ISA 632 – Big Data Analytics and Modern AI (Spring 2021)

Class Information

Prerequisite:	ISA514
Meeting Times:	Section A&B: TR 2:50pm - 4:10pm, FSB 2037 & Zoom

Instructor

Name:	Dr. Zhe (Jay) Shan
Office:	3035 FSB
E-Mail:	jayshan@miamioh.edu
Office Hours:	TR 10am-11am, F 10am-12pm, and by appointment.

Textbook

No textbook is required for this course. All the materials (slides, source code, readings) will be provided by the instructor.

Course Overview

This course will further develop students' big data and AI skills for advanced data analytics tasks. We will introduce advanced operations and functions in in-memory cluster computing and non-relational storage solutions. Moreover, we will examine advanced analytics functions enabled by in-memory cluster computing, such as advanced text mining, real-time analytics on streaming data, and large-scale social network analysis. Following that, we will cover data-driven modern AI technologies, such as NLP and dialog generation, image processing and video analytics. Those topics will be taught in an applied way, without focusing too much on the theory.

Learning Objectives

Upon successful completion of the course, Students will gain the ability to initiate and design highly scalable systems that can accept, store, and analyze large volumes of unstructured data in batch mode and/or real time. Moreover, they will know how to apply modern AI technology to improve business process and generate new innovation. In particular, students will be able to:

Managerial Knowledge
- Describe the need of big data analytics and AI in modern enterprises
- Reengineer existing business processes with modern AI technologies
- Develop big data strategy to drive smart decision making and business innovation.

Scalable Data Analytics
- Describe the key challenges of massive data processing
- Describe parallel processing mechanisms
- Understand advanced analytics functions in in-memory cluster computing
- Develop integral solutions solving challenging analytics problems.

Artificial Intelligence
- Understand the key differences between modern and classic AI.
- Know the core technologies behind cognitive computing
- Describe major business applications of modern AI

- Develop integral solutions using cloud-based services

Cloud Computing
- Understand the pros and cons of using cloud-based services.
- Configure basic services on a cloud platform.

Homework Assignments, Exam, and Group Project
The course involves individual assignments, an exam, and a group project. You will demonstrate your mastery of the material by applying what you learn – not only in-class through exercises and exams, but also by doing assignments and the project. Some assignments and some portions of the project will be well specified; others will be purposely vague. One objective of these assignments is for you to learn how to approach big data applications in real-life situations.

Note that this course covers highly technical material. Typically, you will not understand the material without reading – and rereading – it carefully. I expect you to devote on average about 4 to 8 hours per week outside of class to this course, including reading, studying, and working on homework assignments and the course project.

The liberal education objectives of the course are accomplished through the use of class discussions, written exam questions, and a group project. The exams, class discussions, and especially the group project aid in the development of critical thinking skills. Lectures are designed to link topics in such a way that students understand the context for each issue in the course. Presentations, the group project, and in-class discussions are opportunities for students to engage with other learners. Time for reflecting and acting comes through assignments, exams, and in-class discussions/exercises. The liberal education objectives of this class can only be met if you attend each class and are prepared to ask and answer questions and discuss the day's material.

Grading Policy
Assignment and exam grades are final one week after their return, i.e., you need to see me during office hours within seven days in case you have any questions about your grade. Your work will be evaluated based on the following grading scheme:
- Assignments   30%
- Midterm exam   30%
- Group project   35%
- Class participation   5%

Final letter grades will be assigned using the following scale:

GRADE	Scores	GRADE	Scores	GRADE	Scores	GRADE	Scores
A+ (4.0)	[97, 100]	B+ (3.3)	[87, 90)	C+ (2.3)	[77, 80)	D+ (1.3)	[67, 70]
A (4.0)	[94, 97)	B (3.0)	[84, 87)	C (2.0)	[74, 77)	D (1.0)	[64. 67)
A- (3.7)	[90, 94)	B- (2.7)	[80, 84)	C- (1.7)	[70, 74)	D- (0.7)	[60, 64)

Assignments: There will be 4-5 graded assignments given during the semester. The graded assignments are take-home assignments, normally short research or problem-based tasks. Meeting deadlines for assignments is crucial**. Assignments are individual tasks. Any work assigned to be done individually which is found to be done in a team fashion will be reported as a case of academic dishonesty.** All work should be completed and delivered in a business professional manner. Grade deductions might occur due to poorly delivered assignments.

Group Project: Your team of at most 4 members will design and implement an artificial intelligence solution to solve a challenging business problem. This project will begin in the second half of the course and continue until the end of the semester. The final deliverable will be a single report documenting and describing the work performed throughout the semester as well as an in-class presentation of your work. You are expected to be a responsible team member and contribute meaningfully to the project. **A peer evaluation will be conducted to make sure each group member can contribute fairly and equally to the team project.** Students are expected to meet the writing standards commonly used in business and academia, *e.g.*, proper organization and use of titles, correct spelling, subject/verb agreement, complete sentences, *etc.* The Howe Writing Initiative provides great support in case one needs to improve her/his writing skills. Grade deductions might occur due to poorly delivered reports.

Exams: There will be one midterm exam given during the semester. The midterm exam will cover all class materials and readings for the period immediately prior to that exam. **Makeup exams will only be available to students with legitimate reasons.** A physician's certificate or some other official documentation is required.

Attendance

No student, faculty, staff member who is ill or has been in close contact with an individual who has tested positive for COVID-19 should attend class or come to campus. Instructors will, without prejudice, provide students with reasonable opportunities for completing missed work. However, students are ultimately responsible for material covered in class, regardless of whether the student is absent or present. If your absence is of significant duration or severity, as your instructor, I will advise you about other options that might be available including assigning an incomplete grade or requesting a medical withdrawal.

Facial Coverings

Facial coverings are required during all class meetings to promote the health and safety of all university members. There may be university approved exceptions to this requirement. Students who cannot wear a facial covering due to medical or disability-related reasons should contact the Miller Center for Student Disability Services at sds@miamioh.edu or Regional Student Disability Services at regionalsds@miamioh.edu.

If a student comes to class without a face covering or refuses to maintain physical distancing, I will first ask the student to comply (e.g. put on a face covering). If the student refuses, I will ask the student to leave the classroom and inform the student that the class will not proceed until the student either complies or leaves. If the student continues to refuse, I will dismiss the class and

immediately report the student to the Office of Community Standards.

Physical Distancing

All employees, students and visitors are expected to maintain physical distancing of at least six feet in all directions. The classroom has been set up to support this distancing and should be maintained. As you enter and leave the room, please be patient and give others the space they need to move safely.

Communication:

Email is the best way to communicate with me. I intend to reply your emails within 24 hours (48 hours in weekend). Therefore, I expect the same courtesy from you. Email will be a very important mode of communication in this class as we meet only once/twice a week. **Please start your subject line of your emails with 'ISA632'.**

Also make sure to check Canvas on a regular basis for updates or additional course material. **Please keep your email information on Canvas up to date. Whenever possible, I will announce changes to the course via the Canvas announcement function.**

Class Conduct:

IMPORTANT !

The use of any mobile device, such as laptop, smart phones, etc., during a lecture session is not permitted unless the instructor has approved its use. Please silence your devices and put them in your bag or jacket. Please be professional!

One of our goals in Farmer School of Business is to prepare you for a professional career and we wish to instill good habits through insisting on a high level of conduct in all your classes. The following behaviors are unacceptable in this class:

1. Not on time
2. Failing to notify the professor by email when you are absent from class.
3. Excessive tardiness/absences.
4. Leaving while class is in session for reasons other than an emergency.
5. Working on non-course related assignments.
6. Falling asleep or resting head on desk.
7. Wearing headphones while class is in session.
8. Web surfing in class
9. Other types of disrespectful behaviors.
10. **No food or drinks will be allowed in the computer lab**. Food should be kept in backpacks.
11. You should pick up any papers and trash before leaving the lab - be a good citizen.

Copyright and Fair Use:
Most sessions, if not all, in this course will be recorded or live-streamed. Such recordings/streaming will only be available to students registered for this class. The faculty member will provide you

notice if any of these recordings/streaming will be shared with anyone outside of this course, and will obtain your prior written consent before sharing. These recordings are the intellectual property of the faculty member and Miami University and may not be shared or reproduced without the explicit, written consent of the faculty member and Miami University. Further, students may not share these sessions with those not in the class, or upload them to any other online environment. Doing so would be a breach of the Code of Student Conduct.

Academic Integrity:

IMPORTANT !

I personally take academic integrity <u>very</u> seriously, and if there are any violations, the consequences will be unfortunate. Please don't take this issue lightly because plagiarism in any form will not be tolerated.

All individual assignments should be your work. You may consult with each other to understand the requirements of an assignment or for trouble-shooting. However, you must do individual assignments **on your own**! Any individual work found to be done in a team fashion will be reported as an act of academic dishonesty. You are required to observe the rules of academic integrity promulgated by the university, including the prohibition on academic misconduct, such as (but not limited to) cheating, dishonesty, plagiarism, submission of other's work, and complicity in academic dishonesty. For more information on academic integrity at Miami University, please take a look at http://miamioh.edu/fsb/academics/integrity/index.html

Disabilities Policy

Students with disabilities are encouraged to request reasonable accommodations. Student Disability Services (SDS) registration should be completed prior to the provision of accommodations. Please visit the Student Disability Services Website for more information You can also contact SDS at 513-529-1541 or sds@miamioh.edu. If you are eligible to receive accommodations please schedule an office hours appointment at the beginning of the semester to discuss accommodation plans.

Course Schedule (Tentative):

Module	Topics
1	Course Overview – Big Data and AI
2	Distributed Computing on Spark
3	Machine Learning at Scale
4	Advanced Text Mining
5	Streaming Analytics
6	Graph Analytics
7	Cloud Computing and AI as a Service (AIaaS)
8	NLP and Chatbots
9	Image Processing with Deep Learning
10	Computer Vision and Video Analytics