Instructor: Josh Introne
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Office Hours: By appointment

Prerequisite: IST 387/687. Exceptions maybe given to students who have acquired skills equivalent to what is taught in IST 387/687

Audience: Undergraduate (407) & Graduate Students (707)

Description: Introduction to data analytics techniques, familiarity with particular real-world applications, challenges involved in these applications, and future directions of the field. Hands-on experience with open-source software packages.

Additional Course Description:
This course will introduce popular data analytics methods for extracting knowledge from data. The principles and theories of data analytics methods will be discussed and will be related to the issues in applying data analytics to problems. Students will also acquire hands-on experience using state-of-the-art software to develop data analytics solutions to scientific and business problems. The focus of this course is in understanding of data and how to formulate data analytics tasks in order to solve problems using the data.

The topics of the course will include the key tasks of data analytics, including data preparation, concept description, association rule analytics, classification, clustering, evaluation and analysis. Through the exploration of the concepts and techniques of data analytics and practical exercises, students will develop skills that can be applied to business, science or other organizational problems.

The format of the class meetings will be a combined lecture and lab format, with lectures and class discussions to cover material and lab time to investigate small examples for the topic of the week. There will be weekly readings based on the textbook and on other materials, which will be posted on-line.

Credits: 3

Learning Objectives:
After taking this course, the students will be able to:

- Document, analyze, and translate data analytics needs into technical designs and solutions.
- Apply data analytics concepts, algorithms, and evaluation methods to real-world problems.
- Employ data storytelling and dive into the data, find useful patterns, and articulate what patterns have been found, how they are found, and why they are valuable and trustworthy.

Bibliography/ Texts / Supplies – Optional:

- Pang-Ning Tan, Michael Steinbach, and Vipin Kumar (2005) Introduction to Data Analytics. (Free sample chapters available at authors' website http://www-users.cs.umn.edu/~kumar/dmbook/index.php)

- Brett Lantz (2015) Machine Learning with R (second edition).

Note to students: Given the diversified background of data science students, one textbook might not fit everyone. If you like rigorous algorithm presentation, I would recommend Mitchell's classic book on Machine Learning. If you like more lay-person explanation of machine learning, see if you like Lantz's book better.
The current required textbook is a balance between the two views. I will put a copy of this book to the Bird Library reserve room. You can check it out and read for up to two hours every time.

Tips for success in this class: Curiosity, critical thinking, math, and programming.

- Curiosity: Curious about the data, pay attention to the data details. Don't treat a data set as a blackbox. Don't treat an algorithm as a blackbox. Try see through them.
- Critical thinking: Data analytics is essentially research. You will learn and practice methods to discover patterns, and also evaluate whether and why the discovered patterns are true and useful.
- Math: You will need some math knowledge, such as algebra and probability, to understand how the data analytics algorithms work.

Software

- R and Weka

Note to students: We will mainly use R but keep Weka as a backup tool for students who do not have enough R skills.

Typical Course Schedule:

Week	Topic	Textbook Readings	Submission items
1	Introduction to Data Analytics	Ch.1	HW1
2	Data Exploration	Ch. 2-3	HW2
3	Association Rules	Ch. 6.1-6.3	HW3
4	Clustering	Ch. 8.1-8.3	HW4
5	Classification: decision tree	Ch. 4.1-4.3	HW5
6	Classification: model evaluation	Ch. 4.4-4.6	
7	Classification: naïve Bayes	Ch. 5.3	HW6
8	Classification algorithm: kNN, SVMs, random forest	Ch. 5.2, 5.5	HW7
9	Artificial Neural Networks		HW8
10	Text Mining and NLP		HW9
11	Individual Portfolio Working Session		
12	Individual Portfolio Presentation		Portfolio Report Due
13	Group Project: Working Session		
14	Group Project: Final Presentation		
	Two days after the presentation		Group Project Report Due

Requirements:

Your final grade is determined by your performance on the items in the table below. An overview of each item is provided in the remainder of this section.

Assessment Item	Weight %
Individual Portfolio	30
Homework assignments	50
Group Project	20
Total	100

- **Individual Project Portfolio:** The objective of the Individual Portfolio to research the concepts introduced in class each week, and to report on how they apply in the real world.
- **Homework assignments:** Assignments must be professionally prepared and submitted electronically to the LMS. All assignments should be submitted in Word files named as "*HW_Num_Lastname_Firstname.doc(x)*", e.g. "HW_1_Smith_John.doc". No PDF please.
- **Group Project:** The objective of the project is to work as a team to apply concepts taught in this class to solve a data analytics problem.

Grading:

For this class, an "A" would mean the student has the capability to independently solve a simple data analytics task. Below is a common formula for number-to-letter grade conversion.

Grade	Points	Grade	Points	Grade	Points	Grade	Points
		B+	87-89	C+	77-79	F	0-69
A	93-100	B	83-86	C	73-76		
A-	90-92	B-	80-82	C-	70-72		

Grades of D and D- may not be assigned to graduate students.

Course Specific Policies on attendance, late work, make up work, examinations if outside normal class time, etc.:

- **Registration**: Students must register prior to the first class or may be restricted from registering. If you are registered but not present at the first class, you run the risk of being administratively deregistered from this course so that your seat can be given to a student on the wait list.
- **Late Policy for Assignments**: To ensure fast return, all assignments should be submitted on time. One-hour grace period is given to accommodate any incidents around deadline. Late policy will be enforced starting from the second hour. You are free to discuss the assignments with your classmates, but you must write up the report all by yourself. Plagiarism cases will be reported to the university.
- **Communications:** This course will use Blackboard as the main communication platforms for class exercises and notifications. Students are required to check their Blackboard accounts on a regular basis.

Educational Use of Student Work

I intend to use academic work that you complete this semester in subsequent semesters for educational purposes. Before using your work for that purpose, I will either get your written permission or render the work anonymous by removing all personal identification.

University Attendance Policy

Attendance in classes is expected in all courses at Syracuse University. Students are expected to arrive on campus in time to attend the first meeting of all classes for which they are registered. Students who do not attend classes starting with the first scheduled meeting may be academically withdrawn as not making progress toward degree by failure to attend. Instructors set course-specific policies for absences from scheduled class meetings in their syllabi.

It is a federal requirement that students who do not attend or cease to attend a class to be reported at the time of determination by the faculty. Faculty should use "ESPR" and "MSPR" in Orange Success to alert the Office of the Registrar and the Office of Financial Aid. A grade of NA is posted to any student for whom the Never Attended flag is raised in Orange SUccess. More information regarding Orange SUccess can be found here, at: http://orangesuccess.syr.edu/getting-started-2/ Students should also review the University's religious observance policy and make the required arrangements at the beginning of each semester

Syracuse University Policies:

Syracuse University has a variety of other policies designed to guarantee that students live and study in a community respectful of their needs and those of fellow students. Some of the most important of these concerns:

Diversity and Disability (ensuring that students are aware of their rights and responsibilities in a diverse, inclusive, accessible, bias-free campus community) can be found here, at https://www.syracuse.edu/life/accessibilitydiversity/

Religious Observances Notification and Policy (steps to follow to request accommodations for the observance of religious holidays) can be found here, at: http://supolicies.syr.edu/studs/religious_observance.htm

Orange SUccess (tools to access a variety of SU resources, including ways to communicate with advisors and faculty members) can be found here, at: http://orangesuccess.syr.edu/getting-started-2/

Disability-Related Accommodations:

Syracuse University values diversity and inclusion; we are committed to a climate of mutual respect and full participation. There may be aspects of the instruction or design of this course that result in barriers to your inclusion and full participation in this course. I invite any student to meet with me to discuss strategies and/or accommodations (academic adjustments) that may be essential to your success and to collaborate with the Office of Disability Services (ODS) in this process.

If you would like to discuss disability-accommodations or register with ODS, please visit their website at http://disabilityservices.syr.edu./ Please call (315) 443-4498 or email disabilityservices@syr.edu for more detailed information.

ODS is responsible for coordinating disability-related academic accommodations and will work with the student to develop an access plan. Since academic accommodations may require early planning and generally are not provided retroactively, please contact ODS as soon as possible to begin this process.

Academic Integrity Policy:
Syracuse University's Academic Integrity Policy reflects the high value that we, as a university community, place on honesty in academic work. The policy defines our expectations for academic honesty and holds students accountable for the integrity of all work they submit. Students should understand that it is their responsibility to learn about course-specific expectations, as well as about university-wide academic integrity expectations. The policy governs appropriate citation and use of sources, the integrity of work submitted in exams and assignments, and the veracity of signatures on attendance sheets and other verification of participation in class activities. The policy also prohibits students from submitting the same work in more than one class without receiving written authorization in advance from both instructors. Under the policy, students found in violation are subject to grade sanctions determined by the course instructor and non-grade sanctions determined by the School or College where the course is offered as described in the Violation and Sanction Classification Rubric. SU students are required to read an online summary of the University's academic integrity expectations and provide an electronic signature agreeing to abide by them twice a year during pre-term check-in on MySlice.

Course evaluations:

There will be an end of course evaluation for you to complete this term. This evaluation will be conducted online and is entirely anonymous. You will receive an official notice in your email account with the evaluation website link and your passcode. Please take the time and fill out this evaluation as your feedback and support of this assessment effort is very much appreciated. The school carefully reviews ratings and comments that you submit, and these factor into decisions about course, program and instructor development.

Use of Blackboard:
This course involves the use of Syracuse University's Blackboard system as an online tool. The environment is composed of a number of elements that will help you be successful in both your current coursework and your lifelong learning opportunities. To access Blackboard, [http://blackboard.syr.edu] use your Syracuse University NetID & Password. This specific course will appear in your course list.

To search for answers to your Blackboard questions, visit the Answers self-help knowledge [https://answers.syr.edu/display/blackboard01/Blackboard]. If you have problems logging in or need assistance with Blackboard, contact the ITS Service Center at: help@syr.edu or 315.443.2677. The Syracuse University Blackboard support team will assist you.