ECE 533 Digital Image and Video Processing with Machine Learning Spring 2025

Professor Marios S. Pattichis
Room ECE 229-A
Department of Electrical and Computer Engineering
MSC01 1100
1 University of New Mexico
Albuquerque, NM 87131-0001
The University of New Mexico

COURSE INTERACTIONS GUIDE

Class Discussion Times (optional and recorded): Saturday mornings 9am to 11am
Class Discussions Zoom Link (updated): https://unm.zoom.us/j/98557787479

Discussions will be recorded and start on January 25th and repeat every Saturday until May 10th. There will not be a discussion during Spring Break on March 22nd.

Students who need to meet at a different time are encouraged to contact the instructor to set up a meeting time:

Instructor Cell Phone: (505) 563-0563 (please text me first with ECE 533 in the text)
Instructor Email: *pattichi@unm.edu*
Department Phone: (505) 277-2436
Department Fax: (505) 277-8298
Instructor office: ECE Room 229A (by appointment only)

During personal meeting times, the instructor can be reached using personal zoom link: https://unm.zoom.us/j/8307784406

Format:
This is a 3-credit hour course. The course is offered online asynchronously and through the Accelerated Online Program.

Meetings:
There is no requirement for synchronous meetings in the course. The students are expected to setup meeting times with the instructor to discuss their projects.

Class discussions:
Class discussions are optional and will be recorded. Their goal is to focus on problem-solving and homework. Students can expect me to go through each problem in the assignment and pause for questions. By Friday afternoon, the students are encouraged to email questions to the

instructor. My goal is to post the class discussions by Saturday evening. For each video, I will briefly describe what was covered.

Office hours:
Class office hours provide the option for one-to-one meetings. A student may request for a private one-to-one meeting or may optionally participate in discussions where many students participate. Office hours may not be recorded except when I get through tutorial material.

A student may also request to setup another time for a one-to-one appointment through my personal zoom link: **https://unm.zoom.us/j/8307784406. Note that this is a different zoom link.**

Contact via email or text message:
You can email me at pattichi@unm.edu for any questions related to the course. Please use "ECE 533" in the email title so that I know that it is related to class. If I am late to an appointment or you desperately need to meet me, feel free to text me at my cell phone: (505) 563-0563. In general, avoid a direct phone call since I may mistake your call for a spam call ☹.

Course Description
The course will focus on the development of modern digital image processing and machine learning methods. The basic methods include the development of morphological and histogram-based methods, Fourier Transforms in for both continuous and discrete images and videos, the sampling theorem, digital filter design, image quality assessment, and motion estimation. The second part of the course is based on the development of AI and machine learning methods based on statistical learning theory. This includes clustering, classification, stochastic gradient descent, Convolutional Neural Networks, transformers, and generative methods. The course will also cover modern machine learning methods: supervised, unsupervised, self-supervised, adversarial, few-shot, zero-shot and active learning. A project is required.

Core Course in Applied Machine Learning and AI Systems Engineering
ECE 533 is a required core course in the Image Processing concentration of Electrical Engineering (E5), Computer Vision, Graphics and Image Processing (C4), and the Applied Machine Learning and AI Systems Engineering concentration of the online degree in Computer Engineering. As a core course, ECE 533 covers several key concepts associated with applying Machine Learning and AI techniques to digital images and videos. As part of the project, students are expected to complete a project that applies modern Machine Learning and AI concepts to image and video datasets. After completing ECE 533, students should be able to work on a project that is required for the Applied Machine Learning and AI Systems Engineering concentration.

Course Goals
The goals of the courses include:
- Learn and apply basic image processing methods.
- Demonstrate an understanding of the mathematical concepts associated with Fourier Transforms, sampling theory, and digital filtering.
- Demonstrate an understanding of modern machine learning methods and their applications to digital image processing.

- Demonstrate an application of digital image processing and machine learning methods to new datasets with limited ground truth.
- Understand how to complete an image processing project including proposal preparation, revision, presentation, and preparing the final report.

Course Outcomes

The following are the outcomes for the course. Each module will have specific learning outcomes listed on the Overview Page. The activities in that module (i.e., discussions, assignments, and assessments) are developed so that you can demonstrate you have met these objectives:

C1. Analyze, modify, and apply digital image processing methods.
C2. Develop and apply the foundational mathematical concepts associated with digital image processing systems.
C3. Develop a project that designs and implements a digital image processing system to solve a challenging problem.

Prerequisites and Co-requisites

- Graduate standing
- Knowledge of Calculus, basic probability and statistics, and Fourier Transforms
- Good coding skills

Specific Course Requirements (If Applicable)

The students should be able to code in Matlab and/or Python. A brief tutorial for Python will be given.

TECHNICAL SKILLS

In order to participate and succeed in this class, you will need to be able to perform the following basic technical tasks:

- Use Canvas (help documentation located in “Help”>”UNM Canvas Help Site” link on left course menu, and also at Online Student Documentation).
- Install, use, and program in Matlab for running the examples in the class.
- Install, use, and program in Python for the last part of the course.
- Use email – including attaching files, opening files, downloading attachments
- Copy and paste within applications including Microsoft Office
- Open a hyperlink (click on a hyperlink to get to a website or online resource)
- Use the in-course web conferencing tool (Zoom)
- Download and install an application or plug in – required for participating in web conferencing sessions

TECHNICAL REQUIREMENTS

Computer

- A high speed Internet connection is highly recommended.

- Supported browsers include: Detailed Supported Browsers and Operating Systems
- Any computer capable of running a recently updated web browser should be sufficient to access your online course. However, bear in mind that processor speed, amount of RAM and Internet connection speed can **greatly** affect performance. Many locations offer free high-speed Internet access including UNM's Computer Pods.
- Microsoft Office products are available free for all UNM students (more information on the UNM IT Software Distribution and Downloads page)

For UNM Canvas Technical Support: (505) 277-0857 (24/7) or visit the Canvas Info Site

Canvas outages: Unexpected Canvas system outages are rare but, if they occur, I will advise everyone on how to proceed.

Web Conferencing

Web conferencing will be used in this course for meetings with the instructor, office hours, and optional synchronous meetings.

For the online sessions, you will need:

- A headset with microphone. Headsets are widely available at stores that sell electronics, at the UNM Bookstore or online.
- A high-speed internet connection is highly recommended for these sessions. Please test your wireless Internet connection for audio and/or video quality prior to web conferencing.
- For UNM Web Conference Technical Help: (505) 277-0857

Tracking Course Activity

Canvas automatically records all students' activities including: your first and last access to the course, the pages you have accessed, the number of discussion messages you have read and sent, web conferencing, discussion text, and posted discussion topics. This data can be accessed by the instructor to evaluate class participation and to identify students having difficulty

TEXTBOOK AND SUPPLEMENTAL MATERIALS

Textbooks:

There are no required textbooks for the course. However, the slides for basic methods are taken from http://live.ece.utexas.edu/. On this website, scroll down to see the slides for *Digital Image Processing* and *Digital Video*.

You are required to download and take quizzes on the slides. You can download the Digital Image Processing directly slides at:
[DIP] https://drive.google.com/file/d/1l8NCj0QmTYpj13XgxCkmBzgiJ0cqNweR/view

You can download the Digital Video Processing slides directly at:
[DVP] https://drive.google.com/file/d/1p0UafVH6NzaQDCXdRf9SBUl9-8N38-Xe/view

The slides are associated with:

[DIP] Al Bovik, Ed., *The Essential Guide to Image Processing*, Academic Press, 2009.
[DVP] Al Bovik, Ed., *The Essential Guide to Video Processing*, Academic Press, 2nd ed., 2009.

The students can also find some nice demos from:
https://live.ece.utexas.edu/class/siva/default.htm

At the undergraduate level, the previous textbook used in this course is still very useful:

[Gonz-1] R.C. Gonzalez and R.E. Woods, *Digital Image Processing*, Prentice Hall, 4th ed., 2017.

It's companion provides a very quick way to learn image processing based on Matlab:

[Gonz-2] R.C. Gonzalez, R.E. Woods, and S.L. Eddins, *Digital Image Processing Using Matlab*, Gatesmark Publishing, 2020.
See tutorials at:
https://www.imageprocessingplace.com/root_files_V3/tutorials.htm

We will be using OpenCV. An outdated standard reference is given in:
[OpenCV] A. Kaehler and G. Bradski, *Learning OpenCV: Computer Vision in C++ with the OpenCV Library*; 2nd ed., 2012.

Instead of the book, we will be using the online documentation for OpenCV and the Python interface.

In terms of Python software patterns, we will be using:

[CNN] Aurelien Geron, *Hands-On Machine Learning with Scikit-Learn & TensorFlow Concepts, Tools, and Techniques to Build Intelligent Systems*, 3rd Edition, O'Reilly Media, 2022.
You can view this book freely at UNM by going to:
https://libguides.unm.edu/Safari

We will also be using state of the art tutorials from:
https://docs.opencv.org/4.x/
https://scikit-learn.org/stable/
https://pytorch.org/tutorials/

There are two excellent Python books that are strongly recommended:
[Python-1] D. Beazley, *Python Distilled (Developer's Library)*, 2021.
[Python-2] B. Slatkin, *Effective Python: 90 Specific Ways to Write Better Python (Effective Software Development Series)*, 2nd Edition, 2019.

The class will try to integrate the mathematics of modern statistical learning theory in Digital image processing using:
[ESL1] James, G., Witten, D., Hastie, T., and Tibshirani, R. *An introduction to statistical learning with Applications in Python*, 2023.
The book is freely available at: https://www.statlearning.com/
[ESL2] Friedman, Jerome, Trevor Hastie, and Robert Tibshirani. *The Elements of Statistical Learning: Data Mining, Inference, and Prediction*, Second Edition, 2009.
The book is freely available at *https://hastie.su.domains/ElemStatLearn/*

In terms of the evolution of computer-based methods in Statistics, an excellent reference is:

[CASI] Efron, B. and Hastie, T. *Computer Age Statistical Inference: Algorithms, Evidence and Data Science*, Cambridge University Press, 2016.

The most important reference for Deep Learning:

[DL1] Ian Goodfellow, Yoshua Bengio, and Aaron Courville. *Deep Learning,* MIT Press, 2016.
This book can be downloaded from http://www.deeplearningbook.org

Recently, we have two more books that are also available to UNM students:
[DL2] Prince SJ. *Understanding Deep Learning*. MIT press; 2023.
This book can be downloaded from https://udlbook.github.io/udlbook/

[DL3] Bishop, C.M. and Bishop, H. *Deep Learning: Foundations and Concepts*. Springer, 2024.
This book can be accessed online through the UNM library.

Required Supplementary Materials:

All students are expected to download and install Matlab. Matlab is freely available for UNM students. Students will also be expected to download and install Python. Python installation instructions will be provided.

COURSEWORK AND PARTICIPATION

Instructor Response Time

I routinely check the course for postings or emails throughout the day and weekends. You can anticipate a 24 to 48 hour response from me, Monday – Thursday. I will try and respond to all weekend (Friday afternoon to Sunday) emails and postings by noon on Monday or earlier. If it takes me more than 72 hours to respond to an email, I may have missed your message. In this case, please email me again.

Procedures for Completing Coursework

- Late homework is subject to penalties and may not be accepted. You may take a few extra days to complete a homework, provided you inform me before the deadline.
- A take-home final will be given in the last week of the course. No extra time will be allowed for the take-home final.
- A final project and a final presentation is required to receive credit for the course. The final project presentation will be due on finals week.
- All written work needs to be submitted online. If you have a difficulty using a tool to complete work, please reach out to UNM's Canvas Support immediately and notify your instructor as well. This statement does not apply to programming assignments. For programming assignments, notify the instructor.

Assignments

A detailed list of the assignments, due dates, and points is given in the schedule in the last page of the syllabus. Note that there will graded discussions as well as quizzes to ensure that students watch the lectures. In each assignment, all problems are weighted equally, unless you see the number of points associated with each problem.

Project

For the project, you will be asked to submit:

- Project proposal
- A revision of the project proposal
- Project presentation (including code)
- Final project material

Please see the assignments links within the course for more details.

Discussions

There will be course discussions that will be graded. You are required to participate in these discussions. There will also be a general Q&A discussion board where you can ask questions.

Final Exam

There will be a take home final exam assigned in the last week of classes.

Grading Policy

Final Take Home Exam	25%
Project	25%
Homework and Lecture Quizzes	50%

Expectations for Participation

- time required (9-12 hrs per week). However, please note that programming assignments may take longer, depending on your programming background. Furthermore, programming assignments may be completed over 2 weeks.
- students are expected to learn how to navigate in Canvas
- students are expected to keep abreast of course announcements
- students are expected to keep instructor informed of class related problems, or problems that may prevent the student from full participation
- students are expected to address technical problems immediately
- students are expected to observe course netiquette at all times

Netiquette

- Students are expected to follow the guidelines of netiquette when communicating and interacting in our course. Netiquette refers to a set of guidelines in online communication that help ensure positive interactions. In this case specifically, these guidelines seek to keep our online class a positive learning environment for everyone.

GRADING PROCEDURES

As outlined in the grading policy, the final grade will reflect three sub-areas:

- **Quizzes and Homework (50%):**
    - **Homework:** Homework assignments are directly related to the learning objectives of the course. Pencil and paper problems are specifically designed to help me assess fundamental mathematical concepts. Furthermore, some pencil-and-paper assignments follow a guided tutorial learn-by-doing approach, where a fundamental concept is developed through a sequence of questions. Programming problems are specifically aimed at testing the performance and

limitations of the different algorithms. Students will be expected to comment on the performance of each algorithm. Homework grades will be based on completeness, correctness, and adherence to programming guidelines. Students must submit running code so that the results can be reproduced if needed. **It is not acceptable for students to submit results without accompanying code.** Homeworks can be quite involved. You can take a few late days for each homework. However, for a delay of 3 or more days, to avoid a 10% minimum penalty, you will need to reach out in advance and provide documentation for extenuating circumstances. Otherwise your late homework may not be accepted. Expect the homework to be graded within two weeks. **Please note that note that the homeworks are not weighted equally. Some homeworks carry a lot more weight than others.**

  - **Quizzes:** There are some lecture quizzes for the first few modules. You can take these quizzes twice. Among the two grades, I will count the highest of the two grades.

- **Project material (25%):** Project material includes discussions, proposals, presentations, revision documents, and final presentation and student paper. The goal of the project is to apply digital image processing and machine learning methods developed in class to specific problems that are of interest to the student. The students will be expected to spend significant time on their projects. More specifically, note that projects count about half as much as credit as the homework. Thus, the goal here is to spend about half as much as the total time spent on the homeworks. **You are required to meet with the instructor online to discuss the project proposal and final presentation.** The instructor will provide you with different meeting times to make sure to find times to meet with each student. During the project proposal meeting, we will discuss the different aspects of your project and what will be needed to properly complete the project. You will be provided with templates for completing the project proposal, presentation, and the final paper. Furthermore, you will be provided with writing guides on how to complete the project assignments. Your project assignments will be graded based on effort, adherence to writing guidelines, completeness, and **response to feedback**. Project assignments will be graded in time to provide feedback prior to the next project assignment. Typically, project assignments will be graded within a week after the assignment is due.
  - **Course and Project Discussion:** You are expected to read the discussion prompt and carefully respond to all of the questions provided in the discussion prompt. Discussions help the instructor understand the needs and interests of the students as related to the learning objectives and the project. For example, there will be questions about your background to help the instructor understand how to focus the lectures on your specific interests and needs. Grades reflect completion. In other words, points will be taken off for not answering all of the questions raised in the discussion prompt. Discussions will be graded within a week after the due date.

- **Take home final exam (25%):** The goal of the final exam is to assess understanding of fundamental concepts developed in class. The final exam will be focused on concepts that were covered during the last part of the class. However, essential concepts that were covered earlier will also be tested. A more detailed guide will be provided on the week prior to the last week of instruction. The final exam will be graded within a week after its due date.

Grading Scale

Final grades will be based on the sum of all possible course points as noted above. Percentage of available points

Grade	
90 -100	A
80 -89	B
70 -79	C
60 -69	D
< 60	F

UNM POLICIES

Title IX: Gender Discrimination

The University of New Mexico and its faculty are committed to supporting our students and providing an environment that is free of bias, discrimination, and harassment. The University's programs and activities, including the classroom, should always provide a space of mutual respect, kindness, and support without fear of harassment, violence, or discrimination. Discrimination on the basis of sex includes discrimination on the basis of assigned sex at birth, sex characteristics, pregnancy and pregnancy related conditions, sexual orientation and gender identity. If you have encountered any form of discrimination on the basis of sex, including sexual harassment, sexual assault, stalking, domestic or dating violence, we encourage you to report this to the University. You can access the confidential resources available on campus at the LoboRESPECT Advocacy Center, the Women's Resource Center, and the LGBTQ Resource Center. If you speak with an instructor (including a TA or a GA) regarding an incident connected to discrimination on the basis of sex, they must notify UNM's Title IX Coordinator that you shared an experience relating to Title IX, even if you ask the instructor not to disclose it. The Title IX Coordinator is available to assist you in understanding your options and in connecting you with all possible resources on and off campus. For more information on the campus policy regarding sexual misconduct and reporting, please see UNM Administrative Policy 2740 and CEEO's website.

If you are pregnant or experiencing a pregnancy-related condition, you may contact UNM's Office of Compliance, Ethics, and Equal Opportunity at ceeo@unm.edu. The CEEO staff will provide you with access to available resources and supportive measures and assist you in understanding your rights. UNM's lactation stations are marked on the UNM campus map.

Copyright Issues

All materials in this course fall under copyright laws and should not be downloaded, distributed, or used by students for any purpose outside this course.

The UNM Copyright Guide has additional helpful information on this topic.

Accessibility

The American with Disabilities Act (ADA) is a federal anti-discrimination statute that provides comprehensive civil rights protection for persons with disabilities. Among other things, this legislation requires that all students with disabilities be guaranteed a learning environment that

provides for reasonable accommodations of their disabilities. If you have a disability requiring accommodation, please contact the UNM Accessibility Resource Center in 2021 Mesa Vista Hall at 505-277-3506. Information about your disability is confidential.

- Canvas's Accessibility statement
- Microsoft's Accessibility statement
- Matlab's Accessibility Statement

Academic Misconduct

You should be familiar with UNM's Policy on Academic Dishonesty and the Student Code of Conduct which outline academic misconduct defined as plagiarism, cheating, fabrication, or facilitating any such act.

Drop Policy

This course falls under all UNM policies for last day to drop courses, etc. Please see or the UNM Course Catalog for information on UNM services and policies. Please see the UNM academic calendar for course dates, the last day to drop courses without penalty, and for financial disenrollment dates.

Virtual Meeting Recordings and Guest Participant Policy

Technology will be used for virtual meetings in this course and our use of such technology is governed by the Family Educational Rights and Privacy Act of 1974 (FERPA), the UNM Acceptable Computer Use Policy, UNM Computer Use Guidelines, and UNM's Student Code of Conduct. Sharing Electronic video and/or audio recording of the class with participants outside of the class is not permitted without written consent of the instructor and each participating student individually. The form to obtain written consent is available at FERPA Consent Form. If a student in the course is uncomfortable with completing the FERPA consent waiver, then the student should talk with their advisor or instructor to determine whether successful participation in the class is still possible, or whether another course will meet the student's degree requirements.

If permission for electronic video and/or audio recording is granted, any distribution of the recording is prohibited. You may not share class recordings with anyone outside of this course and doing so may result in disciplinary action. Students with specific electronic recording accommodations authorized by the University of New Mexico Accessibility Resources Center do not require instructor permission; however, the instructor must be notified of any such accommodation prior to recording. A record of all meetings and recordings is kept and stored by UNM, in accordance with these policies. Guest instructors and other participants may also attend our class meetings. Your instructor will not share course access in relation to class activities outside of the course participants, which include your fellow students, TAs/GAs, and any guest instructors, guest students, or community-based learning partners that we may engage with to achieve the stated course objectives.

UNM RESOURCES

Student Learning Support at the Center for Teaching and Learning offers individual consultations and online support for graduate students through the **Graduate Resource Center**

(GRC). This includes support through the **UNM Graduate Online Writing Lab**, where you can seek feedback on your writing and research projects.

UNM Libraries provides students with a number of ways to access research and resources, such as reserving books and other media, requesting books and online materials through ILLiad, and access to research databases.

Student Health and Counseling (SHAC) provides quality health and counseling services to all UNM students to foster student success. Fees charged at SHAC are much lower than community rates. SHAC is funded in part by student fees, and they are accredited by the Accreditation Association for Ambulatory Healthcare (AAAHC). You can contact SHAC at (505) 277-3136.

LoboRESPECT Advocacy Center (505) 277-2911 can offer help with contacting faculty and managing challenges that impact your UNM experience.

FOR MILITARY-CONNECTED STUDENTS

There are resources on campus designed to help you succeed. You can approach any faculty or staff for help with any issues you may encounter. Many faculty and staff have completed the GREEN ZONE training to learn about the unique challenges facing military-connected students. If you feel that you need help beyond what faculty and/or staff can give you, please reach out to the Veterans Resource Center on campus at 505-277-3181, or by email at vrc@unm.edu.

LAND ACKNOWLEDGEMENT

Founded in 1889, the University of New Mexico sits on the traditional homelands of the Pueblo of Sandia. The original peoples of New Mexico Pueblo, Navajo, and Apache since time immemorial, have deep connections to the land and have made significant contributions to the broader community statewide. We honor the land itself and those who remain stewards of this land throughout the generations and also acknowledge our committed relationship to Indigenous peoples. We gratefully recognize our history.
Resource: Division for Equity and Inclusion.

CITIZENSHIP AND/OR IMMIGRATION STATUS

All students are welcome in this class regardless of citizenship, residency, or immigration status. Your professor will respect your privacy if you choose to disclose your status. As for all students in the class, family emergency-related absences are normally excused with reasonable notice to the professor, as noted in the attendance guidelines above. UNM as an institution has made a core commitment to the success of all our students, including members of our undocumented community. The Administration's welcome is found on our website.

RESPECTFUL AND RESPONSIBLE LEARNING

We all have shared responsibility for ensuring that learning occurs safely and equitably. UNM has important policies to preserve and protect the academic community, especially policies on student grievances (Faculty Handbook D175 and D176), academic dishonesty (FH D100), and respectful campus (FH CO9). These are in the Student Pathfinder and the Faculty Handbook. Please ask for help in understanding and avoiding plagiarism or academic dishonesty, which can both have very serious consequences.

CONNECTING TO CAMPUS AND FINDING SUPPORT

UNM has many resources and centers to help you thrive, including opportunities to get involved, mental health resources, academic support including tutoring, resource centers for people like you, free food at Lobo Food Pantry, and jobs on campus. Your advisor, staff at the resource centers and Dean of Students, and I can help you find the right opportunities for you.

COURSE SCHEDULE

The full course schedule is given in the following page. All of the homework assignments, discussions, and lecture quizzes add up to 50% of the grade. The project accounts for 25% of the total. The take home final accounts for another 25%.

Important Semester Deadline dates can be found on the registrars' website.

List of Modules: Each week covers a different module

Module 1 (week #1) Course Introduction

Module 2: Basic ideas assoc with digital image proc

Module 3: Fundamental ops based on modules #1, #2, and #3.

Module 4: Fourier Transform and fast convolutions

Module 5: Fourier Transforms demos

Module 6: Digital filtering and Fourier analysis

Module 7: Sampling and Fourier Transform problems

Module 8: Introduction to machine learning for image and video analysis

Module 9: Classification

Module 10: Classification examples

Module 11: Enable students to code machine learning methods as well as review the fundamentals

Module 12: Basics of Deep Learning systems and introduction to CNNs

Module 13: Foundations of Convolutional Neural Networks (CNNs)

Module 14: Basics of PyTorch coding of how to create and train a CNN

Module 15: Review unsupervised learning, spatial transformers and final exam

Moulde 16: Final Exam

Week	Dates	Week Info	Materials	Assignment/Exam/Points	Due Dates
1	21-Jan	Monday is MLK	Syllabus, class requirements	Homework #0: Setup (50 pts) & Discussion (100 pts)	27 Jan
2	27-Jan		DIP Modules #1 and #2	Quiz #1 (110 pts). Homework #1 (160 pts).	3 Feb for both
3	3-Feb		DIP Modules #2 and #3	Quiz #2 (120 pts). Homework #2 posted (900 pts).	10 Feb for Q2
4	10-Feb		DIP Module #3 + class lectures	Quiz #3 (120 pts). Homework #2 (due Mar 10).	17 Feb for Q3
5	17-Feb		DIP Module #3 + class lectures	Homework #2 discussion.	10 Mar
6	24-Feb		DIP Module #3: FFT + Hwk solns	Install Python and work on Hwk #2 (900 pts)	10 Mar
7	3-Mar		Module #7 video lectures	Continue working on Hwk #2 (900 pts)	10 Mar
8	10-Mar		Intro to Machine Learning	Project proposal (50 pts), meeting to discuss it (50 pts)	24 March
	17-Mar	Spring Break			
9	24-Mar		Classification+Regression	Proposal meeting + revised Proposal (150 pts)	1 Apr for rev. prop.
10	31-Mar		Classification using Scikit Learn	Homework #3 start (600 pts)	13 Apr
11	7-Apr		ML methods in Python	Homework #3 coding (600 pts)	13 Apr
12	14-Apr		Deep learning + CNN	Start working on Homework #4 (200 pts)	2 May
13	21-Apr		CNN + SE Net	Homework #4 CNNs using PyTorch (200 pts)	2 May
14	28-Apr		Create and Train CNN	Homework #4 coding (200 pts)	2 May
15	5-May		Transformers + Review	Prepare for final exam	
16		Last week of classes	Review and final exam	Take-home final exam (25% of total)	9 May
		Finals week		Final Paper and Presentation (800 project points)	17 May