Intro to CS156, logistics

Yulia Newton, Ph.D.

CS156, Introduction to Artificial Intelligence

San Jose State University

Spring 2021

This lecture is being recorded

Are you in the right class?

- Object oriented design and programming (CS156)
- Section 3
- SJSU
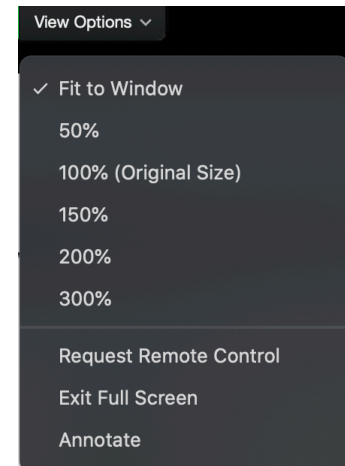- Spring 2021 semester

About me

- Yulia Newton, Ph.D.

- Bachelor of Science in computer science with minor in mathematics, magna cum laude
  - San Jose State University, San Jose, CA
- Master of Science in bioinformatics
  - University of California Santa Cruz, Santa Cruz, CA
- Ph.D. in bioinformatics and biomolecular engineering
  - University of California Santa Cruz, Santa Cruz, CA

- I am not a full time professor
  - This semester I teach CS151 and CS156
  - I live and work in Santa Cruz
- I do computational cancer genomics research (bioinformatics) and data science at a biotech company in Santa Cruz, CA
- Call me Yulia or Dr. Newton (just not Ms/Mrs Newton)

Welcome to CS156 Section 3

- Logistics
  - Class meeting days/times: Mon/Wed 7:30-8:45pm
  - Class meeting place/format: online
    - All lectures are held via zoom
    - All lectures will be recorded and posted in Canvas so you can watch/rewatch them at a later time
  - Office hours: Wed 4:50 – 5:50 PM (online via zoom)
    - Will be posting the zoom link in Canvas
    - Additional hours are available by appointment
      - Please schedule an appointment (via email or Canvas message)
  - My email:
    - yulia.newton@sjsu.edu or yulia.newton@gmail.com
    - Canvas messages
  - No separate lab meeting; homework-heavy class

Class format

- Online/remote format only
- All lectures are held via zoom
  - I will present power point slides
  - All participants will be automatically muted
    - Unmute yourself to speak up and ask questions
    - Use the chat window to ask questions
    - Raise your hand
  - Make sure to fit zoom screen to window or some slides might get cut off
  - You are not required to have your camera on
- All lectures are recorded and will be posted in Canvas so you can watch/re-watch them at a later time

View Options ⌄

✓ Fit to Window

50%

100% (Original Size)

150%

200%

300%

Request Remote Control

Exit Full Screen

Annotate

If you are looking to add this class

- Add your name to this Google sheets document
  - https://docs.google.com/spreadsheets/d/13QR7qxCFoJ7TRsPVRQsxl3YLH3C4TE8-FtV-UUwkM8g/edit?usp=sharing

- I will go through and issue add codes based on the ranking
  - Graduating seniors get the priority

Pre-requisites

- CS 146 (Data Structures and Algorithms)
  - With a grade of "C-" or better
- CS 151/CMPE 135 (Object Oriented Design and Analysis)
  - With a grade of "C-" or better

How strict are pre-requisites?

- 100%
- Not my choice
- Not negotiable
- Zero time and zero tolerance for requests for special treatment
- I expect you to have a sufficient proficiency in python to complete coding assignments for this class
  - There will be a lot of coding in this class as a part of homework assignments
  - There will be some coding questions on the midterm and final exams
- I will not be providing python review/refresher

Harsh reality

- Many students to process in very little time
- No exceptions to the rules except for documented emergency (e.g. medical)
- Email requests for non-emergency special treatment will not be answered
- I will try to get to know each and one of you individually but this is a large class and it may take a while
- You are all adults and are expected to behave and be treated as such

Attendance policy

- Attendance will not be taken
  - Except for this first lecture
    - A secret word will be asked for in a non-graded attendance quiz
      - There will be a non-graded quiz asking for the secret word

      - Secret word: **XXX**
        - **Please use all upper case**
  - It is highly recommended that you attend live lectures
    - You can ask questions as I go

- You are responsible for understanding all the material covered in class, whether you attended the lecture or not
  - If you need help
    - connect during office hours or schedule to have a one-on-one zoom meeting with me
    - ask your peers
    - use resources provided to you by the university
    - use Google

Your conduct during live online lectures

- Be respectful of other students in class
  - Mute your microphone
  - No video is required
    - If your video is turned on please be mindful of your appearance and your background
  - All and any harassment of classmates will not be tolerated in this class, during or outside of the live lectures
  - To ask questions or speak up
    - Unmute your microphone and speak up
    - Type in your message/question into the chat window
    - Raise your hand

- Be aware: I will be recording all live lectures
  - Not the office hours

You are expected to write a lot of code in this class

- You will learn AI by practicing coding
- We will use explicitly only python in this class
  - I expect you to know the basics of python programming
    - No advanced expertise is required
  - I will offer extremely limited help with python debugging
- I will demonstrate plenty of small coding examples in this class
  - I will use Jupyter notebooks for all of my examples
  - I will ask you to submit homework assignment solutions as Jupyter notebooks
    - You will have to submit both the .ipynb and the .pdf files (for pdf, export/save your notebook as pdf)
- What you will need installed for your programming environment: Python 3, Scikitlearn libraries, numpy/scipy, tensorflow/keras, gym, Jupyter notebooks. Installing Anaconda is highly recommended. I will be using JupyterLab in my code demos in class (Jupyter notebooks).
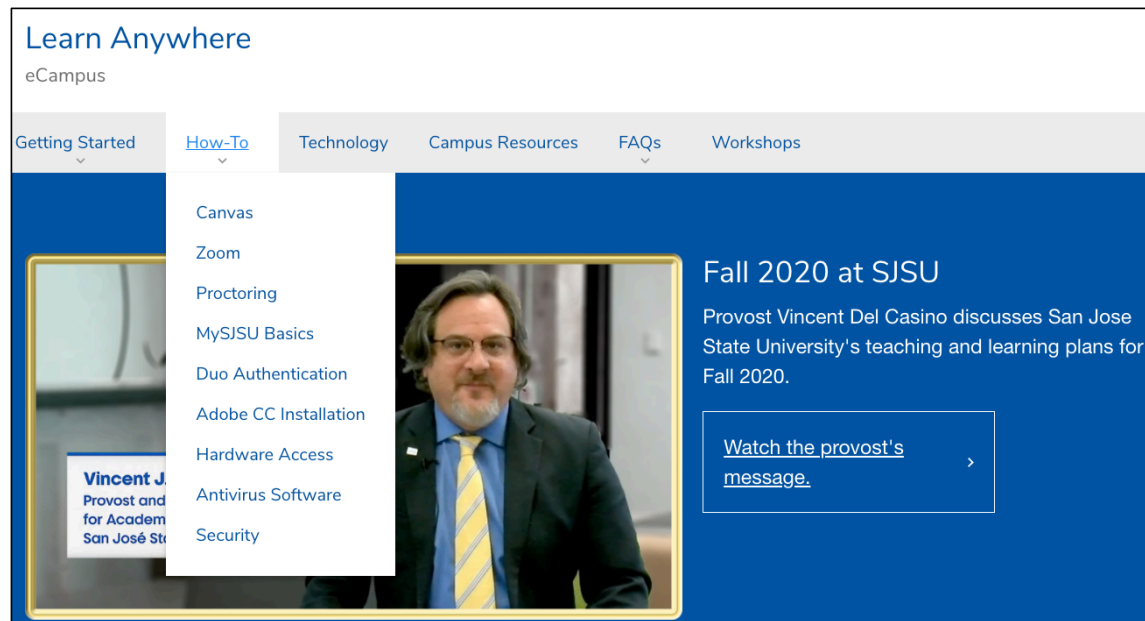
Help with coding/debugging

- Copying code from another source can introduce unrecognized characters
  - Do not copy/paste code snippets
  - Type code in on your own
- I will provide some reasonable amount of help with your code if you struggle but I will not fix all your code issues
  - You are expected to write your own code
  - You are expected to understand your own code
  - You are expected to spend time and effort trouble-shooting and debugging your code
  - These are the expectations you will encounter in the work force

Other study resources available for you

- Peer connections
  - https://peerconnections.sjsu.edu/
- Computer science study lab
  - https://www.sjsu.edu/cs/resources/study-lab/
- Check out other resources
  - http://www.sjsu.edu/cs/resources/index.html
  - https://www.sjsu.edu/cs/practicalities/struggling/index.html
- And there is always Google!

- Software, tools, and other resources available at https://one.sjsu.edu/

LearnAnywhere

- https://www.sjsu.edu/learnanywhere/
- Resources to help you with remote mode of learning

LearnAnywhere workshops

Remote campus resources

- https://www.sjsu.edu/learnanywhere/campus-resources/index.php

- Academic and career
  - Writing center, accessible education center, peer connections, career center
- Advising
  - Advising hub, academic advising and retention services, college student success center, educational opportunity program, etc.
- Creating connections
  - Campus life, African American/black student success center, Chicanx/Latinx student success center, gender equality center, veterans resource center, PRIDE center, cross cultural center, UndocuSpartan resource student center, SJSU events calendar, etc.
- Financial resources
  - Financial help & scholarships office, SJSU Cares
- Health and wellness resources
  - Student health center, counseling and phycological services, COVID-19 health advisories
- Library resources
  - Using library online, live chat help, etc.

Students with disabilities

- Accessible education center (AEC)
  - https://www.sjsu.edu/aec/
- Special accommodations are available if you have a disability
  - Make sure you arrange in advance
  - AEC contacts me directly

MyAEC

Student Portal

Current SJSU Students using SJSU Single-Sign On*(i.e. one.SJSU.edu access)* use the MyAEC student portal to apply online and access AEC services and accommodations.

New Prospective Students *(Non-SJSU Matriculated Students)* Register Here.

Mental well being help

- Counseling and psychological services (CAPS) are available
  - https://www.sjsu.edu/counseling/students/index.html

  - Personal counseling
    - individual counseling, couples counseling, crisis intervention, confidentiality, depression screening
  - Case management
    - helps students to access resources in the community to assist with a variety of basic needs including food, legal services, ongoing counseling, health insurance, childcare, addiction-related counseling, support groups, money-management resources, dental/vision care, disabilities resources, eating disorder treatment/resources, housing/homelessness resources, immigration resources, immune disorder testing/services, information about public benefit programs, intimate partner violence resources and veterans resources.
  - Psychiatric services
    - https://www.sjsu.edu/counseling/students/Psychiatric_Services/index.html

No required text book

- I use a lot of examples in my lectures
- Google is your friend!
  - Many resources are available online
  - In real life experience you rarely consult a text book
  - Technology moves fast: what you learn in school may not be what you will use in 10 years
- Always, always refer to programming API
  - No book or online resources is more accurate than the primary source (specification)
- Optional text (I will not be teaching by this text book)
  - **Artificial Intelligence: A modern approach (3rd or 4th edition)**, Stuart Russel and Peter Nerving
- Practice, practice, practice!
  - The only way you will improve in this class and your career is by actually coding

My teaching style

- Each topic is a module unit
  - If we are done with a unit and still have time during class I will start a lecture on the next unit
  - Some modules take more than one lecture
- For each topic we learn I will present programming examples relevant to that topic
- This class is only an introduction to the topics presented here
  - I can not teach you everything. If you are interested to learn more about some topic, google is your friend
  - Learn on others' examples. There are lots of very smart people who probably already put a lot of thought into what you are working on. Learn from their experiences, failures, and successes
  - I can never show every possible programming example
    - Even the examples that I will show have multiple ways of achieving the same results
- "Go home" and practice
  - Homework assignments are only minimum practice, it's worth it to do more on your own
- No text book required
- Google is your friend!
  - This is representative of what you will encounter in the work force
- You take charge of your success in this class
  - How much you take away from this class is directly correlated to how much effort/time you put in

Lectures

- Zoom lecture format
- PDF format of power point slides will be provided
- All lectures will be recorded and the recordings will be posted to Canvas
- Questions during the lectures are welcomed
  - I will generally mute-all during the lectures to avoid unnecessary noises and other audio distractions
  - Type questions into the chat window

Tentative schedule

- Refer to the syllabus
- Subject to a change, depending on how fast or slowly we are progressing
  - This is my first time teaching this class, so it might be a bit of a bumpy road. Let's all buckle up
- If we have time we will have additional topics lectures at the end of the semester
  - We might review a peer reviewed AI paper
    - In this field you must learn how to read new and upcoming research - things are changing too fast for you to be content with what you know

Course Schedule *Tentative schedule. Subject to change with notice.*

Week	Date	Topics, Readings, Assignments, Deadlines	Additional Notes
1	1/27/2021	Class introduction, logistics, misc.	
2	2/01/2021	High level overview of artificial intelligence, terminology and main concepts	
2	2/03/2021	High level overview of artificial intelligence, terminology and main concepts	
3	2/08/2021	High level overview of artificial intelligence, terminology and main concepts	
3	2/10/2021	High level overview of artificial intelligence, terminology and main concepts	Homework 1 assigned
4	2/15/2021	Introduction to PCA, k-means clustering, and KNN classification	Homework 2 assigned
4	2/17/2021	Regression models	Homework 1 due
5	2/22/2021	Regression models	Homework 2 due
5	2/24/2021	Regression models	Homework 3 assigned
6	3/01/2021	Support vector machines	Homework 4 assigned
6	3/03/2021	Support vector machines	Homework 3 due
7	3/08/2021	Decision tree based models	
7	3/10/2021	Decision tree based models	Homework 4 due Homework 5 assigned
8	3/15/2021	Introduction to single-layer perceptron	Homework 6 assigned
8	3/17/2021	Midterm (no class meeting)	
9	3/22/2021	Introduction to multi-layer perceptron	Homework 5 due
9	3/24/2021	Introduction to multi-layer perceptron	Homework 6 due Homework 7 assigned
10	3/29/2021	Spring break (no class meeting)	
10	3/31/2021	Spring break (no class meeting)	
11	4/05/2021	Introduction to convolutional neural networks	Homework 7 due
11	4/07/2021	Introduction to convolutional neural networks	
12	4/12/2021	Introduction to convolutional neural networks	Homework 8 assigned
12	4/14/2021	Introduction to TensorFlow and Keras	
13	4/19/2021	Introduction to TensorFlow and Keras	Homework 8 due Homework 9 assigned
13	4/21/2021	Autoencoders	Homework 10 assigned
14	4/26/2021	Introduction to generative adversarial networks (GANs)	Homework 9 due Homework 11 assigned
14	4/28/2021	Introduction to recurrent neural networks	Homework 10 due
15	5/03/2021	Introduction to recurrent neural networks	Homework 12 assigned
15	5/05/2021	Introduction to reinforcement learning	Homework 11 due
16	5/10/2021	Introduction to reinforcement learning	Homework 13 assigned
16	5/12/2021	Catch up and/or additional topics	Homework 12 due
17	5/17/2021	Ethics and artificial intelligence	Homework 13 due
Final	5/24/2021	Final exam	

There will be quizzes that are not on this schedule yet. Roughly, there will be one quiz per week, normally posted on Wednesday or Thursday and due on Mondays.

Course objectives

Upon successful completion of this course, students will be able to:

1. Understanding of artificial intelligence and machine learning principals:
   a. General understanding of formulating a prediction problem
   b. Classification vs. regression
   c. Supervised vs. unsupervised learning
   d. Predictor vs. independent/input variables; feature space
   e. Model overfitting and underfitting; model bias and variance
   f. Curse of dimensionality
   g. Occam's razor
   h. Feature space reduction and techniques; feature engineering
   i. Training vs. test vs. validation sets; cross-validation; stratified cross-validation
   j. Model evaluation methods
   k. Loss function and various types of commonly used loss functions
   l. Model parameters vs. hyperparameters
   m. Optimization with gradient descent

2. Understanding of machine learning models:
   a. KNN
   b. Linear, polynomial, logistic regression
   c. Linear and non-linear SVMs
   d. Decision trees
   e. Single layer perceptron
   f. Multi-layer perceptron
   g. Deep neural networks
   h. Reinforcement learning

3. Understanding of various deep neural network architectures:
   a. Fully connected deep neural networks
   b. Convolutional neural networks
   c. Autoencoders
   d. Recurrent neural networks, LSTMs
   e. Generative adversarial networks

4. Knowledge of how to approach solving various prediction tasks:
   a. Dimensionality reduction and clustering
   b. Classification vs. regression problems
   c. Reinforcement learning problems

5. Familiarity with solving problems in the following domains:
   a. Global economy
   b. Bioinformatics
   c. Handwriting recognition
   d. Image processing
   e. Natural language processing
   f. Generative modeling
   g. Robotics

Homework assignments

- Homework assignments through out the semester
  - 40% of your total grade (a pretty good chunk!)
  - Coding assignments
  - Assigned at the end of each topic modules/units
  - No draft submission
    - Incomplete homework assignments will be penalized
  - Start early
  - Ask for help
    - Office hours, one-on-one meeting request (prior to assignment due date!), other campus resources, Google and other online resources, your classmates

Grader

- Akshay Kajale
- akshay.kajale@sjsu.edu

Homework assignments can be time consuming

- Allocate up to several hours to complete each programming assignment
  - Start early
  - Read and instructions/requirements for each question carefully
  - Ask questions if requirements are not clear
  - Similar to real life experience, it might take a bit of time to understand what is being asked of you to code/ implement
  - Use any resources available to you to complete homework assignments

- When submitting your assignment
  - Submission via email
    - Attach both the .ipynb and .pdf files
    - The .ipynb file is the Jupyter notebook
      - Obtain pdf format of your Jupyter notebook by exporting/saving it as pdf
  - Put assignment number in email subject line (instructions are included with each assignment description)
    - E.g. "Assignment 1"
  - Due at 11:59pm on the due date

Quizzes

- Online quizzes
  - Roughly one quiz a week
    - Posted on Wednesday or Thursday and generally due on Monday evening
  - Online format
  - Open notes, lecture slide, and other resources
  - Take/finish any time before the due date
    - No time limit for each quiz
  - Submit by 11:59pm on the due date
- A total of 20% of your grade

Midterm

- One midterm (tentatively 03/17/2021)
  - Worth 20% of your grade
  - Online format
    - Open notes, lecture slides, online resources
    - Will have the whole day to complete it
      - Submit by 11:59pm on 03/17/2021
  - Combination of multiple choice, true/false, and match-terms questions as well as short programming questions
  - Special accommodations and scheduling can be worked out in advance but only for documented emergencies
    - AEC accommodations can be made in advance (slide 19)
  - Midterm study guide will be distributed

Final

- One final exam (5/24/21, online)
  - Worth 20% of your grade
  - Online format
    - Open notes, lecture slides, online resources
    - Will have the whole day to complete it
      - Submit by 11:59pm on 05/24/2021
  - Cumulative
    - Most problems being on the material from the second half of the semester (after the midterm)
    - Combination of multiple choice, true/false, and match-terms questions as well as short programming questions
      - Similar to midterm in size and format
  - Special accommodations can be worked out in advance but no re-scheduling is possible
  - Final exam study guide will be provided

Possible extra credit project (let's see how the semester goes)

- There might be a extra credit project due at the end of the semester
  - To be completed and submitted individually
- Possible ideas
  - Implement kernelized perceptron
  - Other topics might be used

How to succeed in this class

- This is a huge class

- The material is difficult

- Homework and studying require *Large Quantities* of *Quality Time*
  - It helps to employ additional online and printed resources to help you understand the material
  - Start on your homework assignments early and stay on top of them
  - Start forming virtual study groups now

- Lectures: take notes, study power point presentations, ask questions

- **Understand the reason for every line of code that you write**

How to succeed in this class (cont'd)

- Attend all lecture sessions (if possible)
  - From past semesters, data shows that there is a positive correlation between attendance and your overall grade
- Join the class on time
- If you miss a lecture you are still responsible for any material discussed or assignments given
- Be prepared to learn A LOT
- Ask questions
  - If you are stuck or don't understand something, ASK. Join during office hours. If office hours don't work for you please email to schedule one-on-one zoom meetings. I cannot help you if you don't ask for it.

Academic integrity policy

- Cheating of any kind is not tolerated in this class

- I am required to report any and all cheating attempts

- Read the official university academic integrity policy here
    - http://info.sjsu.edu/static/catalog/integrity.html

- Student responsibilities (taken from the web page above)
    - Know the rules that preserve academic integrity and abide by them at all times. This includes learning and abiding by rules associated with specific classes, exams and course assignments.
    - Know the consequences of violating the Academic Integrity Policy.
    - Know the appeal rights, and the procedures to be followed in the event of an appeal.
    - Foster academic integrity among peers.

Grading policy in this class

- **Grading calculation will be based on the following:**
  - Assignments/Problem Sets (40%)
  - Quizzes (20%)
  - Midterm exam (20%)
  - Final Examination (20%)

Grading policy (cont'd)

- **Incomplete work:**
  - Points will be deducted for incomplete question responses and solutions that are partially functional. Consult individual assignment for details of point allocation for each problem.

- **Extra credit:**
  - Extra credit options <u>might</u> be available in this class. All and any possible extra credit options will be announced in class and posted in canvas system if and when they become available.

- **Homework assignment, quiz, and exam due dates:**
  - Submission is allowed till 11:59pm on the due date.

- **Late assignments:**
  - No late homework will be accepted.

- **Makeup Exams:**
  - You must submit only your own work on exams. Makeup exams will only be given in cases of illness (documented by a doctor) or in cases of documentable, extreme emergency.

Grading scale

Grading scale:

Point % Range	Letter Grade	Point % Range	Letter Grade
97.0 – 100	A+	72.0 – 76.99	C
93.0 – 96.99	A	70.0 – 71.99	C-
90.0 – 92.99	A-	67.0 – 69.99	D+
87.0 – 89.99	B+	62.0 – 66.99	D
82.0 – 86.99	B	60.0 – 61.99	D-
80.0 – 81.99	B-	<60.0	F
77.0 – 79.99	C+		

Preferred name and contact information

- If you prefer me to use a name different than what appears in the roster then use this document to let me know your preferred name

- If you prefer to use an email other than your SJSU email then let me know your preferred email in this document

- https://docs.google.com/spreadsheets/d/1NzhtWjLpToacrJLiKOTSFbSXTkwqsqRgoQi_TGTYeTM/edit?usp=sharing

Important dates (Spring 2021)

- January 27 – first day of instructions
- **February 8** – last day to drop a class without W grade
- February 9 – late drop petition required
- February 15 – last day to add courses via MySJSU; last day to submit audit/CR-NC option request
- **March 17** – midterm exam (no class meeting)
- March 29 - April 2 – Spring break (no class meetings)
- May 17 – last day of instructions
- **May 24** – Final exam

Course evaluations

- It is very important to me that you evaluate this course

- I value your feedback and comments

- I will be using your evaluations to improve this course

Looking forward to working with you!

- Secret word: **XXX**

- Welcome to the class and let's get started

- Any questions?