

Applications in Artificial Intelligence (IFT 360) Syllabus SPRING 2020 Session A: Jan 13 – Mar 03

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Classroom: [REDACTED]
Class Time: [REDACTED]
Office Hours: M/W (9:00-10:00am);
Tue (3:00-4:00pm)
Sutton Hall, 301 C

Course Description

Artificial Intelligence (AI) is one of the most exciting technologies, both shaping and challenging the future of our industries and workforce. AI is a multidisciplinary area comprising theoretical, experimental, and applied investigations of intelligent systems. Converging technologies along with natural language processing, big data and the Internet of Things (IoT) are driving the growth of AI. An introductory course in AI applications is a good place to start as it will give you an overview of the components, bring you up to speed on the AI research and developments to date. In this course you will learn about examples of AI in use today such as web crawlers, how humans detect financial frauds, self-driving cars, facial recognition systems, and natural language processors.

Course Prerequisites: IFT 200

Recommended but not Required Books: (Only certain topics will be covered from these)

- Tan, P., Steinbach, M., & Kumar, V. (2005). Introduction to Data Mining, Addison Wesley.
- Bird, S., Klein, E., & Loper, E. (2009). Natural language processing with Python: analyzing text with the natural language toolkit. "O'Reilly Media, Inc."
- Jurafsky, D., & Martin, J. H. (2009). Speech and language processing: An introduction to natural language processing, computational linguistics, and speech recognition. Prentice Hall series in artificial intelligence, 1-1024.
- Vermesan, O., & Friess, P. (Eds.). (2014). Internet of things-from research and innovation to market deployment (Vol. 29). Aalborg: River publishers.
- David, K. (2007). A Brief Introduction to Neural Networks. (Download location: http://www.dkriesel.com/en/science/neural_networks)
- Goodfellow, I. Bengio, Y., & Courville, A. (2016). Deep Learning. An MIT Press Book. (Available at: <http://www.deeplearningbook.org/>)

Course Learning Objectives:

Topic	Learning Objective
Introduction to AI and AI applications	Define AI; Recognize and Describe examples, applications, and impact of AI; Identify and explain the application areas of AI; Know and understand AI issues and ethical concerns;
Programming Concepts for AI	Review all the essentials of programming language concepts needed for AI in Python.
AI Concepts and Terminology	Define basic AI concepts, cognitive computing; Explain Machine Learning, Deep Learning, Neural Networks & Data Science.
Machine Learning concepts	Learn the concepts of Machine Learning; Be able to use computational models to understand, explain & predict behaviors; Apply concepts of Machine Learning to real life problems and applications; Build, implement and evaluate various Machine Learning models.
Data Mining	Learn different types or categories of data; Know various steps of the data mining process.
Language & Communication	Introduce to NLP concepts; Explain and implement NLP pipeline; Introduce and Explain different NLP application areas; Design, implement, and analyze NLP algorithms; Explain Text Analytics concepts and tools.
Computer Vision	Explain Image processing concepts & video basics; Learn and implement Image classification and Analysis; Describe Face Detection and Face Recognition.
Conversation as a Platform	Introduce and Explain Bots; Build and implement an intelligent Bot.
Advanced Topics in AI	Explain concepts of neural networks and deep learning; Recognize applications of deep learning;

Tentative Weekly Schedule* :

Module #	Focus and Content	Assignments/ Quiz
Introduction to AI and AI applications & Programming Concepts for AI		
Module 1	What is AI? History of AI. Impact of AI: Applications and Examples. AI: Issues, Concerns and Ethical Considerations Review of programming concepts, libraries, packages for AI (Python)	Quiz 1 Assignment 1
AI Concepts and Terminology & Machine Learning Concepts		
Module 2	Cognitive Computing (Perception, Learning & Reasoning) Machine Learning, Deep Learning, and Neural Networks Basic techniques and paradigms in machine learning; Build Regression, Classification & Clustering Models (Lab)	Quiz 2 Assignment 2
Data Mining & Language and Communication		
Module 3	Structured & unstructured data, Data Mining Process, data preprocessing, data transformations; Natural Language Processing (NLP) concepts and Applications.	
Mid-Term Exam (03 Feb – 09 Feb, 2020)		
Natural Language Processing (NLP)		
Module 4	NLP Pipeline: lemmatization, Stemming, tokenization, tagging, parsing, Entity Recognition; Sentiment Analysis. Introduction to Text Analytics; Word Frequency; Term Frequency - Inverse Document Frequency (TF-IDF).	Quiz 3 Assignment 3
Computer Vision		
Module 5	Introduction to Image Processing, Classification & Analysis Face Detection, Recognition and Video Basics.	Quiz 4 Assignment 4
Conversation as a Platform		
Module 6	What is a Bot? Creating a Basic Bot. Bot Intelligence, Creating a QnA Bot	Quiz 5 Assignment 5
Advanced Topics in AI		
Module 7	Introduction to Neural Networks; Introduction to Deep learning and its applications	
Final Exam (24 Feb – 02 Mar, 2020)		
Project Based on area of interest (NLP, computer vision, network, cybersecurity or IoT)		

* The above schedule may be adjusted as we move through the semester.

Grading components will consist of the following components:

- *Assignments (20%)*: There will be Lab or conceptual assignments for each of the topics discussed in class.
- *Quiz (20%)*: There will be a Quiz related to each main topic discussed in class.
- *Exams (30%)*: One mid-term exam (15%) and a Final Exam (15%)
- *Project (30%)*: One project on any of the area of interest discussed above.

The students will be required to choose a project in the area of their interest related to topics discussed in class. They will be required to submit a project report and present the work as a demo of the system developed at the end of the semester. Project report and the system demo will be evaluated according to the following criteria: Soundness, Novelty & Clarity.

Grading

- Final grade is computed by totaling the exam and assignment scores based on the weight specified in the schedule.

COURSE GRADING	
Based on Points (absolute, fixed, no curve)	
$\geq 96.0 \leq 100.0$	A+
$\geq 93.0 < 96.0$	A
$\geq 90.0 < 93.0$	A-
$\geq 87.0 < 90.0$	B+
$\geq 84.0 < 87.0$	B
$\geq 80.0 < 84.0$	B-
$\geq 77.0 < 80.0$	C+
$\geq 74.0 < 77.0$	C
$\geq 70.0 < 74.0$	C-
$\geq 67.0 < 70.0$	D+
$\geq 64.0 < 67.0$	D
$\geq 60.0 < 64.0$	D-
< 60.0	E

Late or Missed Assignments

Notify the instructor BEFORE an assignment is due and not after the due date, if an urgent situation arises and the assignment will not be submitted on time. All assignment due dates will follow Arizona Mountain Standard time. NO LATE Assignments will be accepted. Please follow the appropriate University policies to request an accommodation for religious practices or to accommodate a missed assignment due to University-sanctioned activities.

Submitting Assignments

All assignments, unless otherwise announced, MUST be submitted to the designated area of Canvas. Do not submit an assignment via email.

General Course Protocol & Policies

- **Academic Integrity:** All students in this class are subject to ASU's Academic Integrity Policy (available at <http://provost.asu.edu/academicintegrity>) and should acquaint themselves with its content and requirements, including a strict prohibition against plagiarism. All violations will be reported to the Dean's office, who maintain records of all offenses. Students are expected to abide by the FSE Honor Code <http://engineering.asu.edu/integrity/>).
- **Plagiarism:** Although ASU encourages collaboration between students, and faculty, in the sharing of ideas and experiences, individual work needs to represent the student's original thought and be distinguishably different from other students' work. Copying from other people's work in part or in whole will result in a ZERO grade for the whole work. Recurring plagiarism will result in obtaining an E, and reporting student's misconduct.
- **Cheating will not be tolerated.** Any student found cheating on an exam, a quiz, or assignment may be given a failing grade for the course and flagrant violations can result in additional consequences. You are cheating if you represent someone else's work as your own or if someone else represents your work as theirs. All graded work (exams, homework assignments, as well as any written exercises or quizzes) in this class must represent your own individual work only. Students may discuss the conceptual aspects of an assignment, but students must turn in their own, independently developed solutions. Grading will include comparing the structure and content of your solution with that of other students. By registration in this class, you are assumed to have read, understand and agreed to this policy, as well as to the procedures conveyed at the web sites below. In particular, discussion of the exam details is forbidden.
 - Academic integrity policy: <https://provost.asu.edu/academicintegrity/>
 - Student code of conduct: <https://eoss.asu.edu/dos/srr/codeofconduct>
 - Student life's Student Academic Integrity Policy: <http://www.asu.edu/studentlife/judicial/integrity.html>
 - Fulton School of Engineering's Academic Integrity Information Page: <http://engineering.asu.edu/integrity>

- **Classroom Behavior:** Cell phones and pagers must be turned off during class to avoid causing distractions. The use of recording devices is not permitted during class. Any violent or threatening conduct by an ASU student in this class will be reported to the ASU Police Department and the Office of the Dean of Students.
- **Policy against threatening behavior:** All incidents and allegations of violent or threatening conduct by an ASU student (whether on- or off-campus) will be reported to the ASU Police Department (ASU PD) and the Office of the Dean of Students. If either office determines that the behavior poses or has posed a serious threat to personal safety or to the welfare of the campus, the student will not be permitted to return to campus or reside in any ASU residence hall until an appropriate threat assessment has been completed and, if necessary, conditions for return are imposed. ASU PD, the Office of the Dean of Students, and other appropriate offices will coordinate the assessment in light of the relevant circumstances. [SSM 104-02, "Handling Disruptive, Threatening, or Violent Individuals on Campus"](#)
- **Disability Resources:** Suitable accommodations will be made for students having disabilities and students should notify the instructor as early as possible if they will require same. Such students must be registered with the Disability Resource Center and provide documentation to that effect. Professional specialists and staff at the Disability Resource Centers (DRC) facilitate a range of academic support services for qualified students with disabilities. Students who wish to request an accommodation for a disability should contact the Disability Resource Center (DRC) for their campus. For more information, visit <http://www.asu.edu/studentaffairs/ed/drc/>
- **Prohibition Against Discrimination, Harassment, and Retaliation (ACD 401):** Title IX is a federal law that provides that no person be excluded on the basis of sex from participation in, be denied benefits of, or be subjected to discrimination under any education program or activity. Both Title IX and university policy make clear that sexual violence and harassment based on sex is prohibited. An individual who believes they have been subjected to sexual violence or harassed on the basis of sex can seek support, including counseling and academic support, from the university. If you or someone you know has been harassed on the basis of sex or sexually assaulted, you can find information and resources at <https://sexualviolenceprevention.asu.edu/faqs>.

As a mandated reporter, I am obligated to report any information I become aware of regarding alleged acts of sexual discrimination, including sexual violence and dating violence. ASU Counseling Services, <https://eoss.asu.edu/counseling>, is available if you wish to discuss any concerns confidentially and privately.

- **Copyright Infringement:** Students that they must refrain from uploading to any course shell, discussion board, or website used by the course instructor or other course forum, material that is not the student's original work, unless the students first comply with all applicable copyright laws; faculty members reserve the right to delete materials on the grounds of suspected copyright infringement.