

DASC 512
Applied Statistics (Using Python)
Summer 2023

Instructors: Capt Takayuki Iguchi
email: takayuki.iguchi@afit.edu
email: takayuki.iguchi.1@us.af.mil
MS Teams: takayuki.iguchi.1@au.af.edu

Prerequisites: DASC 511

Required Text: Diaz, Çetinkaya-Rundel, and Barr. [OpenIntro Statistics, Fourth Edition](#).
ISBN: 978-1943450169.

Course Description: This course covers classic statistic measures such as mean, variance, confidence intervals, distributions, and statistical testing for parametric and non-parametric analyses, with a focus on automated evaluation and processing for statistical inference and prediction via linear and logistic regression.

Material Covered: We will cover the entire textbook according to the (approximate) schedule below. Much will also be covered beyond the textbook.

Week	Chapter	Topics
1	1–2	Math Refresher, Python, Data Collection, Expectation, Variance, Visualization
2	3	Probability, Conditional Probability, Counting, Random Variables
3	4–5	Discrete/Continuous Univariate Distributions, Central Limit Theorem
4	6–7	Hypothesis Tests, Confidence Intervals, Normality, Power, Contingency Tables
5	7	Tests for Mean and Variance (2 or more populations), Multiple Comparisons
6	8	Linear Regression, Correlation, R^2 , Model Coefficients, Assumptions, Testing
7	9	Multiple Regression, Interpretation of Regression Models, Feature Selection
8–9	9+	Advanced Feature Selection, Transformations, Discrete Data
10	9+	Logistic Regression, Generalized Linear Models

Grading:

Progress Checks 10%
Homework 25%
Midterm 30%
Final Project 35%

Grading may be on a curve with guaranteed cutoffs:

$93 \leq \text{Grade}$	A	$77 \leq \text{Grade} < 80$	C+
$90 \leq \text{Grade} < 93$	A–	$73 \leq \text{Grade} < 77$	C
$87 \leq \text{Grade} < 90$	B+	$70 \leq \text{Grade} < 73$	C–
$83 \leq \text{Grade} < 87$	B	$60 \leq \text{Grade} < 70$	D
$80 \leq \text{Grade} < 83$	B–	Grade < 60	F

Progress Checks: Most videos will have a progress check afterward to ensure comprehension of basic concepts. These may be completed multiple times.

Homework: Assignments will given for each block of instruction above except weeks 5, and 10. The due date will be posted on Canvas for each assignment. Homework should reflect individual effort and may include code output and/or written results.

Midterm: The midterm will cover the material from Chapters 1–7 of the course text. It will be given approximately halfway through the quarter and students will have at least one week to complete the assignment.

Final Project: The final project will consist of a written report. The report should include the final regression model detailing model selection procedures, required testing of assumptions with appropriate transformations as required, and appropriate conclusions/inference on the data.

Student Learning Objectives

The successful student will be able to:

1. Apply classical statistical measures and visualization techniques to a dataset using Python.
2. Perform standard inferential methods for mean and variance including hypothesis testing and confidence intervals.
3. Transform and back-transform data for use in standard regression.
4. Develop and present a regression analysis given an appropriate dataset.

Academic Integrity: All students must adhere to the highest standards of academic integrity. Students are prohibited from engaging in plagiarism, cheating, misrepresentation, or any other act constituting a lack of academic integrity. Failure on the part of any individual to practice academic integrity is not condoned and will not be tolerated. Individuals who violate this policy are subject to adverse administrative action including disenrollment from school and disciplinary action. Individuals subject to the Uniform Code of Military Justice may be prosecuted under it. Violations by government civilian employees may result in administrative disciplinary action without regard to otherwise applicable criminal or civil sanctions for violations of related laws. (References: Student Handbook, ENOI 36 – 107, Academic Integrity)

Academic Grievance: AFIT and the Graduate School of Engineering and Management affirm the right of each student to resolve grievances with the Institution. Students are guaranteed the right of fair hearing and appeal in all matters of judgment of academic performance. Procedures are detailed in ENOI 36 – 138, Student Academic Performance Appeals.