## **Cover Sheet: Request 12362**

## EEL 4XXX Fundamentals of Machine Learning

Info	
Process	Course New Ugrad/Pro
Status	Pending at PV - University Curriculum Committee (UCC)
Submitter	Shannon Chillingworth schill@ece.ufl.edu
Created	2/28/2018 1:54:22 PM
Updated	11/6/2018 2:41:02 PM
Description of	New course request.
request	

## Actions

Step	Status	Group	User	Comment	Updated
Department	Approved	ENG - Electrical and Computer Engineering 011905000	Robert Fox	New course	2/28/2018
EEL4XXX_Fun					2/28/2018
		Consult_CISE.pdf			2/28/2018
College	Approved	Consult_Email.pdf ENG - College of	Heidi Dublin	Approved by the HWCOE	2/28/2018 9/28/2018
		Engineering		Curriculum Committee and at the full faculty meeting on 9/18	9/20/2010
No document c					
University Curriculum Committee	Commented	PV - University Curriculum Committee (UCC)	Lee Morrison	Added to November agenda.	10/23/2018
No document c					
University Curriculum Committee	Pending	PV - University Curriculum Committee (UCC)			10/23/2018
No document c	hanges				
Statewide					
Course					
Numbering					
System					
No document c	hanges				
Office of the					
Registrar					
No document c	nanges				
Student Academic					
Support					
System					
No document c	hanges				
Catalog					
No document c	hanges				
College					
Notified					
No document c	hanges				

## Course|New for request 12362

## Info

Request: EEL 4XXX Fundamentals of Machine Learning Description of request: New course request. Submitter: Shannon Chillingworth schill@ece.ufl.edu Created: 2/28/2018 1:37:22 PM Form version: 1

## 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: EEL

#### **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: 4

#### 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: Advanced

- 1000 and 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 and 4000/6000 levels = Joint undergraduate/graduate (these 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: None

#### Course Title

Enter the title of the course as it should appear in the Academic Catalog.

Response: Fundamentals of Machine Learning

#### **Transcript Title**

Enter the title that will appear in the transcript and the schedule of courses. Note that this must be limited to 21 characters (including spaces and punctuation).

Response: Fund Machine Learning

#### **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: On-Campus

#### **Co-Listing**

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

Response: Yes

#### **Co-Listing Explanation**

Please detail how coursework differs for undergraduate, graduate, and/or professional students. Additionally, please upload a copy of both the undergraduate and graduate syllabus to the request in .pdf format.

Response:

Homework assignments for the graduate level course will include an additional, more challenging question (which will be an optional extra credit opportunity for the undergraduate level course)

#### **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: Earliest Available

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

Response: Earliest Available

#### **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

#### If variable, # min

Response: 0

## If variable, # max

Response: 0

#### 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 50 words or fewer. See course description guidelines.

Response:

Overview of machine intelligence and the role of machine learning in a variety of real-world problems. Probability and statistics to handle uncertain data. Topics covered include: learning models from data in both a supervised and unsupervised fashion, linear models and non-linear models for classification, and linear dimensionality reduction.

#### 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.

Response:

#### EEL 3135 or equivalent & STA 3032 or equivalent

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.

Example: A grade of C in HSC 3502, passing grades in HSC 3057 or HSC 4558, and major/minor in PHHP should be written as follows:

HSC 3502(C) & (HSC 3057 or HSC 4558) & (HP college or (HS or CMS or DSC or HP or RS minor))

#### **Co-requisites**

Indicate all requirements that must be taken concurrently with the course. Co-requisites are not checked by the registration system.

Response: None

#### **Rationale and Placement in Curriculum**

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

Response:

This course builds on concepts learned in statistics and signals & systems that students can apply to machine learning.

#### **Course Objectives**

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

#### Response:

Understand and utilize the concepts of machine learning for data science and electrical engineering. Focus on tools for multivariate data analysis and how to handle uncertain data with probability models. Both static and time varying data fitting and classification problems will be covered. Neural network implementations will also be used in the course.

#### 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. & https://ease provide specific examples& https://ease.

Response: Title: Pattern Recognition Author: S. Theodoridis and K. Koutroumbas Publication date, edition, and publisher: Academic Press: Cambridge, MA, 2009 ISBN number: 9781597492720 Software: Homework and projects will be a mixture of programming and write-ups of your results and analyses. You are free to use any programming language for these assignments (although Matlab and/or Python are recommended). You will need access to a fast personal computer to develop and run your code on real-world datasets that we provide

#### 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:

Course Schedule

- Week 1: Introduction to machine learning problems and methodologies
- Week 2: Review of linear algebra HW1
- Week 3: Linear projections to subspaces (PCA) HW2
- Week 4: Filtering and Least Squares HW3
- Week 5: Searching for the optimum
- Week 6: Review of Probability theory and statistics, Project 1
- Week 7: Maximum likelihood, MAP, Regularization & Bayesian Prior Equivalence
- Week 8: Bayesian hypothesis testing (classification), Exam 1
- Week 9: Quadratic Classifiers
- Week 10: Introduction to Neural Networks HW4
- Week 11: Neural Networks and delta rule HW5
- Week 12: Backpropagation Algorithm HW6
- Week 13: Feature selection and mixture modeling HW7
- Week 14: Clustering with K-means HW8
- Week 15: Clustering
- Week 16: Clustering Validation and Evaluation Project 2

#### **Links and Policies**

Consult the syllabus policy page for a list of required and recommended links to add to the syllabus. Please list the links and any additional policies that will be added to the course syllabus. Please see: syllabus.ufl.edu for more information

#### Response:

Attendance Policy, Class Expectations, and Make-Up Policy Excused absences are consistent with university policies in the undergraduate catalog (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation. Grading Policy:

Grade Grade Points Percent 93.0 - 100 A 4.00 90 .0- 92.9 A-3.67 87 .0- 89.9 B+ 3.33 83 .0- 86.9 B 3.00 80 .0- 82.9 B-2.67 77 .0- 79.9 C+ 2.33 73.0-76.9 C 2.00 70 .0- 72.9 C-1.67 67 .0- 69.9 D+ 1.33 63 .0- 66.9 D 1.00 60 .0- 62.9 D-0.67 0-59.9 E 0.00

A "C-" will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: A "C-" average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement.

More information on UF grading policy may be found at:

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

#### Students Requiring Accommodations

Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, https://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.

#### Course Evaluation

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu/evals. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.

#### University Honesty Policy

UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students 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." The Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

#### Software Use

All faculty, staff and student 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. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

Campus Resources:

Health and Wellness

#### U Matter, We Care:

If you or a friend is in distress, please contact umatter@ufl.edu or 352-392-1575 so that a team member can reach out to the student.

Counseling and Wellness Center: http://www.counseling.ufl.edu/cwc, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

Sexual Assault Recovery Services (SARS) Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

#### Academic Resources

E-learning technical support, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

Library Support, http://cms.uflib.ufl.edu/ask. Various ways to receive assistance with respect to

using the libraries or finding resources.

Teaching Center, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. https://teachingcenter.ufl.edu/.

Writing Studio, 302 Tigert Hall, 846-1138. Help brainstorming, formatting, and writing papers. https://writing.ufl.edu/writing-studio/.

Student Complaints Campus: https://www.dso.ufl.edu/documents/UF\_Complaints\_policy.pdf.

On-Line Students Complaints: http://www.distance.ufl.edu/student-complaint-process.

#### **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.

Response: Evaluation of Grades:

Assignment Total Points Percentage of Final Grade Homework Sets (8)10 (each)

40% Mid-Term Exam 100

20% Projects

Letter grade 40%

Total 100%

#### Instructor(s)

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

Response: Dr. Alina Zare

## **Chillingworth, Shannon M**

From:	Robert M. Fox <fox@ece.ufl.edu></fox@ece.ufl.edu>
Sent:	Wednesday, February 28, 2018 10:41 AM
То:	Chillingworth,Shannon M
Cc:	Fox,Robert M; John G. Harris; Zare, Alina
Subject:	Re: EEL 4XXX- Fundamentals of Machine Learning

CISE approves.

\_\_\_\_\_

Robert Fox Associate Professor & Associate Chair Department of Electrical and Computer Engineering University of Florida PO Box 116130 1064 Center Drive, 537 NEB Gainesville, FL 32611-6130

Tel. (352) 392-2543 FAX (352) 392-8381 Email: <u>fox@ece.ufl.edu</u>

On Feb 28, 2018, at 10:29 AM, Banerjee, Arunava <a href="mailto:arunava@ufl.edu">arunava@ufl.edu</a>> wrote:

Rob:

Anand and I who teach ML are ok with this one.

Thanks

-Arunava

Arunava Banerjee Associate Professor Computer & Information Science & Engineering University of Florida www.cise.ufl.edu/~arunava

From: Rangarajan, Anand
Sent: Wednesday, February 28, 2018 10:14 AM
To: Banerjee, Arunava
Subject: Re: Fw: EEL 4XXX- Fundamentals of Machine Learning

Nope.

On Feb 28, 2018 8:53 AM, "Banerjee, Arunava" <a>arunava@ufl.edu</a>> wrote:

Anand:

Alina is proposing the attached course for a permanent number. Based on the course number request, I surmise it is a undergrad machine learning course. Do we have an objection to this?

-Arunava

Arunava Banerjee Associate Professor Computer & Information Science & Engineering University of Florida

www.cise.ufl.edu/~arunava

From: Robert M. Fox <<u>fox@ece.ufl.edu</u>>
Sent: Tuesday, February 27, 2018 3:48 PM
To: Banerjee,Arunava
Cc: Fox,Robert M
Subject: Fwd: EEL 4XXX- Fundamentals of Machine Learning

Arunava:

One more course for y'all to look over.

Rob

\_\_\_\_\_

Robert Fox Associate Professor & Associate Chair Department of Electrical and Computer Engineering University of Florida PO Box 116130 1064 Center Drive, 537 NEB Gainesville, FL 32611-6130

Tel. (352) 392-2543 FAX (352) 392-8381 Email: <u>fox@ece.ufl.edu</u>

Begin forwarded message:

From: "Chillingworth,Shannon M" <<u>schill@ece.ufl.edu</u>> Subject: EEL 4XXX- Fundamentals of Machine Learning Date: February 27, 2018 at 3:45:38 PM EST To: "Fox,Robert M" <<u>fox@ece.ufl.edu</u>>

# UF FLORIDA

# **UCC: External Consultations**

Department	Name and Title  E-mail		
Phone Number			
Comments			
Department	Name and Title		
Phone Number	E-mail		
Comments			
Department	Name and Title		
Phone Number	E-mail		
Comments			

## Fundamentals of Machine Learning EEL 4XXX Section #XXXX *Class Periods:* TBD *Location:* TBD *Academic Term:* Fall XXXX

## Instructor

- Name: Alina Zare
- Email Address: azare@ufl.edu
- Office Phone Number: 352-273-2604
- Office Hours: TBD, New Engineering Building. (NEB) 453

## **Teaching Assistants**

Please contact through the Canvas website

- TBD
- TBD

## **Course Description**

3 credits. Overview of machine intelligence and the role of machine learning in a variety of real-world problems. Probability and statistics to handle uncertain data. Topics covered include: learning models from data in both a supervised and unsupervised fashion, linear models and non-linear models for classification, and linear dimensionality reduction.

## Course Pre-Requisites / Co-Requisites

EEL 3135 and STA 3032 or equivalent

## *Course Objectives*

Understand and utilize the concepts of machine learning for data science and electrical engineering. Focus on tools for multivariate data analysis and how to handle uncertain data with probability models. Both static and time varying data fitting and classification problems will be covered. Neural network implementations will also be used in the course.

## **Materials and Supply Fees**

N/A

## Professional Component (ABET)

This course consists of 1.5 credits of Engineering Design and 1.5 credits of Engineering Science

## Relation to Program Outcomes (ABET)

**Engineering Criteria** 

- a an ability to apply knowledge of mathematics, science, and engineering
- b an ability to design and conduct experiments, as well as to analyze and interpret data
- k an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

**EE Program Criteria** 

EE1 - knowledge of probability and statistics, including applications

EE2 - knowledge of mathematics, basic and engineering sciences necessary to analyze and design complex systems

EE3 - knowledge of advanced mathematics including linear algebra, complex variables and discrete mathematics

## Required Textbooks and Software

Fundamentals of Machine Learning, EEL 4XXX Alina Zare, TERM YEAR

- Title: Pattern Recognition
- Author: S. Theodoridis and K. Koutroumbas
- Publication date, edition, and publisher: Academic Press: Cambridge, MA, 2009
- ISBN number: 9781597492720
- Software: Homework and projects will be a mixture of programming and write-ups of your results and analyses. You are free to use any programming language for these assignments (although Matlab and/or Python are recommended). You will need access to a fast personal computer to develop and run your code on real-world datasets that we provide.

## **Course Schedule**

- Week 1: Introduction to machine learning problems and methodologies
- Week 2: Review of linear algebra **HW1**
- Week 3: Linear projections to subspaces (PCA) HW2
- Week 4: Filtering and Least Squares HW3
- Week 5: Searching for the optimum
- Week 6: Review of Probability theory and statistics, **Project 1**
- Week 7: Maximum likelihood, MAP, Regularization & Bayesian Prior Equivalence
- Week 8: Bayesian hypothesis testing (classification), **Exam 1**
- Week 9: Quadratic Classifiers
- Week 10: Introduction to Neural Networks **HW4**
- Week 11: Neural Networks and delta rule **HW5**
- Week 12: Backpropagation Algorithm **HW6**
- Week 13: Feature selection and mixture modeling HW7
- Week 14: Clustering with K-means HW8
- Week 15: Clustering
- Week 16: Clustering Validation and Evaluation **Project 2**

## Attendance Policy, Class Expectations, and Make-Up Policy

Excused absences are consistent with university policies the undergraduate catalog in (https://catalog.ufl.edu/ugrad/current/regulations/info/attendance.aspx) and require appropriate documentation.

## **Evaluation of Grades:**

Assignment	<b>Total Points</b>	Percentage of Final Grade
Homework Sets (8)	10 (each)	40%
Mid-Term Exam	100	20%
Projects	Letter grade	40%
	Total	100%

Note: This course is co-listed with the graduate class. Homework assignments for the graduate level course will include an additional, more challenging question (which will be an optional extra credit opportunity for the undergraduate level course)

## Grading Policy:

Percent	Grade	<b>Grade Points</b>
93.0 - 100	А	4.00
90.0-92.9	A-	3.67
87.0-89.9	B+	3.33
83.0-86.9	В	3.00

Fundamentals of Machine Learning, EEL 4XXX Alina Zare, TERM YEAR

B-	2.67
C+	2.33
С	2.00
C-	1.67
D+	1.33
D	1.00
D-	0.67
Е	0.00
	C+ C C- D+ D D-

A "C-" will not be a qualifying grade for critical tracking courses. In order to graduate, students must have an overall GPA and an upper-division GPA of 2.0 or better (C or better). Note: A "C-" average is equivalent to a GPA of 1.67, and therefore, it does not satisfy this graduation requirement.

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Students with disabilities requesting accommodations should first register with the Disability Resource Center (352-392-8565, <u>https://www.dso.ufl.edu/drc</u>) 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.

## **Course Evaluation**

Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at <u>https://evaluations.ufl.edu/evals</u>. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at <u>https://evaluations.ufl.edu/results/</u>.

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UF students are bound by The Honor Pledge which states, "We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students 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." The Honor Code (https://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor or TAs in this class.

## Software Use

All faculty, staff and student 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. We, the members of the University of Florida community, pledge to uphold ourselves and our peers to the highest standards of honesty and integrity.

## Campus Resources:

## Health and Wellness

## U Matter, We Care:

If you or a friend is in distress, please contact <u>umatter@ufl.edu</u> or 352-392-1575 so that a team member can reach out to the student.

**Counseling and Wellness Center:** <u>http://www.counseling.ufl.edu/cwc</u>, and 392-1575; and the University Police Department: 392-1111 or 9-1-1 for emergencies.

**Sexual Assault Recovery Services (SARS)** Student Health Care Center, 392-1161.

University Police Department at 392-1111 (or 9-1-1 for emergencies), or http://www.police.ufl.edu/.

## <u>Academic Resources</u>

**E-learning technical suppor***t*, 352-392-4357 (select option 2) or e-mail to Learning-support@ufl.edu. https://lss.at.ufl.edu/help.shtml.

Career Resource Center, Reitz Union, 392-1601. Career assistance and counseling. https://www.crc.ufl.edu/.

**Library Support**, <u>http://cms.uflib.ufl.edu/ask</u>. Various ways to receive assistance with respect to using the libraries or finding resources.

**Teaching Center**, Broward Hall, 392-2010 or 392-6420. General study skills and tutoring. <u>https://teachingcenter.ufl.edu/</u>.

**Writing Studio, 302 Tigert Hall**, 846-1138. Help brainstorming, formatting, and writing papers. <u>https://writing.ufl.edu/writing-studio/</u>.

Student Complaints Campus: <u>https://www.dso.ufl.edu/documents/UF\_Complaints\_policy.pdf</u>.

**On-Line Students Complaints**: <u>http://www.distance.ufl.edu/student-complaint-process</u>.

## Foundations of Machine Learning Fall 2018

Instructor: Dr. Alina Zare Email: azare@ece.ufl.edu Office: New Engineering Building 453 Office Hours: Tuesday, 11:30am-12:30pm Website: https://faculty.eng.ufl.edu/alina-zare/

Teaching Assistant: Connor McCurley Email: cmccurley@ufl.edu Office Hours: Monday, 3:00-3:50pm in NEB 401

Teaching Assistant: Xiaolei Guo Email: suninth@ufl.edu Office Hours: Thursday, 1:55-2:45pm in NEB 401

Teaching Assistant: Daniel Wells Email: dwells@ufl.edu Office Hours: Wednesday, 12:50-1:40pm in NEB 401

Course Website: Canvas & GitHub Lecture: Tuesdays 10:40-11:35am and Thursdays 10:40-12:20pm, NEB 100

**Course Description:** This course will cover introductory topics in pattern recognition and machine learning. We will review some needed mathematical and statistical concepts throughout the course. The following is an approximate schedule of the course:

- Week 1-3, Aug. 23-Sept. 6: Introduction to Machine Learning Concepts:
  - What is Machine Learning?
  - Regression
  - Overfitting and Regularization
  - Maximum Likelihood and Maximum A-Priori
- Weeks 4-5, Sept. 11 Sept. 18: Non-parametric Clustering and Classification Methods and Evaluation Metrics:
  - K-Means
  - K-Nearest Neighbors
  - Error and Accuracy Metrics
  - ROC Curves
  - Cross Validation
- Weeks 6-7, Sept. 20-Oct. 4: Parametric Clustering and Classification Methods :
  - Gaussian Mixture Models
  - Probabilistic Generative Models
- Weeks 7-8, Oct. 9 Oct. 16: Dimensionality Reduction:
  - Curse of Dimensionality
  - Principal Components Analysis
- Weeks 9-11, Oct. 18 Nov. 1: Linear Discriminants and Artifical Neural Networks:
  - Linear Classifiers
  - Artifical Neural Networks: Neuron, Perceptron Learning Algorithm, Multi-layer Perceptrons, Back-Propogation
- Weeks 11-13, Nov. 6 Nov. 15: Introduction to Deep Learning:

- Autoencoders
- Momentum + ADAM + Other Deep Learning Strategies
- Weeks 13-15, Nov. 20-Dec. 5: Modeling and Optimization Strategies:
  - Genetic and Evolutionary Algorithms
  - Coming up with and defining objective functions

Required Textbook: C. Bishop, "Pattern Recognition and Machine Learning," Springer, 2006. ISBN 0387310738.

**Programming Language:** We will be using Python 3+ in this course for all class assignments that require code implementations.

Prerequisites: Programming ability; Prior exposure to calculus, probability, statistics and linear algebra.

#### **Evaluation and Grading:**

Mid-Term Exam20% of gradeProjects (2 projects)30% of gradeHomework Assignments (approx. 8 assignments)50% of grade (+ assignment with lowest grade will be dropped)

Grading Scale:		
А	$x \ge 93.5$	
A-	$93.5 > x \ge 90.0$	
B+	$90.0 > x \ge 86.7$	
В	$86.7 > x \ge 83.5$	
B-	$83.5 > x \ge 80.0$	
C+	$80.0 > x \ge 76.7$	
С	$76.7 > x \ge 73.5$	
C-	$73.5 > x \ge 70.0$	
$\mathrm{D}+$	$70.0 > x \ge 66.7$	
D	$66.7 > x \ge 63.5$	
D-	$63.5 > x \ge 60.0$	
$\mathbf{E}$	60.0 > x	

Late Homework Assignments will not be accepted. Projects submitted late will lose 1 letter grade per day late.<sup>1</sup> If you feel a graded assignment or exam needs to be re-graded, you must discuss this with the instructor within one week of grades being posted for that assignment/exam. After one week, items will not be considered for re-grading. The class will be graded on a curve.

**Assignment Requirements:** Requirements for all assignments in this class are listed below. For maximum credit, along with correct, substantial answers, I expect high quality professional looking code and documents. Complete your assignments with care and ensure that your submission illustrates that you understand the concepts the assignment is trying to emphasize.

- For all assignments that require submission of code, turn in clean, easy to read, easy to run, and well commented Python 3+ code. Points will be taken off if code cannot be run and/or easily understood. For example, do not use one letter variable names, do not include "magic" numbers/parameters in your code that are unexplained, etc.
- Complete all assignments in the format assigned. For example, if a PDF document is requested and a Word DOC is submitted instead, you will lose points.
- Most assignments will be assigned (and will need to be submitted) via GitHub. Be sure to pay attention and follow any required file naming conventions or file organization requirements for all assignments.

Academic Dishonesty: UF students are bound by The Honor Pledge which states, We, the members of the University of Florida community, pledge to hold ourselves and our peers to the highest standards of honor and integrity by abiding by the Honor Code. On all work submitted for credit by students 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.'

The Honor Code (http://www.dso.ufl.edu/sccr/process/student-conduct-honor-code/) specifies a number of behaviors that are in violation of this code and the possible sanctions. Furthermore, you are obligated to report any condition that facilitates academic misconduct to appropriate personnel. If you have any questions or concerns, please consult with the instructor.

Any student found to have received or given unauthorized aid during on an exam or assignment will be given a grade of 0 for that exam or assignment and the evidence will be sent to the student honor court for the determination of any additional disciplinary action. Unless an assignment

 $<sup>^{1}</sup>$ For example, if you earned a B on your project and you submitted your project 24 hours and 1 minute after the due date, you will receive a D on the project because it is two days late.

is specifically structured as a group project, duplicate assignments written in collaboration with others is not acceptable. Although it is permissible to discuss the homework with others, these discussions should be of a general nature. All work at a detailed level must be done on your own. Students submitting the same or similar solutions to the homework will be considered as having cheated. No statements or actions made by anyone can alter this policy.

Accommodations: 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.

**Online Course Evaluation:** Students are expected to provide feedback on the quality of instruction in this course by completing online evaluations at https://evaluations.ufl.edu. Evaluations are typically open during the last two or three weeks of the semester, but students will be given specific times when they are open. Summary results of these assessments are available to students at https://evaluations.ufl.edu/results/.