Course Syllabus

Course Number: CS 312

Course Title: Machine Learning & AI

Department Name: Natural Sciences and Mathematics

College/School/Division Name: Chaminade University of Honolulu

Term: Fall 2022

Course Credits: 3

Class Meeting Days: Tuesdays, Thursdays

Class Meeting Hours: 11:30am – 12:50pm

Class Location: Tredtin Hall, Room DSC

Instructor Name: Laura Tipton, PhD

Email: laura.tipton@chaminade.edu

Phone: 808-735-4804

Office Location: Tredtin DSC 3

Office Hours: MW 9-11am, or by appointment via Zoom

Instructor Website:

Other Professional Contact Information:

1. University Course Catalog Description

This course is an overview of machine learning and AI. This course will include lectures, discussions, assignments, hands-on experiences, and a project. The goal of the course will prepare and provide students with machine learning and AI knowledge, techniques, skills, and a data science mindset. Students in this course will learn Python and various machine learning algorithms, such as trees, models, clustering, and networks.

2. Course Overview

This course will cover a range of topics under the umbrella of machine learning and artificial intelligence, including clustering, classification, decision trees, statistical models, and neural networks. The emphasis will be on hands-on weekly write-ups, written in Python.

3a. CS Program Learning Outcomes

Upon completion of the undergraduate B.S. program in Computer Science, students will:

1. Identify, describe, and execute foundational computer organization and architecture, operating systems, computer networks and management, information systems, database systems, software engineering, and programming;
2. Describe and apply foundational mathematical concepts and operations towards design, development, and analysis of applications;
3. Identify and apply programming tools such as Python, Java, R, and SQL languages towards application design and development;
4. Evaluate and integrate an awareness of regulatory, ethical issues, and collective standards to positively influence the application of computer science to service, justice, and peace in working towards solutions for societal problems and opportunities;
5. Identify and apply awareness of technological changes to positively influence adaption and change of computer science methods;
6. Explain, plan, and execute computer science tasks within multidisciplinary teams;
7. Execute a domain-specific capstone project addressing a stakeholder-generated use case

3b. DS Program Learning Outcomes

Upon completing the B.S. degree program in Data Science Analytics and Visualization the student will demonstrate the following:

1. Source, describe and curate large data sets ('Big Data') that may not be amenable to traditional hardware and software, and conventional statistical analysis including domain and file specific metadata and the tools built around alternatives to tabular relations that allow the use of multimodal data;
2. Identify, describe and apply foundational mathematical and statistical concepts and operations, including the application of tools such as R, SQL and Python languages, that underlie data sourcing, management, analysis and interpretation;
3. Develop and implement approaches for effective data translation, dissemination and communication between domains, stakeholders and the public;
4. Identify and apply basic data modeling, predictive models and visualizations to support decision-making;

5. Integrate an awareness of ethical issues and collective standards to positively influence the application of data science to service, justice and peace in working towards solutions for societal problems;
6. Explain, plan and execute data science tasks within multidisciplinary teams;
7. Execute a domain-specific capstone project addressing a stakeholder-generated use case.

4a. Course Learning Outcomes and Linkage to CS Program Learning Outcomes

At the conclusion of CS 312, students will:

Course Learning Outcomes	CS PLO 1	CS PLO 2	CS PLO 3	CS PLO 4	CS PLO 5	CS PLO 6	CS PLO 7
1. Explain machine learning.	X	X					
2. Explain artificial intelligence.	X	X					
3. Identify and describe ML/AI algorithms.	X	X					
4. Implement ML/AI algorithms in Python.		X	X			X	
5. Identify and describe ethical issues in ML/AI.				X			

4b. Course Learning Outcomes and Linkage to DS Program Learning Outcomes

At the conclusion of CS 312, students will:

Course Learning Outcomes	DS PLO 1	DS PLO 2	DS PLO 3	DS PLO 4	DS PLO 5	DS PLO 6	DS PLO 7
1. Explain machine learning.		X					
2. Explain artificial intelligence.		X					

3. Identify and describe ML/AI algorithms.		x					
4. Implement ML/AI algorithms in Python.		x		x		x	
5. Identify and describe ethical issues in ML/AI.					x		

5. Course Prerequisites

DS100 or DS101 and CS201 or CS202

6. Required Learning Materials

Any materials will be provided on Canvas as needed

7. Course Website:

datascience.chaminade.edu

8. Technical Assistance for Canvas Users:

Search for help on specific topics at help.instructure.com. Chat live with Canvas Support 24/7/365. Watch this video to get you started with online guides and tutorials. Contact the Chaminade IT Helpdesk for technical issues: helpdesk@chaminade.edu, or call (808) 735-4855

9. Assessment.

Communication	5 points
Weekly reports (12X)	72 points (6 points each)
Project pitch	23 points
Total	100 points

Grading will be based on student points earned from communication, weekly reports (due at the beginning of class each week), and a final project pitch. The final project pitch will be to pitch a project that uses ML/AI in your topic area of interest.

10. Grading Scale

Letter grades are given in all courses except those conducted on a credit/no credit basis. They are interpreted as follows:

A 90-100% initiative — 90 points or more: Outstanding scholarship and an unusual degree of intellectual

B 80-89% — 80-89 points: Superior work done in a consistent and intellectual manner

C 70-79% — 70-79 points: Average grade indicating a competent grasp of subject matter

D 60-69% — 60-69 points: Inferior work of the lowest passing grade, not satisfactory for fulfillment of prerequisite course work.

F <60% — 59 points or less: Failed to grasp the minimum subject matter; no credit given

11. Course Schedule

Week	Date	Lesson	Assignment Due
1	8/23-5	• Introduce syllabus. • Everyone introduces themselves. • Overview of ML/AI • Install Python	
2	8/30-9/1	• Clustering and Classifiers	Python report
3	9/6-8	• Reinforcement learning	Clustering and Classifiers report
4	9/13-15	• Neural networks	Reinforcement learning report
5	9/20-22	• Neural network applications	
6	9/27-29	• Transfer learning	Neural networks report
7	10/4-6	• Gaming and game theory	Transfer learning report
8	10/11-13	• Ranking, sorting, and making recommendations	Gaming report
9	10/18-20	• Natural language processing	Rank and sort report
10	10/25-27	• Robotics	NLP report
11	11/1-3	• Human/AI interactions	Robotics report
12	11/8-10	• Deep learning	Human/AI report
13	11/15-17	• Algorithmic bias (possible guest lecture/videos)	Deep learning report
14	11/22-24	• Project Pitches • Thursday - Thanksgiving, no class	Project Pitch
15	11/29-12/1	• Future of ML/AI	Algorithmic bias report
16	12/6-8	• Exams - no class	

12. Alignment of Natural Sciences Courses with Marianist and Hawaiian values of the University.

The Natural Sciences Division provides an *integral, quality education:* sophisticated integrative course content taught by experienced, dedicated, and well-educated instructors.

- We *educate in family spirit* – every classroom is an *Ohana* and you can expect to be respected yet challenged in an environment that is supportive, inclusively by instructors who take the time to personally get to know and care for you.
- We *educate for service, justice and peace*, since many of the most pressing global issues (climate change, health inequity, poverty, justice) are those which science and technology investigate, establish ethical parameters for, and offer solutions to.
- We *educate for adaptation and change*. In science and technology, the only constant is change. Data, techniques, technologies, questions, interpretations and ethical landscapes are constantly evolving, and we teach students to thrive on this dynamic uncertainty.

The study of science and technology can be formative, exploring human creativity and potential in the development of technologies and scientific solutions, the opportunity to engage in the stewardship of the natural world, and the opportunity to promote social justice. We provide opportunities to engage with the problems that face Hawai'i and the Pacific region through the Natural Sciences curriculum, in particular, those centered around severe challenges in health, poverty, environmental resilience, and erosion of traditional culture. The Marianist Educational Values relate to Native Hawaiian ideas of *mana, na'auao, ohana*, *aloha* and *aina*. We intend for our Natural Sciences programs to be culturally-sustaining, rooted in our Hawaiian place, and centered on core values of *Maiau,* be neat, prepared, careful in all we do; *Makawalu*, demonstrate foresight and planning; *`Ai,* sustain mind and body; *Pa`a Na`au*, learn deeply.

13. Additional departmental and university policies

13.1. Late Work Policy

Requests for extensions due to extenuating circumstances (medical problems, for example) will be considered but in general work received after the deadline will not be graded. Computer problems are not an excuse for late work.

13.2. Grades of "Incomplete"

Students and instructors may negotiate an incomplete grade when there are specific justifying circumstances. An Incomplete Contract (available form the Divisional Secretary and the Portal) must be completed. When submitting a grade the "I" will be accompanied by the alternative grade that will automatically be assigned after 90 days. These include IB, IC, ID, and IF. If only an "I" is submitted the default grade is F. The completion of the work, evaluation, and reporting of the final grade is due within 90 days after the end of the semester or term. This limit may not be extended.

13.3. Writing Policy

Paper requirements and formatting will be discussed during the course when the assignment is given.

13.4. Instructor and Student Communication

Questions for this course can be emailed to the instructors at laura.tipton@chaminade.edu. Online, in-person, and phone conferences can be arranged. Response time will take place up to 3 days.

The University provides a Chaminade email address for all students. Official Chaminade communications will be sent to the students' Chaminade email address and instructors will use only this email to communicate with students. It is the responsibility of the student to check their email frequently. Report email-related problems to the Helpdesk at 808-735-4855 or helpdesk@chaminade.edu

13.5. Cell phones, tablets, and laptops

Music Devices and Cellular Phones: Unless specifically permitted by your instructor, use of music devices and cell phones is prohibited during all Natural Science and Mathematics classes, as it is discourteous and may lead to suspicion of academic misconduct. Students unable to comply will be asked to leave class. Out of consideration for your classmates, please set your cell phone to silent mode during class. Students are encouraged to bring laptops or tablets to class as the instructor will assign online activities and readings that will require the use of a laptop or tablet. Laptops and tablets should not be misused, such as checking distracting websites. Use your best judgment and respect your classmates and instructor.

13.6. Disability Access

If you need individual accommodations to meet course outcomes because of a documented disability, please speak with me to discuss your needs as soon as possible so that we can ensure your full participation in class and fair assessment of your work. Students with special needs who meet criteria for the Americans with Disabilities Act (ADA) provisions must provide written documentation of the need for accommodations from the Counseling Center by the end of week three of the class, in order for instructors to plan accordingly. If a student would like to determine if they meet the criteria for accommodations, they should contact the Kokua Ike Coordinator at (808) 739-8305 for further information (ada@chaminade.edu).

13.7. Title IX Compliance

Chaminade University of Honolulu recognizes the inherent dignity of all individuals and promotes respect for all people. Sexual misconduct, physical and/or psychological abuse will NOT be tolerated at CUH. If you have been the victim of sexual misconduct, physical and/or psychological abuse, we encourage you to report this matter promptly. As a faculty member, I am interested in promoting a safe and healthy environment, and should I learn of any sexual misconduct, physical and/or psychological abuse, I must report the matter to the Title IX Coordinator. If you or someone you know has been harassed or assaulted, you can find the appropriate resources by visiting Campus Ministry, the Dean of Students Office, the Counseling Center, or the Office for Compliance and Personnel Services. Should you want to speak to a confidential source you may contact the following:

- Chaminade Counseling Center| 808 735-4845.
- Any priest serving as a sacramental confessor or any ordained religious leader serving in the sacred confidence role

13.8. Attendance Policy

If you are not feeling well, please do not come to campus! Please email Dr. Tipton to let her know that you will not be attending. All lectures will be posted online and participation in online components will

be considered attendance. Repeated unexcused absences without email notification may lead to a grade reduction for the course.

~~The following attendance policy is from the 2018-2019 Academic Catalog (p. 57-58): Students are expected to attend regularly all courses for which they are registered. Student should notify their instructors when illness or other extenuating circumstances prevents them from attending class and make arrangements to complete missed assignments. Notification may be done by emailing the instructor's Chaminade email address, calling the instructor's campus extension, or by leaving a message with the instructor's division office (Natural Science and Math 1 (808) 440-4204). It is the instructor's prerogative to modify deadlines of course requirements accordingly. Any student who stops attending a course without officially withdrawing may receive a failing grade.~~

~~Unexcused absences equivalent to more than a week of classes may lead to a grade reduction for the course. Any unexcused absence of two consecutive weeks or more may result in being withdrawn from the course by the instructor, although the instructor is not required to withdraw students in that scenario. Repeated absences put students at risk of failing grades.~~

~~Students with disabilities who have obtained accommodations from the Chaminade University of Honolulu ADA Coordinator may be considered for an exception when the accommodation does not materially alter the attainment of the learning outcomes. Federal regulations require continued attendance for continuing payment of financial aid. When illness or personal reasons necessitate continued absence, the student should communicate first with the instructor to review the options. Anyone who stops attending a course without official withdrawal may receive a failing grade or be withdrawn by the instructor at the instructor's discretion.~~

Class begins at 11:20 AM and ends at 2:30 PM; there is no accepted variation to this schedule.

13.9. Academic Conduct Policy

See the current Undergraduate Academic Catalog and the Student Handbook available from Student Affairs.

14. Dr. Tipton's policies

14.1 Inclusion Statement

I recognize that I cannot fully understand the lived experience of many minoritized individuals. However, I am dedicated to increasing excellence through inclusion. That includes recognizing as assets the different perspectives students and scholars from diverse backgrounds bring to the classroom and to science. It includes a drive to have the readings and examples used in the classroom be as inclusive and diverse as possible. Furthermore, it is an awareness that biases, both conscious and unconscious, exist in academia, science, and the world, and an aim to reduce the influence of those biases in my decisions and in those around me. Actions that seek to limit the potential of others or perpetuate biases or anti-inclusive sentimentality will not be tolerated.

14.2 Safe Space

To the extent possible, I hope you will consider my office a safe, non-judgmental space; a place where you can bring your whole self and all your emotions. As stated above, I am obligated by law to report Title IX violations and any reports of abuse. Beyond that, I will do my best to listen, help, and direct you to campus and community resources when appropriate.

14.3 Syllabus Changes

This syllabus is a guide to the class and will be adhered to as much as possible; however, I reserve the right to make changes as I see fit, so long as they do not create an additional undue burden on the student.

14.4 Miscellaneous

Congratulations on reading all the way to the end of the syllabus. For an extra credit point, please email a picture of your favorite statue to me.