

**CS 4347 - Introduction to Machine Learning**  
Course Syllabus (updated: Aug 25 2021)

**Instructor:** Dr. Jelena Tešić, [jtesic@txstate.edu](mailto:jtesic@txstate.edu)  
**Web Page:** [jtesic.github.io](https://jtesic.github.io)  
**Student Hours Time:** Tue 5 pm – 6:30 pm Thu 1:30 pm – 3 pm  
**Student Hours Location:** Microsoft Teams chat (NetID: j\_t463) for Zoom meet  
In person meets in Comal 307B not held at the moment

**Lectures:** Tuesday Thursday 3:30 pm - 4:50 pm @ **Derrick 240**  
**Internal course Canvas page:** <https://canvas.txstate.edu/courses/1776358>  
**Internal course git page:** <https://git.txstate.edu/ML/2021Fall.git>

**TA:** Debojyoti Biswas (Bishal)  
**NetID:** ubq3  
**Student Hours:** Monday 4 p.m. (contact ubq3 on MS Teams for 1-1 meet)  
Wednesdays 4p.m. open door on Zoom <https://txstate.zoom.us/my/bishal>

**Syllabus is subjected to change.**  
**Canvas course information trumps information in the pdf file.**  
**Please check the update dates for both.**

### Course Description

Provides a systematic introduction to machine learning, covering basic theoretical as well as practical aspects of machine learning methods and their applications. Covers learning theory and algorithms, and applications in the fields of face recognition, text recognition, biometrics, bioinformatics, and multimedia retrieval.

### Course Objectives

- The student will be able to describe learning methodologies such as unsupervised learning, supervised learning etc.
- The student will be able to recognize various learning tasks, such as regression and classification, and choose appropriate learning approaches for the task.
- The student will be able to implement machine learning algorithms such as K-means, Hierarchical Clustering, Linear Regression, Logistic Regression, Bayesian Learning, SVM, etc.
- The student will be able to build up learning systems, train the systems on training datasets, and generate predicted results on testing datasets.
- The student will be able to evaluate the performance of machine learning algorithms in terms of precision, recall, and F-measure.
- The student will be able to analyze a target problem and apply machine learning techniques to it.

### Course Topics

- m1: Introduction to Machine Learning Concepts
- m2: Statistical Learning
- m3: Linear Regression
- m4: Classification
- m5: Resampling Methods
- m6: Model Selection
- m7: Decision Trees
- m8: Support Vector Machines
- m9: Principal Components and Clustering
- m10: Gradient Descent
- m11: Neural Networks and Deep Learning

## Course Prerequisites

- C or higher in CS 3358: Data Structures OR Equivalent.
- **Knowledge of basic computer science principles and skills, at a level sufficient to write a reasonably non-trivial computer program.**
- Familiarity with the basic probability theory and basic linear algebra.

## Course Instruction Mode

The class meets twice a week on Tuesdays & Thursdays 3:30pm – 4:50pm in Derrick 240.

- Students are encouraged to attend the classes in person (all -quizzes; 4347 participation points)
- Zoom access will be provided per need basis.
- Slides, class notes and other lecture material will be available on Canvas.
- A combination of presentation slides and coding examples will be used in lectures.
- Solutions to exercise and homework problems will be discussed in class. All students are expected to work on these problems and participate in the class discussions.
- Midterm exam will be on Nov 11<sup>th</sup> and it will be **open-notes**.
- Python will be used as the primary programming language of the course.

## Resources

The course has no required textbook. Course materials come from the following sources:

- *An Introduction to Statistical Learning*, by James, G., Witten, D., Hastie, T., Tibshirani, R. ISBN 978-1-4614-7138-7 (Free PDF: [https://web.stanford.edu/~hastie/ISLRv2\\_website.pdf](https://web.stanford.edu/~hastie/ISLRv2_website.pdf))
- *Introduction to Machine Learning with Python: A Guide for Data Scientists*, by Andreas C. Müller, Sarah Guido, ISBN-13: 978-1449369415 (ebook available from Alkek Library)
- *Pattern Recognition and Machine Learning*, by Christopher M. Bishop, 2006. ISBN 978-0-387-31073-2
- *Deep Learning*, by Ian Goodfellow, Yoshua Bengio and Aaron Courville, 2016. ISBN-13: 978-0262035613
- Material released by instructor, link: <https://git.txstate.edu/CS4347/2021Fall>
- Texas State LinkedInLearning instructor collections, e.g. [Python Data Analysis](#)

## Assessment

- **Class attendance:** 5pt
- **Class participation:** 5pt
- **Canvas Quizzes:** 5pt
- **Homework assignments:** 40pt
- **Midterm Exam** 30pt
- **Final Project** 30pt

**Class attendance:** class attendance is taken on Canvas at random time during class. Class seating chart is finalized during the first week of instructions. Students will keep the same seat throughout the semester.

**Class participation:** ACTIVE Participation will prepare you well for homework assignment, midterm exam, and projects. Students are expected to attend the classes, interact actively during lectures, and discuss homework assignment solutions in the class.

**Quizzes:** There will be 5 quizzes on Canvas, at the end of the lecture. It is a timed exercise.

**Homework:** 9 homework assignments posted a week ahead, 5pt each. Top 8 scores counted towards the grade. Late homework submissions incur 1pt penalty per day, for up to 3 days. After the 3 days, no submission will be accepted.

**Midterm Exam:** Midterm exam is in person on Nov 11<sup>th</sup> during class time. It covers all the material from the first 11 weeks of instructions.

**Final Project:** Final project is a team project. Project presentations need to be recorded and submitted by Dec 2<sup>nd</sup>. Teams will be randomly picked by an instructor to present Dec 2<sup>nd</sup> during class time. Entire team needs to be present for the presentation grade. Final report in markdown format and code submitted on git is due Tuesday Dec 7<sup>th</sup> EOD.

**Missed Exams and Makeup Work:** Extra credit for missed homeworks or class participation is built into assessment (extra HW, 115pt out of 100pt max). Contact the instructor if you miss midterm exam or quiz due to unavoidable circumstances (e.g., health).

**Attendance and Drop Policy:** Attendance though not mandatory, is HIGHLY encouraged. Class participation is assessed through **class attendance and participation** component.

**Grade Grievance Policy:** If a student believes a mistake has been made in grading a homework assignment, the student needs to email the TA first. If it is not resolved, the student needs to email instructor next to resolve an issue.

**Drop Policy:** You must follow the withdrawal and drop policy set up by the University and the College of Science. You are responsible for checking the drop deadlines and making sure that the drop process is complete. <http://www.registrar.txstate.edu/registration/drop-a-class.html>

**Academic Integrity and Student Conduct:** You are expected to adhere to [Code of Student Conduct](#), the University's Academic [The Honor Code](#), and the [Computer Science Department Honor Code](#).

- All work submitted in the class is expected to be your individual work, except where explicitly and specially allowed (such as group project).
  - Plagiarism will not be tolerated and if detected will result in automatic "F" grade.
- Do not include code (or other materials) obtained from the Internet in your assignments
  - except what is provided or allowed by the instructor.
- Do not email your program to anyone except your team or the instructor.
- The penalty for submitting a program that has been derived from the internet or any other non-approved source will be a 0 for that assignment.
  - Violators will be reported to the Texas State Honor Code Council (<http://www.txstate.edu/honorcodecouncil/>).

### **Campus Health, Wellness, and Safety**

Considering rising infection rates and recent [Centers for Disease Control and Prevention guidelines](#), Texas State is requesting all members of the university community to take these five additional steps:

1. **Get tested.** Regardless of vaccination status, get tested before the start of the fall semester and when selected to participate in Texas State's random COVID-19 testing program. Testing information can be found on the [Texas State's COVID-19 Testing, Reporting, and Response Steps webpage](#).
2. **Stay home and get tested if you develop cold-like or other [COVID-19 symptoms](#),** regardless of vaccination status.
3. **Promptly Report to Bobcat Trace** if you test positive for COVID-19 or have had close contact with someone who received a positive test result. Reporting information can be found on the [Texas State's COVID-19 Testing, Reporting, and Response Steps webpage](#).
4. **Isolate if you test positive for COVID-19.** Stay home and away from others for 10 days from the start of symptoms or the positive test if you have no symptoms.
5. **Quarantine if you have been identified as a close contact** and stay home for the prescribed time period. Fully vaccinated Bobcats who are asymptomatic are not required to quarantine but should get tested for COVID-19 three to five days after last exposure. They should also wear a face mask when indoors in public spaces for 14 days since the exposure or until a negative test result is obtained three to five days after exposure. Unvaccinated Bobcats are required to quarantine for 10 days since the time of last exposure.

Please continue to follow the university's [Roadmap](#) for updates.

### **Face Covering and Vaccination Protocol**

Per standing guidance from Governor Abbott's executive orders and confirmed by The Texas State University System's Office of the Vice Chancellor and General Counsel, the university is not able to require face coverings or vaccinations. Every member of the university community is urged to get

vaccinated and wear a mask indoors, regardless of vaccination status. Together, we can reduce the risk of infection and transmission of COVID-19 and live out our shared values of respect and compassion.

### **Student Accommodations**

- COVID-19 Information: <https://www.ods.txstate.edu/current-student-resources/COVID-19-Information.html>
- COVID-19 FAQs: <https://www.ods.txstate.edu/current-student-resources/COVID-19-Information.html>

The Office of Disability Services is no longer providing special accommodation approvals for students who state they are at higher-risk for complications from contracting COVID-19. The [Office of Disability Services \(ODS\)](#) provides reasonable accommodations to qualified students with disabilities. Faculty are responsible for implementing accommodations based on the office's process, assessment, and formal recommendations per [UPPS 07.11.01, Disability Services for Students](#). Please note that although students with ODS accommodations may discuss alternatives with instructors if they are unable to attend a face-to-face class, a faculty member is not required to accommodate a request that represents a fundamental alteration to the delivery methods of a course or program. Student requests for modifications outside of the ODS process may be considered by a faculty member, but there is no requirement to make modifications.

### **Student Absences**

As in the past, faculty have discretion in managing student absences, including those due to illness. Students who must isolate or quarantine should report to [Bobcat Trace](#) and contact their professors to make appropriate arrangements for completing assignments. Students can notify instructors directly or utilize [the absence notifications form](#). Faculty members determine appropriate arrangements for students who miss class.

### **Our Mission and Our Shared Values**

Faculty who wish to include information about the university's mission and shared values statements in a syllabus for spring 2021 courses should use the following statements from the [2017-2023 Texas State University Plan](#):

#### Mission

Texas State University is a doctoral-granting, student-centered institution dedicated to excellence and innovation in teaching, research, including creative expression, and service. The university strives to create new knowledge, to embrace a diversity of people and ideas, to foster cultural and economic development, and to prepare its graduates to participate fully and freely as citizens of Texas, the nation, and the world.

#### Shared Values

In pursuing our mission, we, the faculty, staff, and students of Texas State University, are guided by a shared collection of values:

- Teaching and learning based on research, student involvement, and the free exchange of ideas in a supportive environment;

- Research and creative activities that encompass the full range of academic disciplines— research with relevance, from the sciences to the arts, from the theoretical to the applied;
- The cultivation of character, integrity, honesty, civility, compassion, fairness, respect, and ethical behavior in all members of our university community;
- A diversity of people and ideas, a spirit of inclusiveness, a global perspective, and a sense of community as essential conditions for campus life;
- A commitment to service and leadership for the public good;
- Responsible stewardship of our resources and environment; and
- Continued reflection and evaluation to ensure that our strengths as a community always benefit those we serve.

## Emergency Management

In the event of an emergency, faculty, students, and staff should monitor the [Safety and Emergency Communications web page](#). This page will be updated with the latest information available to the university, in addition to providing links to information concerning safety resources and emergency procedures. Faculty, students, and staff are encouraged to sign up for the [TXState Alert](#) system.

## Sexual Misconduct Reporting (SB 212)

Effective January 2, 2020, state law (SB 212) requires all university employees, acting in the course and scope of employment, who witness or receive information concerning an incident of sexual misconduct involving an enrolled student or employee to report all relevant information known about the incident to the university's Title IX Coordinator or Deputy Title IX coordinator. According to SB 212, employees who knowingly fail to report or knowingly file a false report shall be terminated in accordance with university policy and The Texas State University System Rules and Regulations.

## Relevant Campus Resources

[cs.txstate.edu](https://cs.txstate.edu) -> News, Job Announcements, Lab and Tutoring Announcements (@txstCS)

**Free Online Courses through LinkedIn Learning Hub:** <https://doit.txstate.edu/services/online-training.html>

**Food Insecurity: Bobcat Bounty** is the first student-run, on-campus food pantry at Texas State University. It is run by students under the direction of faculty from the Food Security Learning Community in the Nutrition & Foods Program. Our goal is to decrease food insecurity by providing healthy food to the students, faculty, and administration at Texas State University. The majority of our food comes from the Hays County Food Bank, a partnership to create a grocery store style experience for clients.

<https://bobcatbounty.txstate.edu/Eligibility.html>

**Texas State Counseling Center:** Counseling Center services are free, confidential, and provided by trained professionals to currently enrolled Texas State students while classes are in session. Counseling Center Services include brief individual, group, and couples counseling, consultation and crisis response, and workshops about coping with stress and other mental health topics.

<https://www.counseling.txstate.edu/>

**Texas State Sexual Misconduct Policy and Reporting:** If you need to make a report, please contact Ameerah McBride, Title IX Coordinator at 512.245.2539 or you can file a report for someone else, anonymously, or using a pseudonym here:

[https://cm.maxient.com/reportingform.php?TexasStateUniv&layout\\_id=10](https://cm.maxient.com/reportingform.php?TexasStateUniv&layout_id=10)

Title IX details: <https://www.txstate.edu/oei/title-IX.html>

**Discrimination Complaints:** Texas State prohibits discrimination and harassment based on race, color,

national origin, age, sex, religion, disability, veterans' status, sexual orientation, gender identity, or gender expression. Additionally, Texas State prohibits retaliation against a person who files a harassment or discrimination complaint, or who assists or participates in the investigation of a report.

<https://www.txstate.edu/oei/policies/complaints.html>

**Office of Student Diversity and Inclusion:** <https://www.sdi.txstate.edu/>

Texas State Alliance: <https://twitter.com/TxstAlliance>

<https://www.sdi.txstate.edu/Support-and-Empowerment/LGBTQIA-and-Allies.html>

**Full List of On-Campus Resources:**

<https://www.studentsuccess.txstate.edu/programs/faces/On-Campus-Resources.html>

**Search Student Organizations:**

<https://www.lbjsc.txstate.edu/soc/join/search-orgs.html>