Course Syllabus

Course Number: CS 312

Course Title: Introduction to Machine Learning

Department Name: Natural Sciences and Mathematics

College/School/Division Name: Chaminade University of Honolulu

Term: Spring 2024

Course Credits: 3

Class Meeting Days: Monday, Wednesday, and Friday

Class Meeting Hours: 06:30pm – 7:20pm

Class Location: Data Science Center

Instructor Name: Mariah Yelenick

Email: mariah.yelenick@chaminade.edu

Office Location: Data Science Center

Office Hours: Monday and Wednesday 5:30-6:30pm or via Zoom per request

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.

3. 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.

Upon completion of the undergraduate B.S. program in Data Science, Analytics & Visualization, students will be able to:

1. Source, describe, and curate large, multimodal data sets (‘Big Data’);
2. Apply foundational mathematical and statistical concepts and operations, including the application of up-to-date tools, 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. Apply basic data modeling, predictive models, and visualizations to support decision-making, independently or in teams;
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.

4. Course Learning Outcomes and Linkage to Program Learning Outcomes

Students who successfully complete this course will be able to:

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. Write, debug, and execute Python code	X		X				
2. Explain the differences between machine learning algorithms		X			X	X	
3. Apply machine learning to a variety of data sources and types		X	X		X		
4. Develop bespoke machine learning models from scratch			X			X	X

Course Learning Outcomes	DS PLO 1	DS PLO 2	DS PLO 3	DS PLO 4	DS PLO 5
1. Write, debug, and execute Python code		X	X		
2. Explain the differences between machine learning algorithms			X		
3. Apply machine learning to a variety of data sources and types	X		X	X	
4. Develop bespoke machine learning models from scratch	X			X	

5. Course Prerequisites

EN 102, COM 101, and CS 201 or CS 205

6. Required Learning Materials

Learning materials will be provided on Canvas.

7. Course Website:

All assignments and materials will be submitted via **Canvas Course Management System** unless stated otherwise. The assignments are to be clear, professional quality, and must be submitted in the requested format or the work will receive zero points. Please familiarize yourself with Canvas and visit the site regularly as materials, grades, announcements, and submission of assignments will be on Canvas.

Chaminade University Data Science Program 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.

Assessments	Points
Participation and Communication	5
Assignments (6x), lowest score will be dropped	40
Project proposal	5
Project progress check	5
Project submission	30
Project presentation	15
Total	**100**

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% 90 points or more: Outstanding scholarship and an unusual degree of intellectual initiative

B 80-90% 80-89 points: Superior work done in a consistent and intellectual manner

C 70-80% 70-79 points: Average grade indicating a competent grasp of subject matter

D 60-70% 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

Feedback and grades on course deliverables (e.g., assignments, projects, quizzes, etc.) will be provided in the "Grades" of Canvas. Response time will take place up to 3 days.

11. Course Schedule

Week	Date	Lesson	Assignment
1	1/8 – 1/12	• Introduce syllabus and policies • Everyone introduces themselves • Define and introduce machine learning • Python setup	Assignment 0 given 1/8
2	1/15 – 1/19 No class 1/15	• Data types & one-hot encoding • Metrics and evaluation • ML best practices (train/test splits, normalizing, etc.) • Overview of scikit-learn	Assignment 0 due 1/14 Assignment 1 given 1/17
3	1/22 – 1/26	• Regression • Classifiers	Assignment 2 given 1/22
4	1/29 – 2/2	• Decision trees • Random forests • Bagging and boosting	Assignment 1 due 1/28 Assignment 3 given 1/29
5	2/5 – 2/9	• Clustering • Naïve Bayes	Assignment 2 due 2/4 Assignment 4 given 2/5
6	2/12 – 2/16	• Reinforcement learning • git	Assignment 3 due 2/11 Assignment 5 given 2/12
7	2/19 – 2/23 No class 2/19	• Genetic algorithms & genetic programming • **Introduce project proposal**	Assignment 4 due 2/18
8	2/26 – 3/1	• Neural networks	Assignment 5 due 2/25 Assignment 6 given 2/26
9	3/4 – 3/8	• Principle component analysis • Data visualizations • **Submit project proposal**	Project proposal due 3/3
10	3/11 – 3/15	• Natural language processing	Assignment 6 due 3/10
11	3/18 – 3/22	***Spring Break, no class***	
12	3/25 – 3/29 No class 3/29	• Work on project – Check-in • Large language models/ChatGPT	
13	4/1 – 4/5	• Machine learning use cases and flowchart	Project progress due 4/3
14	4/8 – 4/12	• Work on project – Check-in	
15	4/15 – 4/19	• **Submit project** • Add project to GitHub portfolio • Prepare for project presentation	**Project submission (Jupyter notebook, visualizations, datasets) due 4/14**
16	4/22 – 4/26	Finals week	**Project presentations**

Credit Hour Policy:

This is a three-credit course requiring a minimum of 135 clock hours of student engagement, per the official CUH Credit Hour Policy. Students enrolled in this course are anticipated to spend 35 hours in class and 48 hours research and completing a project. There will be an additional 52 hours of work required beyond what is listed here (course readings, assignments, etc.), averaging 3.3 hours each week.

Course Changes: The instructor reserves the right to change the course instruction, schedule, deadlines, course requirements, and grading throughout the semester. Changes will be announced through email or Canvas Course Management System.

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 if submitted before the original deadline.

Assignments turned in within 7 days of the original deadline will receive up to 75% of the original points available. Assignments turned in within 14 days of the original deadline will receive up to 50% of the original points available. Work received more than 14 days after the deadline will not be graded and will receive a score of 0. 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 from 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 instructor at mariah.yelenick@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
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 to class as the instructor will assign online activities and readings that will require the use of a laptop. Laptops and other technologies 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 Counseling Center at (808) 735-4845 for further information (counselingcenter@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.

13.8. Attendance Policy

The following attendance policy is from the 2023-2024 Academic Catalog: Students are expected to attend regularly all courses for which they are registered. Students should notify their instructors when illness or other extenuating circumstances prevent 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 school 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.

13.9. Academic Conduct Policy

(Excerpts taken from https://provost.umn.edu/chatgpt-syllabus-statements)

Academic dishonesty includes but is not limited to: plagiarism, cheating on assignments or examinations, the unauthorized use of online learning support and testing platforms, engaging in unauthorized collaboration on academic work, posting student-generated coursework on online learning support and testing platforms not approved for the specific course in question, and using course materials without faculty permission, including the posting of faculty-provided course materials on online learning and testing platforms.

Artificial intelligence (AI) language models, such as ChatGPT, and online assignment help tools, such as Chegg®, are examples of online learning support platforms: they cannot be used for course assignments except as explicitly authorized by the instructor. The following actions are prohibited in this course:

- Submitting all or any part of an assignment statement to an online learning support platform
- Incorporating any part of an AI generated response in an assignment
- Submitting your own work for this class to an online learning support platform for iteration or improvement

If you are in doubt as to whether you are using an online learning support platform appropriately in this course, I encourage you to discuss your situation with me.

For university-wide policies, see the current Undergraduate Academic Catalog and the Student Handbook available from Student Affairs.