



School of Natural Sciences and Mathematics  
Computer Science

## CS-312 Machine Learning and Artificial Intelligence

Tredtin Hall DSC TTh 8:30AM – 9:50 AM  
Credits: #3    Section: #1    Term: Spring 2026

### Instructor Information



**Instructor:** Kelly Gaither

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**Virtual Office:**

<https://utexas.zoom.us/j/5041849659?pwd=ZGNKcDBjZVBVYlhpcUJmN1IDOXJnZz09>

**Virtual Office Hours:** M-F 11-12 HST or by appointment

**Communication:** Email, slack or text. I will respond within 24/48 business hours.

### School & Department Information

#### School of Natural Sciences and Mathematics

Office Location: Henry Hall

Phone: (808) 739-8340

If you have questions regarding the Computer Science Department, reach out to your instructor or the School of Natural Sciences and Mathematics.

### Course Description & Materials

#### Catalog Course Description

This course will introduce machine learning and artificial intelligence (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, and skills. Students in this course will learn and implement various machine learning algorithms, such as trees, models, clustering, and networks. Prerequisites: EN 102, COM 101, and CS 202 or CS 205. Prerequisites: CS 201 or CS 202.

## Time Allocation

This is a three-credit hour course requiring 135 clock hours of student engagement, per the official CUH Credit Hour Policy. Over the 15 weeks of this course, students will spend 37.5 hours in class, 60 hours programming the final project over the course of the semester, and 20 hours designing and prototyping visualizations. There will be an additional 17.5 hours of work required beyond what is listed here (course readings, homework assignments, etc.), averaging 1.2 hours each week.

## Required Materials

No textbook is required. Relevant reading materials will be provided prior to each class meeting. These include PowerPoint PDF slides, tutorials, websites, articles, Python applications, Google Drive, Zoom video conference application, consider.it application, and Microsoft applications.

## Canvas (<https://chaminade.instructure.com>)

Canvas is Chaminade University of Honolulu's official learning management system, designed to enhance teaching and learning. It's a versatile platform suitable for various instructional formats, including online (asynchronous/synchronous), hybrid, and traditional face-to-face classes. Canvas empowers educators to create engaging learning experiences with its rich set of tools for content creation, assignments, assessments, and communication. Its user-friendly interface and mobile compatibility ensure accessibility and convenience, elevating the overall educational quality at Chaminade University. For easy access, you can bookmark the bitly link at <https://bit.ly/CUHCanvasLinks> to an external site. or type "bit.ly/CUHCanvas" in your browser's address bar to log in directly to CUH Canvas, streamlining your online learning experience.

## Learning Outcomes

### Program Learning Outcomes (PLOs)

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

1. Apply collection, storage, or cleaning of datasets;
2. Apply technologies to collect or manage data, analyze data, or program an application;
3. Analyze data using mathematics, statistics, prediction models, visualization, or other forms of analytics to support decision-making;
4. Apply effective data communication approaches for stakeholders and the public;

- 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.

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

- Describe foundational computer organization, architecture, computing resources, and system;
- Describe foundational mathematical concepts and operations towards design, development, and analysis of applications;
- Apply programming language towards application development;
- Integrate an awareness of 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;

### Course Learning Outcomes (CLOs)

Upon completion of CS312, students will achieve the following course outcomes shown in the tables below. Table 1 shows course learning outcomes mapped to the program learning outcomes for the Bachelor of Science in Computer Science. The mapping for program learning outcomes for the Bachelor of Science in Data Science is shown in Table 2:

Table 1: Course Learning Outcomes Mapped to Computer Science Program Learning Outcomes

| Course Learning Outcomes                         | CS PLO 1 | CS PLO 3 | CS PLO 3 | CS PLO 4 |
|--|----------|----------|----------|----------|
| 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        |          |
| 5. Identify and Describe Ethical Issues in ML/AI |          |          |          | X        |

Table 2: Course Learning Outcomes Mapped to Data Science Program Learning Outcomes

| Course Learning Outcomes                         | DS PLO 1 | DS PLO 3 | DS PLO 3 | DS PLO 4 | DS PLO 5 |
|--|----------|----------|----------|----------|----------|
| 1. Explain Machine Learning                      |          |          |          | X        |          |
| 2. Explain Artificial Intelligence               |          |          |          | 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        | X        |

## Marianist Values

This class represents one component of your education at Chaminade University of Honolulu. An education in the Marianist Tradition is marked by five principles and you should take every opportunity possible to reflect upon the role of these characteristics in your education and development:

1. Education for formation in faith.
2. Provide an integral, quality education.
3. Educate in family spirit.
4. Educate for service, justice and peace, and integrity of creation.
5. Educate for adaptation and change.

This course will provide a collaborative environment for instruction that fosters and teaches concepts from the standpoint of service, justice and peace, and integrity of creation. Additionally, this course will provide instruction that integrates concepts of adaptation and change.

## Native Hawaiian Values

Education is an integral value in both Marianist and Native Hawaiian culture. Both recognize the transformative effect of a well-rounded, value-centered education on society, particularly in seeking justice for the marginalized, the forgotten, and the oppressed, always with an eye toward God (Ke Akua). This is reflected in the 'Ōlelo No'ēau (Hawaiian proverbs) and Marianist core beliefs:

1. Educate for Formation in Faith (Mana) E ola au i ke akua ('Ōlelo No'ēau 364) May I live by God.
2. Provide an Integral, Quality Education (Na'auao) Lawe i ka ma'alea a kū'ono'ono ('Ōlelo No'ēau 1957) Acquire skill and make it deep.
3. Educate in Family Spirit ('Ohana) 'Ike aku, 'ike mai, kōkua aku kōkua mai; pela iho la ka nohana 'ohana ('Ōlelo No'ēau 1200) Recognize others, be recognized, help others, be helped; such is a family relationship.
4. Educate for Service, Justice and Peace (Aloha) Ka lama kū o ka no'ēau ('Ōlelo No'ēau 1430) Education is the standing torch of wisdom.
5. Educate for Adaptation and Change (Aina) 'A'ohe pau ka 'ike i ka hālau ho'okahi ('Ōlelo No'ēau 203) All knowledge is not taught in the same school

## Alignment of Course Learning Outcomes

|                  | CLO 1 | CLO 2 | CLO 3 | CLO 4 | CLO 5 | CLO 6 |
|------------------|-------|-------|-------|-------|-------|-------|
| Marianist Values | 2,4   | 5     | 2,5   | 2,4,5 | 2,4,5 | 2,4,5 |

|  |     |     |     |       |       |       |
|--|-----|-----|-----|-------|-------|-------|
| PLOs                                     | 2   | 2   | 2,3 | 2,4   | 1,3   | 1,3,4 |
| Native Hawaiian Values                   | 2,5 | 3,5 | 2,5 | 2,4,5 | 2,4,5 | 2,4,5 |
| Gen Ed Learning Outcomes (if applicable) |     |     |     |       |       |       |

## Course Activities

### Discussions

Discussions will be conducted on topics over the course of the semester. Participation in these discussions will be graded.

### Homework

Readings will be given prior to class with the expectation that students will read the material and come prepared to participate in in-class discussion.

### Quizzes and Exams

This course is primarily project based. Quizzes and exams will not be given.

### Team Projects

There will be no team project assignments. Teams may only work on the final project with prior approval of the instructor.

### Individual Projects

Individual projects will be given as programming assignments to gain proficiency in machine learning and AI algorithms.

### Final Project

Students will conduct a semester-long machine learning/AI project on real-world data in a domain of their choosing for their final project. All individual projects will serve as preparatory components for the final project.

## Course Policies

### Attendance

Attendance will be taken for this class and will factor into the class participation grade. We will be discussing new concepts and conducting activities during class and attendance is an important part of mastering the subject matter. Lectures will be recorded and saved on instructor's google drive for access outside of class for the duration of the course.

### Late Work

Late work will be accepted up to one week after the deadline. A penalty for late work will be assessed. This does not apply to work that is late due to circumstances with appropriate documentation. If work is late due to excused circumstances, student will work with faculty to determine appropriate and fair timeline for completion.

### Extra Credit

Extra credit work may be given during the course semester. This work is intended to enhance learning of topic areas and students will be asked to adhere to documented instructions. Late extra credit work will not be accepted without appropriate documentation.

### Changes to the Syllabus

While the provisions of this syllabus are as accurate and complete as possible, your instructor reserves the right to change any provision herein at any time. Every effort will be made to keep you advised of such changes, and information about such changes will be available from your instructor.

### Grades of Incomplete

While the provisions of this syllabus are as accurate and complete as possible, your instructor reserves the right to change any provision herein at any time. Every effort will be made to keep you advised of such changes, and information about such changes will be available from your instructor.

### Final Grades

Final grades are submitted to [Self-Service](#):

A = 90% and above

B = 80-89%

C = 70-79%

D = 60-69%

F = 59% and below

| Grading and Assessment                |        |
|---------------------------------------|--------|
| Assessments                           | Points |
| Communication and Class Participation | 5      |
| Programming Assignments (5)           | 40     |
| Final Project Proposal                | 5      |
| Final Project Progress Check          | 5      |
| Final Project Submission              | 30     |
| Final Project Presentation            | 15     |

## Important Information

### Academic Honesty

Academic honesty is an essential aspect of all learning, scholarship, and research. It is one of the values regarded most highly by academic communities throughout the world. Violations of the principle of academic honesty are extremely serious and will not be tolerated.

Students are responsible for promoting academic honesty at Chaminade by not participating in any act of dishonesty and by reporting any incidence of academic dishonesty to an instructor or to a University official. Academic dishonesty may include theft of records or examinations, alteration of grades, and plagiarism, in addition to more obvious dishonesty.

Questions of academic dishonesty in a particular class are first reviewed by the instructor, who must make a report with recommendations to the Dean of the Academic Division. Punishment for academic dishonesty will be determined by the instructor and the Dean of Academic Division and may include an “F” grade for the work in question, an “F” grade for the course, suspension, or dismissal from the University.

For the most up to date information, please refer to the [Academic Honesty Policy](#) on the Chaminade University Catalog website.

### Title IX and Nondiscrimination Statement

Chaminade University of Honolulu is committed to providing a learning, working and living environment that promotes the dignity of all people, inclusivity and mutual respect and is free of all forms of sex discrimination and gender-based violence, including sexual assault, sexual

harassment, gender-based harassment, domestic violence, dating violence, and stalking. As a member of the University faculty, I am required to immediately report any incident of sex discrimination or gender-based violence to the campus Title IX Coordinator. For pregnant and parenting students, I am also obligated to provide you with similar resources for support and protections available to you. My goal is to make sure that you are aware of the range of options available to you and have access to the resources and support you need.

### **Nondiscrimination Policy & Notice of Nondiscrimination**

The university is committed to comply with all State and Federal statutes, rules, and regulations which prohibit discrimination. The university is committed to a policy of nondiscrimination on the basis of race, sex, gender identity and expression, age, religion, color, national origin (including shared ancestry and ethnic characteristics), ancestry, citizenship, disability, genetic information, marital status, breastfeeding, arrest and court record (except as permissible under State law), sexual orientation, or status as a covered veteran. Inquiries about Title IX or general Civil Rights concerns may be referred to the University's Title IX Coordinator, the U.S. Department of Education's Office for Civil Rights, or both and contact information may be found [HERE](#). *On-campus Confidential Resources may also be found here at [CAMPUS CONFIDENTIAL RESOURCES](#).*

The University's Nondiscrimination Policy and Grievance Procedures can be located on the University webpage at: <https://chaminade.edu/compliance/title-ix-nondiscrimination-policies-procedures/>.

To report information about conduct that may constitute sex discrimination or make a complaint of sex discrimination under Title IX, please refer to the [Campus Incident Report form](#). Chaminade University of Honolulu prohibits sex discrimination in any education program or activity that it operates.

The NOTICE of NONDISCRIMINATION can be found here: [Notice of Nondiscrimination](#).

### **Hazing Prevention Resources and Athlete Helpline:**

Assists athletes, parents, coaches, and any allies interested in ensuring physical and mental safety for sports communities by offering confidential emotional support, crisis intervention, informational athlete-focused resources, and guidance related to concerns about any type of abuse—including hazing.

Chaminade University's Hazing Policy:

<https://catalog.chaminade.edu/studenthandbook/codeofconduct>

<https://hazingpreventionnetwork.org/athlete-helpline/>  
<https://hazingpreventionnetwork.org/how-to-report-hazing/>

**Basic Needs Resources:** <https://chaminade.edu/basic-needs/>

### **Campus Safety/ SafeSwords**

A program for students, faculty and staff, who may feel uncomfortable or unsafe walking alone on campus, at any time of the day. Call security, and a security professional will meet you at your location on campus. The security professional will escort you to your residence hall, car, etc. Students may utilize this when walking to and from night classes around campus or after late night events. [SafeSwords Webpage](#)

### **CUH Alert Emergency Notification**

To get the latest emergency communication from Chaminade University, students' cell numbers will be connected to Chaminade's emergency notification text system. When you log in to the Chaminade portal, you will be asked to provide some emergency contact information. If you provide a cellphone number, you will receive a text from our emergency notification system asking you to confirm your number. You must respond to that message to complete your registration and get emergency notifications on your phone.

### **Assessment for Student Work**

With the goal of continuing to improve the quality of educational services offered to students, Chaminade University conducts assessments of student achievement of course, program, and institutional learning outcomes. Student work is used anonymously as the basis of these assessments, and the work you do in this course may be used in these assessment efforts.

### **Student with Disabilities Statement**

Chaminade University of Honolulu offers accommodations for all actively enrolled students with disabilities in compliance with Section 504 of the Rehabilitation Act of 1973, the Americans with Disabilities Act (ADA) of 1990, and the ADA Amendments Act (2008).

Students are responsible for contacting Kokua Ike: Center for Student Learning to schedule an appointment. Verification of their disability will be requested through appropriate documentation and once received it will take up to approximately 2–3 weeks to review them. Appropriate paperwork will be completed by the student before notification will be sent out to their instructors. Accommodation paperwork will not be automatically sent out to instructors each semester, as the student is responsible to notify Kokua Ike via email at [ada@chaminade.edu](mailto:ada@chaminade.edu) each semester if changes or notifications are needed.

### **Kōkua 'Ike: Tutoring & Learning Services**

Chaminade is proud to offer free, one-on-one tutoring and writing assistance to all students. Tutoring and writing help is available on campus at Kōkua 'Ike: Center for Student Learning in a variety of subjects (including, but are not limited to biology, chemistry, math, nursing, English, etc.) from trained Peer and Professional Tutors. Please check [Kōkua 'Ike's](#) website for the latest times, list of drop-in hours, and information on scheduling an appointment. Free online tutoring is also available via TutorMe. Tutor Me can be accessed 24/7 from your Canvas account. Simply click on Account > TutorMe. For more information, please contact Kōkua 'Ike at [tutoring@chaminade.edu](mailto:tutoring@chaminade.edu) or 808-739-8305.

## Topics & Due Dates

| Week   | Date        | Lesson  | Due Dates   |
|--|-------------|---|---|
| 1  | 1/13 - 1/15 | <ul style="list-style-type: none"> <li>• Student Introductions</li> <li>• Syllabus Review</li> <li>• TACC Accounts and Jupyter Notebooks</li> <li>• <b>Introduction to Machine Learning and AI Basics</b></li> </ul>  |   |
| 2  | 1/20 - 1/22 | <ul style="list-style-type: none"> <li>• <b>Foundations of AI</b></li> <li>• Foundational Concepts</li> <li>• Historical Milestones</li> <li>• Applications</li> </ul>  |   |
| 3  | 1/27 - 1/29 | <ul style="list-style-type: none"> <li>• <b>Machine Learning</b></li> <li>• <b>Introduction to Supervised Learning</b></li> <li>• Data Cleaning/Preparation</li> <li>• ML Best Practices (Train/Test/Split, Normalization)</li> <li>• Classifiers (Binary, Multiclass)</li> </ul> | Assignment 1<br>Due 1/30 11:59 PM                       |
| 4  | 2/3 – 2/5   | <ul style="list-style-type: none"> <li>• Logistic Regression</li> <li>• Gradient Boosted Trees</li> </ul>   |   |
| 5  | 2/10 – 2/12 | <ul style="list-style-type: none"> <li>• Random Forests</li> <li>• Support Vector Machines</li> </ul>   | Assignment 2<br>Due 2/13 11:59 PM                       |
| 6  | 2/17 – 2/19 | <ul style="list-style-type: none"> <li>• <b>Introduction to Unsupervised Learning</b></li> <li>• Clustering</li> <li>• Principal Component Analysis</li> </ul>  | Final Project<br>Proposal Due<br>2/20 11:59 PM          |
| 7  | 2/24 – 2/26 | <ul style="list-style-type: none"> <li>• <b>Neural Networks and Deep Learning</b></li> <li>• Neural Networks and Activation Functions</li> </ul>  |   |
| 8  | 3/3 – 3/5   | <ul style="list-style-type: none"> <li>• Convolutional Neural Networks</li> <li>• Recurrent Neural Networks</li> </ul>  | Assignment 3<br>Due 3/6 11:59 PM                        |
| 9  | 3/10 – 3/12 | <ul style="list-style-type: none"> <li>• <b>Generative AI</b></li> <li>• Large language models</li> <li>• Generative Pre-Trained Transformer (GPT)</li> </ul>   |   |
| <b>Week of March 16: SPRING BREAK (NO CLASS)</b> |             |   |   |
| 10   | 3/24 – 3/26 | <ul style="list-style-type: none"> <li>• Prompt Engineering</li> <li>• Code Generation</li> <li>• NO CLASS 3/26 – Prince Kuhio Day</li> </ul>   | Final Project<br>Progress<br>Check Due<br>3/27 11:59 PM |
| 11   | 3/31 – 4/2  | <ul style="list-style-type: none"> <li>• <b>Agentic AI</b></li> <li>• What is it?</li> <li>• How can I build it?</li> </ul>   | Assignment 4<br>Due 4/3 11:59 PM                        |
| 12   | 4/7 – 4/9   | <ul style="list-style-type: none"> <li>• <b>Real World Applications</b></li> <li>• Image and Video Analysis</li> <li>• Self-Driving Cars</li> <li>• Robotics</li> </ul>   |   |

|    |                    |  |  |
|----|--------------------|--|--|
| 13 | 4/14 – 4/16        | <ul style="list-style-type: none"> <li>• <b>Introduction to the Ethical Considerations for AI</b></li> <li>• Mitigating Bias in AI Systems</li> <li>• Transparency</li> </ul>    | Assignment 5<br>Due 4/17 11:59 PM            |
| 14 | 4/21 – 4/23        | <ul style="list-style-type: none"> <li>• Misinformation/Disinformation</li> <li>• Deep Fakes</li> <li>• <b>Introduction to Explainable AI</b></li> <li>• Transparency</li> </ul> |  |
| 15 | 4/28 – 4/30        | <ul style="list-style-type: none"> <li>• Interpretability</li> <li>• Causality</li> <li>• Fairness</li> <li>• Trustworthiness</li> </ul>   |  |
| 16 | 5/4 (8:30 – 10:30) | Final Project Presentations  | Final Project Submission<br>Due 5/8 11:59 PM |