Chaminade University

School of Natural Sciences and Mathematics
Computer Science

CS-204 Data Visualization

Tredtin Hall DSC MWF 2:30P-3:20P
Credits: #3   Section: #1   Term: Fall 2024

Instructor Information

Instructor: Kelly Gaither
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Phone: 512-775-1537
Virtual Office: Zoom (Coordinates provided in virtual office overview)
Virtual Office Hours: M-F 12-1 HST or by appointment
Communication: Email, slack or text. I will respond within 24/48 business hours.

Course Description & Materials

Catalog Course Description

This course is an applied visualization and analytics course that includes lectures, discussions, assignments, hands-on experiences, and a semester project. The course will primarily focus on visualization and analytics of data by providing and preparing students with the necessary knowledge, techniques, skills from a data science mindset. Students in this course will use Python, jupyter notebooks, and a visualization library to create web-based interactive visualizations and will learn the design, development, evaluation, and interpretation of visualization methods with different levels of development difficulty. Prerequisites: CS 201 or CS 202.

Time Allocation

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 37.5 hours in class and 60 hours for final project and research. There will be an additional 37.5 hours of work required beyond what is listed here (course readings, assignments, etc.), averaging 2.5 hours each week.

Required Materials

No textbook is required. Relevant reading materials will be provided prior to each class meeting

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.

Course Prerequisites
CS 201 or CS 202

Learning Outcomes

Course Learning Outcomes (CLOs)
Upon completion of the undergraduate B.S. program in Data Science, Analytics & Visualization, 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, visualizations, or other forms of analytics to support decision-making;
4. Apply effective data communication approaches for stakeholders and the public;
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.

Course Learning Outcomes	PLO 1	PLO 2	PLO 3	PLO 4	PLO 5
Apply a structured design process to create effective visualizations	X	X	X	X	
Critique visualizations and identify suggestions for refinement and improvement				X	

Construct visualization designs using sketching and prototyping		X			
Apply principles of human perception, cognition and storytelling to visualization design				X	X
Create web-based interactive visualizations on TACC's supercomputers using Jupyter	X	X	X	X	
Create dashboards for interactive visualizations using UI/UX principles, visualization design and storytelling	X	X	X	X	

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

Course Learning Outcomes	PLO 1	PLO 2	PLO 3	PLO 4
Apply a structured design process to create effective visualizations	X	X		
Critique visualizations and identify suggestions for refinement and improvement		X		
Construct visualization designs using sketching and prototyping		X	X	
Apply principles of human perception, cognition and storytelling to visualization design	X	X	X	
Create web-based interactive visualizations on TACC's supercomputers using Jupyter	X	X		
Create dashboards for interactive visualizations using UI/UX principles, visualization design and storytelling	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 ʻOlelo Noʻeau (Hawaiian proverbs) and Marianist core beliefs:

1. Educate for Formation in Faith (Mana) E ola au i ke akua (ʻŌlelo Noʻeau 364) May I live by God.
2. Provide an Integral, Quality Education (Naʻauao) Lawe i ka maʻalea a kūʻonoʻono (ʻŌlelo Noʻeau 1957) Acquire skill and make it deep.
3. Educate in Family Spirit (ʻOhana) ʻIke aku, ʻike mai, kōkua aku kōkua mai; pela iho la ka nohana ʻohana (ʻŌlelo Noʻeau 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 noʻeau (ʻŌlelo Noʻeau 1430) Education is the standing torch of wisdom.
5. Educate for Adaptation and Change (Aina) ʻAʻohe pau ka ʻike i ka hālau hoʻokahi (ʻŌlelo Noʻeau 203) All knowledge is not taught in the same school

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.

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 to design and prototype visualizations and interactive web-based components of the final project.

Final Project

Students will create a web-based interactive dashboard using Jupyter notebooks, Python and D3.js as their final project. All individual projects act as preparatory components for the final project.

Course Policies

Attendance

The following attendance policy is from the <mark>2024-2025 Academic Catalog:</mark> 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 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.

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 students are expected to complete course work during the semester, there are instances in which circumstances prevent that outcome. Students can only receive a grade of I if they provide appropriate documentation excusing them.

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

Assessment

Assessments	Points
Communication and Participation	10
Assignments (9x)	45
Final project	45
Total	**100**

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.

Nondiscrimination Policy & Notice of Nondiscrimination

Chaminade University of Honolulu does not discriminate on the basis of sex and prohibits sex discrimination in any education program or activity that it operates, as required by Title IX and its regulations, including in admission and employment. Inquiries about Title IX 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 at the [Chaminade University Title IX Office Contact Information and Confidential Resources website](#). 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.

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 each semester if changes or notifications are needed.

Kōkua ʻIke: 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 ʻIke: 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 ʻIke'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 ʻIke at tutoring@chaminade.edu or 808-739-8305.

Topics & Due Dates

Wk of	Theme	Info	Due Dates
08/19	Introductions	Syllabus; The Purpose of Visualization; Seven Stages of Visualization	
08/26	Development Tools	Jupyter Notebook through TAP; Creating Our First Visualization; Command Line Tools	
09/02	Data Visualization Principles and Encoding Techniques	Holiday; Principles and Encoding Techniques; Design and Data Visualization Brainstorming Exercise	
09/09	Designing Visualizations	User-Centered Design Process; Design Thinking	Map; Sketch
09/16	Types and Effectiveness of Visualizations	Scientific Visualizations; Information Visualizations; Effective Visualizations	Decide
09/23	Dashboards	Visual Hierarchy, Gestalt Principles, Color and Inspiration; Creating Our First Dashboard; **Semester Project Assigned**	Prototype
09/30	Storytelling	Data Stories and Narrative; Storyboarding and Inspiration; Creating a Storyline	Storyline
10/07	Evaluation	Qualitative User Studies; Design Critiques; Think-Aloud Studies	Test
10/14	Advanced Visualizations	Holiday; Advanced Visualizations; Advanced Visualizations in Practice	Map
10/21	Perception	Bottom-Up Versus Top Down; Encoding Effectiveness; Animation	Sketch; Decide

10/28	Developing Dashboard Using Python and D3.js	Learn command line editing and create initial infrastructure for dashboard using Python and D3.js	Prototype
11/04	Dashboard Layout	Learn UI/UX principles; Sketch dashboard layout; Develop dashboard layout	Sketch; Prototype
11/11	Dashboard Graphics	Learn how to connect D3.js with Python dashboard through callback functions	Prototype
11/18	Dashboard Data Connection	Learn how to connect project data into dashboard using Python for data manipulation and D3.js for visualization development	Prototype
11/25	Dashboard Refinement	Learn how to refine dashboard development for improved usability	Prototype; Refine
12/10	Final Projects Due	Final dashboards due; Demonstrate through video recording; Provide documentation for dashboard and visualization design and storytelling	