

BSAN405-001

Machine Learning in Business

Spring 2025 | Wham 0307 | MW 11:00AM - 12:15PM



Instructor	Office Hours
Sharif Islam, DBA, CPA, CMA Assistant Professor, School of Accountancy Office: Rehn Hall 216A Office Phone: (618) 453 1401 E-mail: mdshariful.islam@siu.edu	Mon 09:00AM - 11:00AM Wed 09:00AM - 11:00AM Fri 10:00AM - 12:00PM Or by appointment

Course Description

Catalog Description: Machine learning and its application to business data and business problems. Where AI and expert systems improve human decision making, machine learning is able to progressively improve its performance in detecting patterns in data and applying solutions with minimal human intervention in a rapidly changing environment. Tools, techniques, and processes for developing machine learning systems.

Detailed Description: This course is an introduction to Machine Learning (ML). It is a branch of Artificial Intelligence (AI) that can help deal with unstructured data. In this course, you will learn the various machine learning techniques, when to use which for what, and you will be able to understand what Machine Learning can and cannot do and what it will be able to do in the very near future.

Course Prerequisites

A grade of C or better in BSAN 404. Restrictions might apply for business analytics majors, minors, junior standing.

Course Objectives

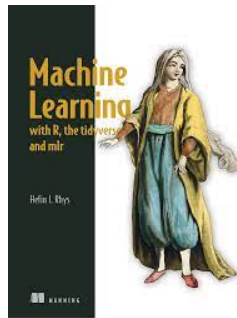
On the completion of the course, the students are expected to -

- Understand the fundamental issues and challenges of Machine Learning (ML) - data, model selection, model complexity and so on.
- Learn the algorithms underpinning Machine Learning techniques and develop knowledge on the theoretical relationships between these algorithms.
- Understand the strength and weakness of popular ML approaches and techniques.
- Be able to design and implement various ML algorithms in real world problems.

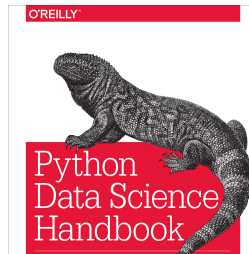
Course Materials (Not Required)

- Textbook

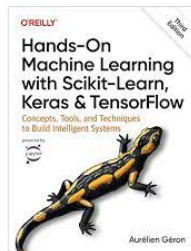
Machine Learning with R, the tidyverse, and mlr by Hefin I. Rhys. The book is available on [Manning Publications website](#). The hard copy of the book is not required. Online copy is fine.



Python Data Science Handbook: Essential Tools for Working with Data by Jake VanderPlas. The book is available on [Github](#). The hard copy of the book is not required. Online copy is fine. This is the first edition of the book. The second edition of the book is also available. If you are interested, you can buy one from [Amazon](#).

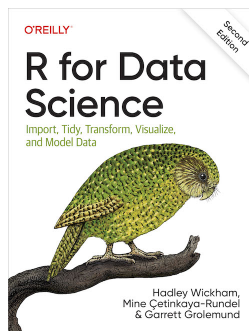


Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow by Aurélien Géron. The book is available on [Amazon](#). The hard copy of the book is not required. A pdf copy of the book is available from me on request.

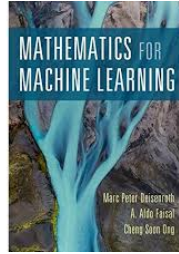


- **Supplemental Reading**

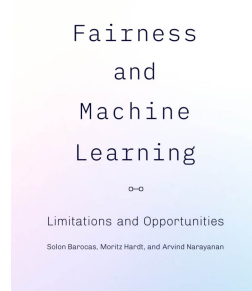
1. **R for Data Science** by Hadley Wickham and Garrett Grolemund is an excellent book to learn about the basics of R. The [online version](#) of 2nd Edition of the book is available free.



2. To learn about the mathematics underlying many Machine Learning (ML) algorithms, **Mathematics for Machine Learning** by Marc Deisenroth, A Aldo Faisal, and Cheng Ong can be used -



3. To learn about the Ethics in Machine Learning, **Fairness and Machine Learning** by Solon Barocas, Mortiz Hardt, and Arvind Narayanan can be used.



The book is not needed to be purchased. An [online version](#) of the book is available.

Machine Learning Data Source

Two good sources for Machine Learning data are -

- University of California Machine Learning Repository (<https://archive.ics.uci.edu/ml/index.php>)
- Kaggle (<https://www.kaggle.com/>)

My Mission

My goal is to create a learning environment where you can learn the concepts, apply the material, and understand how Machine Learning (ML) works. I am **very much interested in your success and am available to help you** navigate the course during class and during office hours. However, data science (including Machine Learning) is learned through **preparation** and **practice**, so you **must be willing to invest time** into learning the course material by (1) completing the reading assignments and homework as assigned, (2) attending and participating in class, and (3) recognizing when you need additional assistance and/or explanation.

Open Door Policy

Since **your learning is the primary concern of mine**, it is important that anything barring you from learning be discussed. Please feel free to make an appointment with me or call me so that I can help you keep on track.

Contacting Your Instructor

I am available during office hours, through D2L messaging, via e-mail (mdshariful.islam@siu.edu), and via phone (618-453-1401) [**E-mail is the best option**]. It is my goal to respond to messages within 24 hours; however, please allow 48 hours on weekends and during breaks.

Statement of Ethics and Scholastic Dishonesty

One of the most important concerns in Machine Learning is **ethics**. By focusing on Machine Learning Ethics, and thinking about the effect of ML professionals work, one will ultimately end up building robust and better systems. This

ethical concern reaches into the academic arena where the profession's future leaders are being prepared. Therefore, academic dishonesty **will not** be tolerated in the course and **any** instance will be reported following University policy. Academic dishonesty includes, but is not limited to copying, sharing, or obtaining information from any unauthorized source during homework, examinations, or quizzes. It also includes copying from or unauthorized sharing of homework assignments, uploading **any** course materials to unauthorized websites, attempting to take credit for the intellectual creation of another person, or falsifying information. Unless notified otherwise, all assignments, exams, and activities should be completed without the unauthorized assistance of others and/or without assisting others. **Any student involved in academic dishonesty will receive a zero for the respective assignment or exam. Recurring issues may result in failure of and dismissal from the course.**

Classroom Etiquette

It is expected that you will be attentive to the class discussion. In addition, one should be aware of that one's activities do not hamper the understanding/participation/discussion of other students.

Desire to Learn (D2L)

The syllabus, assignment sheet and other class information will be available on D2L. Test grades, quiz grades, project grades and final grades will be posted on D2L/Connect.

Grading System

Grading Scale: Grades based on total points using 10-point scale.

(90%=A, 80%=B, 70%=C, 60%=D, Below 60%=F)

As both a licensed Certified Public Accountant and a Southern Illinois University Carbondale instructor, I have a responsibility to uphold the standards of the data science profession and the University, and therefore I have high expectations regarding matters of ethics, integrity, and objectivity - including the integrity of the grading process. Part of ensuring the integrity of the grading process is ensuring all students receive the same treatment with regard to grades. Please consider that a request to change a grade based on anything other than an error is, in effect, a request both to subvert the integrity of the grading process and to violate my professional responsibilities.

Grade Components

Components	Points
Reading Materials (5 points*10)	50
Homework (10 points*10)	100
Quiz (15 Points*10)	150
Projects (20 Points*10)	200
Exam 1 (Chapters 1,2,3)	150
Exam 2 (Chapters 4,5,6)	150
Final Exam (Comprehensive - including chapters 09,10,13,16)	200
Total Points	1000

Readings (50 Points - 5%)

Reading materials discussing different emerging issues of Machine Learning (ML) will include practice materials published in Harvard Business Review mainly. Other published materials will also be discussed. Students are required to read the assigned materials and prepare Power Point slide and upload on D2L.

Homework (100 Points - 10%)

For each chapter, homework will be assigned on D2L. Homework questions will be Multiple Choice Questions (MCQ). Homework questions will cover basic and necessary components of each chapter.

Quiz (150 Points - 15%)

For each chapter, quiz will be assigned on D2L. Quiz questions will be Multiple Choice Questions (MCQ). Quiz questions will cover basic and necessary components of each chapter.

Projects (200 Points - 20%)

Each project will be related to different chapters. For some chapters, no projects might be involved. Detailed discussion about each project will be discussed in class.

Exams (500 Points - 50%)

The course includes three exams. Although the class schedule is tentative and subject to change, **exam dates will not change** unless the University is unexpectedly closed on the scheduled exam date. Conflicts with dates should be discussed as soon as possible. *The opportunity for make-up exams is extremely limited.*

Additional Opportunities

Additional opportunities for bonus points **may** be presented throughout the semester. Such opportunities will be announced in class or on D2L.

Make-up Policy

No makeup exams will be given without prior permission from me. Absolutely no makeup will be given for missed quizzes, projects, or in-class work.

Written Communications

At least 10% of your grade will be determined from written communication. The purpose of this requirement is to test your understanding of key concepts and to improve written communication skills.

Emergency Closure of University

In the unlikely occurrence of a major natural disaster or other catastrophic event, we will continue to conduct class via D2L. Go to the website: <http://www.mycourses.siu.edu> for instructions should a catastrophic event occur. You will need to find a location where you have computer access, and we will continue with our class through additional online lectures and assignments in Connect.

Emergency Notification Systems (ENS)

All Southern Illinois University Carbondale (SIUC) students are strongly encouraged to enroll and update their contact information in the Emergency Notification System. It takes just a few seconds to ensure you are able to receive important text and voice alerts in the event of a campus emergency. For more information on the Emergency Notification System, visit <https://siu.edu/emergency/>.

Non-Discrimination Policy

Southern Illinois University Carbondale (SIUC) is committed to the principle of providing the opportunity for learning and development of all qualified citizens without regard to race, color, gender, age, religion, national origin, citizenship, disability, sexual orientation, or veteran status for admission to, participation in, or employment in the programs and activities which the University sponsors or operates. Persons with concerns may contact the Southern Illinois University Carbondale Title IX Coordinator -

Nicholas K. Wortman

Title IX Coordinator

478 Woody Hall, Mail Code 4316

Southern Illinois University Carbondale

Carbondale, Illinois 62901
618/453-4807 or 618/453-1395 (fax)

Special Accommodations

Students needing testing or classroom accommodations based on a disability are encouraged to discuss those needs with me as soon as possible. Some aspects of this course, the assignments, the in-class activities, and the way the course is usually taught may be modified to facilitate your participation and progress. As soon as you make me aware of your needs, we can work with the Disability Support Services (DSS) to help us determine appropriate academic accommodations. For more information about eligibility for accommodations, contact the Office of Disability Support Services (DSS) at [618-453-5738](tel:618-453-5738) or email at disabilityservices@siu.edu.

****PLEASE NOTE THAT THE INSTRUCTOR HAS RIGHT TO CHANGE THE SYLLABUS AND COURSE SCHEDULE****

GOOD LUCK!

BSAN 405-001
MACHINE LEARNING IN BUSINESS
Spring 2025
CLASS SCHEDULE

Date	Day	Week	Topic	Readings/Projects
01/13/2025	Monday	1	Introduction; Discussion on Course; Course Grading and Schedule	No Assignment
01/15/2025	Wednesday	1	Chapter - 1 What Machine Learning (ML) is; Artificial Intelligence vs Machine Learning, Model vs Algorithm; Classes of ML algorithm.	Readings
01/20/2025	Monday	2	NO CLASS - MLK Jr.'s Birthday	No Assignment
01/22/2025	Wednesday	2	Chapter - 1 Classes of ML algorithm; Artificial Intelligence, Machine Learning and Deep Learning; Ethics in ML; Why use R/Python Programming Language for ML.	Readings
01/27/2025	Monday	3	Chapter - 2 Installing R, RStudio, VS Code, Jupyter Notebook, and Positron; installing and loading packages tidyverse and sklearn; data frame vs tibble; dplyr/pandas package	Readings
01/29/2025	Wednesday	3	Chapter - 2 ggplot2/matplotlib/seaborn package; tidy package; purrr package for looping	Readings
02/03/2025	Monday	4	Chapter - 2 Using tidyverse package in different problems	Readings
02/05/2025	Wednesday	4	Chapter - 3 What is KNN Algorithm; How does KNN learn? Building KNN algorithm	Readings
02/10/2025	Monday	5	Chapter - 3 Bias-Variance trade-off; Cross validation; Parameters vs hyper-parameters	Readings
02/12/2025	Wednesday	5	Chapter - 3 Using sklearn package for KNN Algorithm	
02/17/2025	Monday	6	Review of Exam # 01	
02/19/2025	Wednesday	6	EXAM # 01 (Chapters 1, 2, 3)	Using Jupyter Notebook
02/24/2025	Monday	7	Chapter - 4 What is Logistic Regression; How does logistic regression learn? Building the logistic model	Readings
02/26/2025	Wednesday	7	Chapter - 4 Feature engineering and feature selection; dealing with missing data; interpreting the model; using model to make predictions; strengths and weakness of logistic regression	Readings
03/03/2025	Monday	8	Chapter - 4 Using sklearn package for Logistics Algorithm	Readings

Date	Day	Week	Topic	Readings/Projects
03/05/2025	Wednesday	8	Chapter - 5 When Discriminant Analysis (DA) is used? The curse of Dimensionality; Linear Discriminant Analysis (LDA)	Readings
03/10/2025 - 03/14/2025	Full Week	9	NO CLASS - Spring Break	Readings
03/17/2025	Monday	10	Chapter - 5 Quadratic Discriminant Analysis (QDA); How do LDA and QDA make predictions; strengths and weakness of LDA and QDA	Readings
03/19/2025	Wednesday	10	Using sklearn package for Discriminant Analysis Algorithm	Readings
03/24/2025	Monday	11	Chapter - 6 Support Vector Machine (SVM); When classes are not fully separable; SVM for non-linearly separable data; Hyper-parameter for SVM; More than two class cases; strength and weakness of SVM	Readings
03/26/2025	Wednesday	11	Review of Exam # 02	
03/31/2025	Monday	12	EXAM # 02 (Chapters 4, 5, 6)	Using Jupyter Notebook
04/02/2025	Wednesday	12	Chapter - 7 What is Linear Regression? multiple predictors; categorical predictor; building linear regression model; automating feature selection	Readings
04/07/2025	Monday	13	Chapter - 7 Interpreting model; strengths and weakness of linear regression	Readings
04/09/2025	Wednesday	13	Chapter - 7 Using sklearn package for Linear Regression Algorithm	Readings
04/14/2025	Monday	14	Chapter - 08 Decision Tree Analysis; How does decision work; Entropy (Information Gain); Gini Index (gini gain); strength and weakness of Decision Tree	Readings
04/16/2025	Wednesday	14	Chapter - 08 Using sklearn package to develop decision tree for classification and Regression; Evaluating the model of decision tree	Readings
04/21/2025	Monday	15	Chapter - 09 Why is Dimension Reduction necessary? Curse of dimensionality; What is Principal Component Analysis (PCA)? Building PCA model	Readings
04/23/2025	Wednesday	15	Chapter - 09 Using sklearn package for Principal Component Analysis (PCA) Algorithm	Readings
04/28/2025	Monday	16	Chapter - 10 Need for Clustering. What is K-means clustering? Building K-means model; strength and weakness of K-means algorithm; Using sklearn package for K-means Algorithm.	Readings
04/30/2025	Wednesday	16	Review of Exam # 03	Readings
05/07/2025	Wednesday	17	FINAL EXAM (Chapters 09, 10, 13, 16)	Using Jupyter Notebook

GOOD LUCK!