. Students will write a 3-page review of their chosen application or method, using a minimum of 10 references from scientific literature. A draft will be due Friday of week 12, which will receive comments from the instructor for improvement. The final paper will be due Wednesday of finals week.

Required Computer

To complete this course, students are required to have regular access to a computer that can establish a secure shell (SSH) connection over the internet. Nearly all computers running a recent version of Microsoft Windows or Apple OS will work, as will a computer running UNIX or Linux. Google Chrome also has an SSH client available, so it should work, as well. Students without their own computer and internet access should make sure they have regular access to a computer lab where they can do their work. Setting up your computer connection will be covered in week 1 of the course.

Required and Recommended Textbooks

There is no required textbook for this course. All course materials will be provided by the instructor.

Recommended Textbooks for your Reference Library, if you want to learn more about AI:

The elements of Statistical Learning, Second Edition. Trevor Hastie, Robert Tibshirani, Jerome Friedman. Springer. 2009

Neural Networks and Deep Learning. Charu C Aggarwal. Springer. 2018.

Grading Scale

Course grades will be determined based on percentage of total possible points. The following grading scale will be used:

A 93.00 – 100.0
A- 90.00 – 92.99
B+ 87.00 – 89.99
B 83.00 – 86.99
B- 80.00 – 82.99
C+ 77.00 – 79.99
C 73.00 – 76.99
C- 70.00 – 72.99
D+ 67.00 – 69.99
D 63.00 – 66.99
D- 60.00 – 62.99
E 00.00 – 59.99

Grades and Grade Points

For information on current UF policies for assigning grade points, see:

https://catalog.ufl.edu/UGRD/academic-regulations/grades-grading-policies/

Attendance and Make-Up Work

Requirements for class attendance and make-up exams, assignments and other work are consistent with university policies that can be found at:

https://catalog.ufl.edu/UGRD/academic-regulations/attendance-policies/

Online Course Evaluation Process

Student assessment of instruction is an important part of efforts to improve teaching and learning. At the end of the semester, students are expected to provide feedback on the quality of instruction in this course using a standard set of university and college criteria. Students are expected to provide professional and respectful feedback on the quality of instruction in this course by completing course evaluations online via GatorEvals. Guidance on how to give feedback in a professional and respectful manner is available at:

 https://gatorevals.aa.ufl.edu/students/

Students will be notified when the evaluation period opens and can complete evaluations through the email they receive from GatorEvals, in their Canvas course menu under GatorEvals, or via:

https://ufl.bluera.com/ufl/

Summaries of course evaluation results are available to students at:

https://gatorevals.aa.ufl.edu/public-results/

Academic Honesty

As a student at the University of Florida, you have committed yourself to uphold the Honor Code, which includes the following pledge: "*We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honesty and integrity.*" You are expected to exhibit behavior consistent with this commitment to the UF academic community, and on all work submitted for credit at the University of Florida, the following pledge is either required or implied: "*On my honor, I have neither given nor received unauthorized aid in doing this assignment*."

It is assumed that you will complete all work independently in each course unless the instructor provides explicit permission for you to collaborate on course tasks (e.g. assignments, papers, quizzes, exams). Furthermore, as part of your obligation to uphold the Honor Code, you should report any condition that facilitates academic misconduct to appropriate personnel. It is your individual responsibility to know and comply with all university policies and procedures regarding academic integrity and the Student Honor Code. Violations of the Honor Code at the University of Florida will not be tolerated. Violations will be reported to the Dean of Students Office for consideration of disciplinary action. For more information regarding the Student Honor Code, please see:

http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code

Software Use:

All faculty, staff and students of the university are required and expected to obey the laws and legal agreements governing software use. Failure to do so can lead to monetary damages and/or criminal penalties for the individual violator. Because such violations are also against university policies and rules, disciplinary action will be taken as appropriate.

Services for Students with Disabilities

The Disability Resource Center coordinates the needed accommodations of students with disabilities. This includes registering disabilities, recommending academic accommodations within the classroom, accessing special adaptive computer equipment, providing interpretation services and mediating faculty-student disability related issues. Students requesting classroom accommodation must first register with the Dean of Students Office. The Dean of Students Office will provide documentation to the student who must then provide this documentation to the Instructor when requesting accommodation.

0001 Reid Hall, 352-392-8565

https://disability.ufl.edu/

Campus Helping Resources

Students experiencing crises or personal problems that interfere with their general well- being are encouraged to utilize the university's counseling resources. The Counseling & Wellness

Center provides confidential counseling services at no cost for currently enrolled students. Resources are available on campus for students having personal problems or lacking clear career or academic goals, which interfere with their academic performance.

- *University Counseling & Wellness Center*, *3190 Radio Road*, *352-392-1575*, **www.counseling.ufl.edu**

Counseling Services Groups and Workshops Outreach and Consultation Self-Help Library Wellness Coaching

- U Matter We Care, **www.umatter.ufl.edu**

- *Career Connections Center*, First Floor JWRU, 392-1601, https://career.ufl.edu/

- Student Complaints:

    - Residential Course: https://sccr.dso.ufl.edu/policies/student-honor-code-student- conduct-code/

    - Online Course: http://www.distance.ufl.edu/student-complaint-process

Diversity, Inclusion and Equity

This class fully supports the University of Florida's commitment to diversity, inclusion, and equity. By fostering a sense of belonging for students, staff and faculty while leveraging the uniqueness of the people who study and work at the university, we believe our campus community is enriched and enhanced by diversity, including but not limited to race, ethnicity, national origin, gender, gender identity, sexuality, class and religion. Our course will help foster an understanding of the diversity of our campus community, locally and globally.

We will strive to create a learning environment for our students that support a diversity of thoughts, perspectives and experiences while honoring your identities. To accomplish this, please let us know:

- If you have a name and/or set of pronouns that differ from those that appear in your official university records

- If you believe your performance in the class is being impacted by your experiences outside of class. Do not hesitate to reach out and talk with us. We want to be a resource for you. Anonymous feedback may be submitted, which may lead us to make a general announcement to the class, if necessary, to address your concerns.

- We, like many people, are still in the process of learning about diverse perspectives and identities. If something was said in class (by anyone) that makes you feel uncomfortable, please talk to us about it.

Contact us with any concerns regarding inclusion and equity, including accessibility of learning materials, equipment, and software.

CALS Curriculum Committee
Submission Checklist

NOTE: This checklist must be included with all course and certificate submissions.

The checklist below is intended to facilitate course and certificate submissions to the University of Florida Academic Approval Tracking System (https://approval.ufl.edu/). The checklist consists of the most common items that can cause a submission to require changes or be recycled. Contrary to information provided on the UF approval site, the CALS Curriculum Committee requires a syllabus be submitted with each new course or course modification request. Please note that submitters are encouraged to attend the CALS CC meeting at which their item is being reviewed. This allows the submitter to answer any potential questions that may arise that could cause the item to not be approved. Also, be aware that when completing the UCC form the section Description of Request is asking for a brief statement about what you are doing. This is **not** the place for a course description. A statement such as "Proposal of a new undergraduate course" is all that is needed. Please do not submit documents in pdf format. All documents should be submitted in Word to facilitate editing on our end if necessary.

CHECKLIST: PLEASE INITIAL OR MARK N/A FOR EACH STATEMENT TO INDICATE YOUR COMPLIANCE.

BK It is required when making a submission that you consult your department's representative to the CALS CC. A list of current members can be found on the committee site located at: https://cals.ufl.edu/faculty-staff/committees/.

BK You MUST comply with the CALS Syllabus Policy, including items 1 through 8 and all standard syllabus statements. This document can be viewed at the committee site(https://cals.ufl.edu/faculty-staff/committees/) by clicking on the Curriculum Committee – Information & Documents heading and scrolling down to Forms, Checklists, and Other documents. The other items included here are all very helpful when making a curriculum submission. Some will be mentioned in other checklist items below.

BK Joint course submissions must include both graduate and undergraduate syllabuses and a separate statement outlining the substantial (more than one) differences in assignments between the two courses. These assignments must account for at least a 15% difference in graded material between the two levels. If this is a new course submission both courses must be submitted for approval simultaneously.

BK The course description on the UCC form and in the syllabus must match. Any other information you wish to include needs to be under a different heading such as background or additional information.

BK The course learning objectives must be consistent with Bloom's taxonomy. Please see the following link at the CALS Curriculum site. (https://cals.ufl.edu/content/PDF/Faculty_Staff/cals-course-objectives.pdf). Do not use the words demonstrate or understand when listing learning objectives.

BK The course schedule should be concise and include the appropriate number of weeks in the semester.

BK All graduate course submissions must include a reading list if a textbook is not required. The reading list should include at least some current readings (within the last 5 years). All readings do not need to be current.

BK Outside consultations are required if there is a possibility of the proposed course covering material taught in another department or college on campus. There must be a consult form completed by the chair of the department from who you are seeking the consult. Instructors may provide additional consults. The form can be found at: https://registrar.ufl.edu/pdf/uccconsult.pdf.

BK Prerequisite courses are required for 3000 and 4000 level courses. This line of the approval form cannot be "none" or left blank. Junior or senior standing is an acceptable option. A phrase such as "a course in basic biology" is not acceptable.

BK Decimal points must be included in the grading scale if grade cut-offs are based on percentages. While this is not a university policy it is a CALS standard practice to avoid any confusion when final grades for the course are determined.

BK The attendance and make-up policy in a syllabus cannot contradict the university's policy. Do not include any additional wording to this policy. A statement and link regarding this is included in the CALS Syllabus Statements. For the approval process the college suggests a less is more view when it comes to this policy.

BK The most recent version of the CALS Syllabus Statements boiler plate must be included in all syllabuses. This document is included in the CALS Syllabus Policy and can be copied and pasted to the syllabus. Do not use the boilerplate statements from an old syllabus as they are likely to be out of date.

Certificates

If proposing a new undergraduate or graduate level certificate that includes any courses outside of the submitters department a statement regarding any possible impact on those courses needs to be included. An email from the instructor is acceptable. Also, any courses required for the certificate must have permanent prefixes and course numbers. The submission must include intended catalog copy. (Contact Dr. Joel Brendemuhl (brendj@ufl.edu) for further instruction)