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**CS3120: Machine Learning**

Department of Mathematical and Computer Sciences

College of Letters, Arts and Sciences

**Course Syllabus**

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| --- | --- | --- | --- |
| Instructor: | *Dr. Feng Jiang* | Term: | *Spring 2020* |
| Office: | AES 200U | Class Days: | Tuesday/Thursday |
| E-Mail  Office Hours: | fjiang@msudenver.edu  MW 12pm-2pm  Friday by email appointment | Class Time: | 10:00 a.m. – 12:00 p.m. |
| Class Location: | AES210 |
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**Course Overview**

*This course introduces fundamental machine learning and deep learning techniques. Students will gain both theoretical and practical understanding machine learning technologies. Both the classical machine learning algorithms and the recent cutting-edge techniques are introduced. The course focuses on improve the students’ ability of solving real world problem, such as computer vision problems and data processing problems.*

**Learning Assistant**

Jacob Watters Email: jwatter4@msudenver.edu

Office hour: TR 9am-10am (or email appointment) at AES237

Nathanael Whitney Email: nwhitne3@msudenver.edu

Office hour: TBA

**Course Prerequisites**

*MTH 2140 or MTH 3130 or MTH 3140*

*AND*

*MTH 3210*

*AND*

*CS2050*

**Course Credits**

4 credits

**Textbooks and Materials**

1. *Hands-On Machine Learning with Scikit-Learn and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems, 1st Edition, Aurélien Géron*
2. *Raschka, Sebastian, and Vahid Mirjalili. Python machine learning. Packt Publishing Ltd, 2017.*
3. *Rosebrock AD. Deep learning for computer vision with python. New York: Pyimageseach. 2017.*

**Course Schedule**

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| --- | --- | --- |
| Topics |  | *HW & Project*  *HWs are not equally weighted* |
| 1 | Syllabus  Introduction ML  Introduction Python  Introduction Computer Vision |  |
| 2 | Linear Regression, Cost Function  Gradient Descent | *HW1* |
| 3 | Logistic Regression, Cost Function  Classification | *HW2* |
| 4 | Optimization, Regularization |  |
| 5 | Classification (binary and multi-class)  KNN classifier | *HW3* |
| 6 | Classification (PCA LDA SVM)  Dimensionality reduction | *HW4* |
| 7 | Clustering  KMeans | *Midterm Project* |
| 8 | Neural Networks/Deep Learning  Backpropagation |  |
| 9 | Convolutional Neural Networks |  |
| 10 | CNN architectures  Recent CNN methods | *HW5* |
| 11 | Image Classification  Object Detection | *HW6* |
| 12 | Transfer Learning  RNN |  |
| 13 | Recent Deep Learning Techniques  e.g. GAN | *Final Project* |

**IMPORTANT DATES** *(Dates may be subject to change or correction. Please consult Academic Calendar for current listings)*

Mon. Jan 20 Martin Luther King Jr. Day (Campus Open, No Classes)

Tue. Jan 21 Classes begin (Full Semester Classes)

Mon. Jan 27 Self-Add Deadline

(Last day to register for full term classes without department permission.)

Tue. Jan 28 Last day to drop full-term courses with 100% refund

Thu. Feb 6 Census Day

Thu. Feb 6 Last day to drop full-term courses with 50% refund and have classes deleted from your record.

March 21-29 Spring Break (Campus Open, No Classes)

Fri. April 3 Last day to withdraw from full-semester classes and receive a ‘W’

Sat. May 9 Last day of classes

May 11-16 Finals Week

Fri. May 15 Commencement

Fri. May 17 Commencement

Thu. May 21 Grades due from faculty by noon

Fri. May 22 Grades available online in Student Hub

**Assignments**

*Assignments are not equally weighted. Please expect spending at least 6 hours for each assignment. Students are encouraged to help each other in their assignments and projects (Read student honesty part about citation policy.)*

**Course Policies**

Students are responsible for full knowledge of the provisions and regulations pertaining to all aspects of their attendance at MSU Denver, and should familiarize themselves with the policies found in the [MSU Denver Catalog](http://catalog.msudenver.edu/). For more information check “General Course Policies.pdf” from blackboard.

NOTE: If you have any difficulty accessing the hyperlinks in this document, please inform the instructor.

**Attendance**: *Students are expected to attend all lectures, as participation in lecture is important to the student’s success in the course. Students are also expected to arrive to class on time. If a student is to miss two or more lectures, they should inform the instructor ahead of time with an excuse.* **Late Work:** *Homework/assignments must be turned through blackboard before the deadline, else it will be considered late. A 20% late penalty is gained for each day after the deadline. Resubmission is allowed* ***without any late penalty*** *within* ***5 days after the deadline*** *if a draft version was submitted before the deadline.* ***Only the work that had completed at least 80% of the requirement could be considered as a “draft version”.* Exam:** *Project presentation can NOT be rescheduled for any reason. No makeup exam could be given for whoever being absent on the presentation day.***Honesty:** *Plagiarism is strictly prohibited. Any student that is caught cheating or plagiarizing on any assignment, project code etc. will be reported to the academic dean.*

*If you use or generate your work from any existing work (other students’ work, public online resource, published paper etc.), you must CITE the source. If you do not cite, this will be considered plagiarism and you will receive either an F in the course and your actions will be reported to college officials.*

*Adding reference to your work report.*

*Adding footnote to your work report.*

*Discussion about your design is necessary for each project.*

**Basis for Final Grade**

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| --- | --- |
| **Assessment** | **% of Final Grade** |
| Homework | About 45 % |
| Projects  (in/out class) Practice | About 45 % (1 midterm + 1 final)  10% |

*Letter Grade Scale*

|  |  |
| --- | --- |
| **Final Grade** | **Letter Grade** |
| 90-100 | A |
| 80-89 | B |
| 65-79 | C |
| 47-64 | D |
| < 47 | F |

**Other Information:**

*The key to doing well in the course is consistent hard work. Plan on at least 6-10 hours of work outside of class to solve homework problems and study the course material. The material builds from fundamental concepts to more advanced programming techniques. It is critical that students master the fundamentals in order to do well throughout the semester. Lecture topics will follow the schedule given above.* ***Students are expected to complete reading assignments prior to lecture.*** *Students are responsible for all material covered in the assigned readings, which may not be covered during lectures. Students are responsible for all class business conducted during any scheduled class period. Any revision of homework assignments or exam dates will be announced during class.* ***Student missed classes could not make up any practice assigned in class.******Students are expected to be familiar with computers.*** *Students may download and install free versions of software.* ***Students are expected to be able to debug their own program.*** *Most students find it convenient to carry a laptop to school with them.*